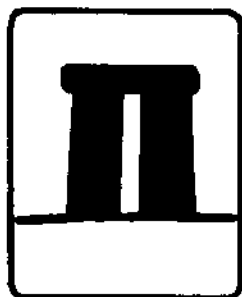


STRANGE ARTIFACTS



A SOURCEBOOK ON ANCIENT MAN

Compiled by
WILLIAM R. CORLISS

VOLUME M-2

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NOTICE

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*A breakdown of the subsections within these categories follows. Use the headings at the tops of the pages to locate specific subsections and entries.

<u>Section Code and Title</u>	<u>Subsection Code and Title</u>
MA Anthropological evidence	MAD Physical characteristics
	*MAS Social structure
ME Geological artifacts	MEF Fossil footprints
	MES Skeletons
	MET Technological artifacts
MG Graphic artifacts	MGM Macroforms
	MGP Pictographs
	MGS Symbols and notation
	MGT Statues, images
	MGW Writing

CONTENTS

- | | | | |
|----|--------------------------|------|------------------------------|
| ML | Legends, myths, concepts | MLD | Dwarfs |
| | | *MLE | Elementals |
| | | *MLG | Gods, messiahs |
| | | *MLM | Giants |
| | | *MLO | Origin of man |
| | | MLT | Myths of technology |
| | | MLW | Cosmology, world history |
| MM | Manufactured artifacts | MMC | Coins, metallic items |
| | | MMF | Flints, celts, etc. |
| | | *MMP | Pottery, seals, etc. |
| | | MMT | High technology |
| MS | Structural artifacts | MSB | Buildings |
| | | MSC | Canals and waterworks |
| | | MSD | Dolmens and standing stones |
| | | MSF | Forts |
| | | MSG | Graves and mounds |
| | | MSH | Henges, organized structures |
| | | *MSO | Obelisks and stellae |
| | | MSP | Pyramids |
| | | MSR | Roads |
| | | MSS | Systems of structures |
| | | MST | Tunnels, mines |
| | | MSW | Walls, ditches |

*This subsection not represented in Volume M2.

PREFACE TO M-2

Volume M1 of the STRANGE ARTIFACTS series was published in the spring of 1974. Although there have been many requests for M2, this second volume has been delayed by the desire to publish sourcebooks in the other series. With five series now well underway and a sixth (in psychology) scheduled shortly, it is time to return to the STRANGE ARTIFACTS file.

Raw material for this series is abundant---so profuse that enough good material is on hand for volumes M3 and M4. Beyond that, the great reservoir of data, the open literature, has been scarcely sampled. We shall go on as long as individuals and libraries continue buying the sourcebooks.

The reader unfamiliar with the sourcebook concept should refer to the prefaces in the first volumes of each series for additional background. The rather unique format of the sourcebooks is explained on page 1. As with volume G2 in the STRANGE PHENOMENA series, the M2 index encompasses both volumes M1 and M2.

William R. Corliss

Glen Arm, MD 21057
April 9, 1976.

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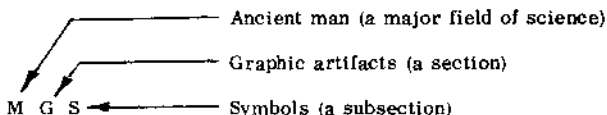
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ORGANIZATION OF THE SOURCEBOOKS

All sourcebook entries are labelled with three letters and a number; viz., MGS-012. The three letters indicate a category of artifacts. MGS, for example, designates a subsection of the book containing accounts of symbols, such as cupmarks. The number following the letters is simply an acquisition number within that subsection. Thus, entry MGS-012 is the 12th entry in the symbol category. The indexes at the back of each sourcebook and all cross references are keyed to the entry number rather than page number.

There is a plan to the assignment of letter codes. The first letter indicates a broad, general field of science, such as ancient man, M. The second and third letters are assigned to sections and subsections within this general field, as illustrated below:



The sections denoted by the second letters are based upon the character of the artifact at hand. Symbols are graphic in essence and thus bear the MG label.

The subsections (third letters) are narrower in scope than the sections. Experience, however, has shown that subsections must be broad to encompass the great variety of artifacts in a reasonable number of categories. They cannot be too broad, though, or a structureless hodgepodge results. The subsections have been selected and named with great care to avoid suggesting specific hypotheses. A complete list of sections and subsections now in use precedes this page and also functions as a Table of Contents. Detailed descriptions of the subsections are placed at the beginnings of the sections.

When searching for a specific entry, scan the running heads at the tops of the pages; they give the entry numbers as well as the subsection titles. The person who reads for curiosity's sake will find that each subsection is much like a chapter, with many related items grouped together.

The loose-leaf format of the sourcebooks makes it possible to combine material subsection by subsection as new volumes are issued.

Each volume is indexed by subject, by author, and by data source. Each volume is self-contained. With the issuance of future volumes, cumulative indexes will be compiled. There will be no necessity to hunt through several indexes to find something. Because some major fields are interrelated, it will doubtless prove useful to cumulate indexes from the different series on geophysics, earth science, ancient man, and so on.

References, annotations, and Compiler's Summaries are printed full-width, while all direct quotes are indented.

ORGANIZATION OF THE SOURCEBOOKS

Being a sourcebook, the core of this volume consists of direct quotations from eye-witnesses and key investigators. The text herein faithfully retains the old spellings (except for the disconcerting *I-for-s*), punctuations, and even a few typos. After all, only the eye-witness' own words convey the facts as he perceived them. Regurgitations and surveys, so common these days, are already once or twice removed from the situation. The whole object of these sourcebooks is to give the reader and researcher an organized collection of original writings on the more unusual facets of the natural world. Much of this unique information is being lost as libraries become more highly computerized. Data selected for data banks must have current relevance and be acceptable to the science of the day. Hopefully, these sourcebooks will preserve something of value and help focus the diverse, widely dispersed anomalies on the frontiers of science. They should also be interesting reading.

SECTION MA:

ANTHROPOLOGICAL EVIDENCE

Modern man retains "memories" of ancient man in his physical and social makeup. Our holidays and festivals, for example, seem to be derived from very ancient celebrations and possess strong astronomical overtones. Blood types, bone structure, and other physical attributes may also tell us something about our ancestors. While not artifacts in the sense that social characteristics are, the M series of sourcebooks seems the appropriate place to locate such material. As with all sections in this volume, the emphasis is on evidence that seems unusual or anomalous, such as that which tends to indicate that the human race has degenerated rather than evolved upward. Even though such radical hypotheses may turn out to be false, the data that stimulated their formulation may be significant.

MAD Physical characteristics. Brain size, blood types, physical and mental capabilities.

*MAS Social structure. Religions, forms of government, social customs, etc.

*This subsection not represented in Volume M2.

ANTHROPOLOGICAL EVIDENCE

MAD-004 ORIGIN OF THE INDIANS - - - THE POLYNESIAN ROUTE

Wickersham, James; American Antiquarian, 16:323-335, 1894.

Long before Thor Heyerdahl, scientists wondered about the possibility of diffusion via oceanic current systems. The 19th Century data on drifting fishermen and debris is most interesting in connection with modern thoughts about Asiatic landings in the Americas.

In the January number of The Antiquarian Professor Cyrus Thomas begins a series of very interesting articles on the origin of the American tribes, and in which he very learnedly supports the theory that they came to America over the Polynesian islands. He finds a wide difference between the Pacific coast tribes and those inhabiting the region west of the Rocky mountains; he includes in the Pacific coast type all that ocean fringe population from Alaska to Nicaragua (except, perhaps, in California) and including the semi-civilized Aztecs and Central Americans. The theory seems to be that the Pacific coast type is Polynesian and the eastern tribes of America are of a different origin. He then presents a comparative view of the customs, traditions, languages and physical appearance of the Pacific coast type and those of the South Sea Islanders, and upon this side-by-side examination concludes that they are of the same stock or type of man; that the New Zealander and the tribes of the Pacific coast of America are brothers; that America was peopled by these South Sea Islanders; that the evidence of this fact exists in the similarity of these customs, traditions, languages and physical appearances. He presents as proof of his theory the similarities pointed out by Niblack between the Maoris of New Zealand and the Haidas of our own coast; altogether he presents proof quite sufficient to establish one point in his argument, viz.: the relationship between the Pacific coast type and the New Zealander and other tribes of Polynesia. But does the fact of relationship, even when admitted, prove the course of migration?

Suppose they do look alike, talk alike, and repeat the same traditions; grant that they are related and belong to the same stock or type of man; admit that they sprang from the same common ancestor, and that they are brothers; how does that prove that the ancestors of our American tribes came from Asia over the Polynesian islands? I grant the truth of all the evidence presented in support of the relationship between these widely separated tribes; Niblack failed only in not finding many more points of resemblance between the tribes of the northwest coast and of New Zealand; but I deny the correctness of the conclusion reached by Professor Thomas. I deny that America was peopled from Asia by way of the Pacific islands.

The Pacific ocean covers nearly one-half the earth's surface; from the Malay peninsula to the west coast of South America, on the line of the equator, is 180 degrees, or exactly one-half the greatest circumference of the globe. Across this wide waste of unknown seas we are told that the Asiatic Mongoloid paddled his canoe, without compass or chart, from island to island, until crossing the 12,500 miles he rested upon and inhabited the continents of America. These island resting places are mere specks in this vast ocean, from 100 to 2,000 miles apart. He was forced to make voyages, from land to land, greater than that from Ireland to New Foundland; greater than from Africa to the coast of South America. If, without compass, he missed his small island resting places he could only continue eastward until by accident he should find another. A voyage, say of 2,000 miles, in a canoe must certainly take not less than 100 days, and provisions and water for this time must be carried; a canoe would

not be sufficient. When all the difficulties of such a voyage are considered, the voyage of discovery performed by Columbus fades into insignificance when compared with it. From Easter Island to the nearest point on the Chilean coast is 2,030 nautical miles; from Easter Island to the next nearest island westward inhabited by South Sea natives is 1,500 nautical miles; Easter Island is thirteen miles long. From Honolulu to San Francisco is 2,080 nautical miles; consider a canoe voyage from either Easter or Hawaiian islands, without compass or chart, against both wind and current, by an Indian in a canoe!

Then how may we account for the apparent relationship between the New Zealander and the Haidah of our own shores? How explain the existence of the same type of people in America and on the widely-separated, far-away Pacific islands? If the admitted relationship and facts do not prove Prof. Thomas' theory, what do they prove?

There is no doubt that many of the nearer and larger of the Pacific islands were peopled from Asia, for the black population had over-run New Zealand. It is quite probable that this migration eastward from Asia had thrown the Papuan race upon the shores of Australia, New Zealand and the Fiji islands; that the islands of Micronesia were inhabited from Asia may also be admitted; it is quite probable, however, that these were mixed with that race which farther east is called the Polynesian; but that Polynesia was inhabited from Asia, or that America received any part of her population from Polynesia, is not believed to be true. Why is it that the Papuan race, which inhabited New Zealand before the Polynesian, had not reached America? All the islands of Polynesia were inhabited by a copper-colored race nearly akin to the Indians of America, and very likely the Japanese; between them and the coasts of Asia existed the Papuan and the Micronesians; why did not the Polynesians inhabit the larger islands of Australia, New Guinea, Borneo and the Philippines? Because they did not come eastward from Asia, but reached Polynesia from the far or eastern side.

The great ocean currents of the equatorial Pacific flow from east to west, from the shores of America to the shores of Asia. The drift of the Pacific in the region of the alleged Polynesian route is westward; the prevailing winds are in the same direction; no castaway vessel in this region has every taken but one course---toward the shores of Asia. It is only by design that man could have crossed from Asia to America in this wide sea region, and the existing well-known natural conditions of wind and current must be changed before we can conceive of such a voyage being performed, even from one island home to another. Not one iota of evidence has ever been produced to prove one such voyage; no record of one such exists; neither by accident nor design has an instance occurred whereby a Polynesian has been involuntarily or otherwise thrown upon the American coast. The Polynesian theory exists without any evidence to support it.

The northern equatorial current of the Pacific takes its rise off the coast of Lower California, and joining force with the great Humboldt current from up the west coast of South America, flows in a broad, resistless equatorial flood half around the world, until striking the shores of Asia it divides, one branch being driven northward past the green hills of Japan, off which it receives the ancient Japanese name "Kuro-schiwo," or "black stream." Thence flowing eastward just south of the Aleutian islands until it reaches the coasts of America, it sweeps southward past the fir-clad hills of Washington and Oregon to join the equatorial current again off the coasts of California---a majestic ocean current on its never ceasing half world circuit. It is to this warm ocean river that we are to look for the explanation of the relationship between the New Zealander and the Haida of our Northwest coast. It is this great highway we must examine

for evidences of migration. Here is offered at least a reasonable probability of a route of travel; here is a means by which, without compass or volition on the part of man, the smallest islands of the broad Pacific may have been populated. It were only necessary for the voyager to preserve life, and, without effort, in this broad, majestic and resistless current he will be swept from either the shores of Asia or the coasts of America, westward across the Pacific, and thrown on the shores of these small equatorial islands, and if none intervene may even be carried again to Asia or back again to America. This great wheel current of the North Pacific is the route traveled by castaways from Asiatic and American shores; on its outer rim around this great circuit is found the same type of man---the Japanese, the Haida, and the Polynesian. This current is the migration route over which the Mongolian tribes of Asia may have reached America and the islands of the Pacific. Is there any evidence that such an instance ever occurred---is there proof of this theory?

First, however, let us understand that there is a probable unity of blood between the tribes inhabiting the Pacific islands of Polynesia. "No writer, probably, is entitled to more weight in his views of the identity and the heterogeneity of the oceanic races than Mr. Ellis, who has spent many years of a useful life among the groups of the Pacific, noting intelligently and investigating patiently their history, traditions, languages and relationship to each other. He authoritatively states, from his own observations, that the natives of Chatham Island and New Zealand in the south, the Sandwich Islands in the north, the Friendly Islands in the west, and all the intermediate islands, as far as Easter Island in the east, are one people. Their mythology, traditions, manners and customs, language, and physical appearances, in their main features, are, as far as we had an opportunity of becoming acquainted with them, identically the same, yet differing in many respects from those of the islands to the westward of Tongabatie."---Missionary Voyage, 410.

"This grouping, though extensive, stretching through seventy degrees of latitude and seventy degrees of longitude, is still comprised in the western hemisphere, with the exception of New Zealand; and we presume in these island-peoples a homogeneity of race, and also, though with less pronounced characteristics, an identity with the red and copper-colored inhabitants of the American continent."---"Hawaii," Manly Hopkins, p. 63.

"The New Zealander and Hawaiian," says Mr. Jarvis, who resided four years in the Sandwich Islands, "though more than four thousand miles apart, with all the intermediate tribes, are members of one family, and require but a short period to acquire the faculty of a free exchange of ideas."---idem, p. 75.

It seems, now, to be conceded that these people are to be classed as Oceanic Mongolidae, and have marked characteristics in common with the natives of eastern Asia and western America---Professor Thomas bringing them directly from the coast of Asia, step by step, across the small and distant islands. All this, except the direction of the migration, being conceded, there arises another preliminary question, viz: When did this migration take place---in ancient or modern times? There is nothing about the population, or the archaeological remains upon these islands, to indicate a long continued residence of these copper-colored inhabitants; on the contrary, their traditions, language, customs and archaeology, show them to have been comparatively recent occupants, and in some instances so recent that historic dates can approximately be determined. It is believed that the New Zealanders reached their present home in the fifteenth century, and, after massacring the Papuan population found there, took possession of the island. The New Zealanders were Tahitians, so they say, and came from the northeast.---"Greater Britain," Dilke, p. 293.

It is true that remains of stone images and other permanent archaeological evidences exist on some of the islands, but none of these conflict in anywise with the facts hereinafter set out, or prove that the builders came from the west rather than via the north Pacific current; neither do they prove in any degree, but rather the reverse, that America was settled from Polynesia. These permanent remains are not of a high order, and not of that magnitude or extent to justify the conclusion of a long continued residence by a civilized people. There is not the slightest proof that the civilization of Mexico, Central America or Peru came from these South Sea islands; the higher type of remains on Easter Island is related to the ancient civilization of the Celebes, and not to anything in America.---Brinton, *Science* of March 9, 1894.

Conceding, then, the close relationship between the tribes of eastern Asia, western America and Polynesia, what was the course of migration across the South Sea? Was Oceanica peopled from Asia? Was America peopled from Oceanica? No safe deductions can be reached from a comparison of languages, habits, traditions, religion or physical appearances. By these evidences we cannot determine whether America was peopled from Oceanica, or Oceanica from America; we can, of course, arrive at the safe conclusion of relationship between the races inhabiting the two regions, but which was the original home? Are there not facts, however, rather than theories, upon which to base a conclusion, and if so what are they? What is the evidence upon which to base a judgment?

* * *

The first fact, and the important one, too, is the existence of the northern equatorial current forever bathing the shores of the islands of Oceanica with its westward flow. This and the "Kuro-shiwo," or "black stream" of the Japanese, make a great wheel current in the North Pacific ocean, upon the outer circumference of which are scattered the wrecks of eastern Asia and western America. This endless ocean river bathes the shores of Asia, America and the Polynesian islands with its warm waters; it carries the drift of Asia to America, and the accumulation of Asia and America to the islands of the mid-Pacific. This unique current of the world's greatest ocean is the explanation of the similarity between the people of Asia, America and Oceanica; it has for countless centuries cast the drifting east-Asian not only on the coasts of America, but, missing that, upon the islands of the Pacific. On the outer rim of this great circling current is found the same type of man, inhabiting the far distant regions of Japan, Southern Alaska to Oregon, Hawaii, New Zealand and the many small islands of Polynesia. This wide distribution of the same type of man was accomplished by this never-ending, ever-flowing, revolving ocean current.

Of the possible thousands of wrecks cast upon the shores of America and the islands of the equatorial Pacific prior to 1492 we can know nothing; but since that date, and especially since the beginning of the seventeenth century, sufficient evidence has been preserved upon which to base an estimate of what must have happened ever since Asia has been inhabited by a seafaring people.

Seven castaway Japanese vessels have been thrown upon the Aleutian islands since the beginning of the seventeenth century. "In July, 1871, the old chief at Atter Island, aged 70 years, reported that three Japanese junks had been lost upon the surrounding islets during his recollection, besides one stranded not far from the harbor of that island in 1862." In 1782 a Japanese junk was wrecked upon the Aleutian islands, from which the survivors were taken in one of the Russian-American company's vessels to Kamtschatka and thence returned to their native island. In 1805 a junk was wrecked upon the coast of Alaska, near Sitka, and the crew was quartered on Japoniski Island,

and afterwards returned by the Russians to Japan. Another of these wrecks was cast upon Queen Charlotte's Island, and two upon Vancouver's Island. In 1833 another was thrown ashore at Cape Flattery, and the crew was rescued from slavery among the Makahs and returned to Japan by the Hudson Bay Company. Another vessel loaded with beeswax was thrown ashore near the mouth of the Columbia river, where the crew was captured by and amalgamated with the Indians. Several floating but abandoned wrecks have been sighted off the coasts of California, while three were thrown ashore on Lower California and two in Mexico. "In 1845 the United States frigate St. Louis took from Mexico to Ningpo, in China, three ship-wrecked Japanese, being survivors of the crew of a junk which had drifted from the coast of Japan, entirely across the Pacific ocean and finally stranded on the coast of Mexico, where they remained two years." For ages last past the shores of America, from the Aleutian islands to Mexico, as well as the Pacific islands, have been strewn with wrecks from Asia carrying human freight. "In 23 cases where the actual number on board was named, they aggregated 293 persons, an average of 12-3/4 persons to a junk---ranging from 3 to 35 in individual cases. Where definite statistics of the saved are given, we find 222 persons saved in 33 cases; an average of 6-3/4 persons in each disaster. On eight occasions three persons were rescued; in four cases, one person; and on four other cases, four persons; three times, eleven were saved; and twice each, 5, 12, 15, 17; and once each 2, 6, 7, 9, 10, 13 were saved. * * Fifteen vessels mention having drifted helplessly at sea an aggregate of 106-1/2 months, averaging a little over seven months each." ---"Japanese Wrecks," Brooks, 1876.

The above facts sufficiently prove the probability of peopling America from Asia via the "Kuro-shiwo," or "black stream," of Japan, yet singularly enough the author of the above paper, which was read before the California Academy of Science in March, 1875, in a later paper read before the same society in May, 1876, used these and additional facts to prove that Asia (and incidentally Polynesia, too,) was peopled from America, via the equatorial current of the Pacific.---"Origin of the Chinese Race," Brooks, 1876.

In the last paper Mr. Brooks shows how easy it would be for vessels leaving the coast of Peru, or even Central America, taking advantage of both wind and current, to reach the continent of Asia, and says: "While we have cited facts showing it reasonable to suppose that early Peruvians or Central Americans may have come to China by the aid of continual fair winds, it is no less necessary to show the almost insurmountable difficulties which exist during a greater part of the year to impede their return by sea. To beat back against strong trade winds and the long regular seas of the Pacific would be a task in which they would surpass our best modern clippers, which now can only make the voyage by running far north and crossing from Japan to the coast of California, upon the arc of a great circle, and sailing thence southerly, close hauled on the wind, to the neighborhood of Tahiti in the South Pacific, which must then be crossed in an easterly direction, south of the trade winds, which in turn enable them to make northing and reach the coast of Peru. Such a return voyage would require the most skillful knowledge of winds, coasts and scientific navigation, such as we have possessed in comparatively recent times, and would also require exceeding strong and weatherly vessels. There seems, therefore, less likelihood that any Chinese ever reached Peru in pre-historic times by such a route."

* * *

Sir Edward Belcher gives a very full record of the landing of a castaway Japanese junk on the Sandwich Islands, in his "Voyage Round the World," pp. 304-5. He says: "About the same time another Japanese junk was wrecked on

MAD-004 PHYSICAL CHARACTERISTICS

the island of Oahu, Sandwich Islands." From the Hawaiian Spectator, Vol. 1, p. 296, I have the details: "A junk laden with fish, and having nine hands on board, left one of the northern islands of the Japanese group for Jeddo, but, encountering a typhoon, was driven to sea. After wandering about the ocean for ten or eleven months, they anchored on the last Sunday of December, 1832, near the harbor of Waialea, Oahu. Their supply of water during the voyage had been obtained from casual showers. On being visited four persons were found on board; three of these were severely afflicted with scurvy, two being unable to walk and the third nearly so. The fourth was in good health, and had the sole management of the vessel. After remaining at Waialea for five or six days, an attempt was made to bring the vessel to Honolulu, when she was wrecked off Barber's Point, on the evening of January 1, 1833. Everything but the crew was lost, with the exception of a few trifling articles. The men remained at Honolulu eighteen months, when they were forwarded to Kamtschatka, from whence they hoped, eventually, to work their way, by stealth, into their own country, approaching by way of the most northerly island of the group. When the people (Hawaiians) saw the junk, and learned from whence it came, they said it was plain, now, whence they themselves originated. They had supposed, before, that they could not have come from either of the continents; but now they saw a people much resembling themselves in person and in many of their habits; a people, too, who came to these islands without designing to come; they said, 'It is plain, now, we came from Asia.'"

Belcher records the fact that a similar circumstance happened in the same bay on the Hawaiian Islands long before the whites came there. In 1854 the American ship Lady Pierce returned to Japan the sole survivor of a crew of fifteen, who was taken from a floating junk near the Hawaiian Islands; the vessel had been drifting seven months from the coast of Japan. A junk was cast upon the windward side of Kauaii, one of the Hiawaiian Islands, and the survivors landed at Hanalie harbor. Ocean and Brooks' Islands are the most western of the Sandwich Island system; in 1859 the bark Gambia, Captain Brooks, found the remains of a Japanese junk on Ocean Island, and in the same year, on July 4, the remains of two stranded junks with lower masts high on the beach, were found on the east, or lagoon side of Brooks' Island. Hawaiian traditions maintain that many castaways were thrown on these islands in times past. Driftwood from the northwest coast is cast upon these islands. "The winds and ocean currents set directly from the northwest coast of America to the Hawaiian Islands; logs and skiffs are constantly being borne from California and Oregon to their shores; none is borne or could be borne from any other direction, except by the way of the Japan current, which unites with the California current a little north of the latitude of these islands. And it is supposed that some of an anterior race, as the Toltec race, were out in their canoes on a sailing or fishing excursion and got blown off from the shore, got into the current and were carried to the islands. And that the Hawaiians came from the northwest coast of America is supported by such an array of probabilities and possibilities that they exclude any other hypothesis. When I was in Hilo, in 1880, a log drifted into Hilo bay that we know grows in no part of the world except the northwest coast, and the bark on the log was still green, and the scar where it was cut off was still white, so anything getting into the current, it takes but a short time to be carried to the island."---"Life in the Sandwich Islands," Bennett, p. 3.

On September 10, 1862, an enormous Oregon tree, about 150 feet in length and fully six feet in diameter above the butt, drifted past the island of Mauii, Hawaiian Islands. Many saw-logs and pieces of driftwood were thrown ashore at this time, and the windward shores of the Hawaiian Islands are literally lined with this material, as well as redwood logs from California.

Baker's Island lies on the equator, in the very center of Polynesia: "A Japanese junk drifted past Baker's Island, latitude 0° 52' north, longitude 176° 22' west, some time in 1863; boats were sent out and towed it to the beach; there were four Japanese bodies on board; all were dead." "In 1864, February 4, on Providence Island, latitude 9° 52' north, longitude 160° 65' east, on the lagoon side of the island, was seen the portions of a vessel which had been many years a wreck. Scattered along the outer shore were many redwood logs, some of them of great size."---"Japanese Wrecks," Brooks, 1875.

Many more instances could be cited if necessary, but I think sufficient has been shown to make out a case. One well attested fact is worth unnumbered theories. The facts show that Polynesia may have received her inhabitants from Asia; there is no reason to doubt that canoes of Indians from the north-west coast of America may not have also been carried to these Polynesian islands with the masses of drift certainly going from the same region. But I believe the source of population for the northwest coast of America, as well as for Polynesia, was Japan and Eastern Asia. From the east coast of Japan the Mongolian of Asia passed over the "Kuro-shiwo" to both America and Polynesia. The Sandwich Islands stretching from Hawaii to Ocean Island presented a barrier full across the southern and return flow of the Japan current, and probably the whole of Polynesia was peopled from their shores. "According to native tradition, frequent intercourse existed between the various groups of islands, and the canoes then used were larger and of better construction. In the Hawaiian meies, or songs, the names of Nuuhioa and Tahuata, two of the Marquesan Islands; Opolu and Savaii, belonging to the Samoan group; and Tahiti, with others in that neighborhood, frequently occur, besides the names of headlands and towns in these islands. These songs also make allusions to voyages from Oahu and Kauai to islands far west."---"Hawaii," Hopkins, p. 51.

We know that the Hawaiians went to Tahiti; the New Zealanders were emigrants from Tahiti; the conclusion seems to be fair that far-distant New Zealand was peopled by castaways from Asia, via the "Kuro-shiwo" and Hawaii.

While the records, traditions, songs and history give many instances of migrations westward, in Polynesia none are mentioned toward the rising sun. Every tradition goes with the ocean drift---westward; the migrations go west and south, but never to the east. There is not a single known exception to this rule.

"If the march of mankind was toward the east, and they had already swarmed downwards and peopled the upper continent of America, there would indeed be no difficulty in the supposition that from the western shores men had taken another departure and reached the nearest of the islands of the Pacific. For the trade winds blow steadily from the northeast during nine months of the year, and cattle have been conveyed in an open boat from the Californian coast to the Hawaiian islands, which can be reached in a few days. So that either accident or a desire to make maritime discoveries, might have thrown upon the shores of Hawaii the crew of a lost canoe or a more organized band of emigrants."

"Ellis, however, and his missionary associates, never heard of a canoe voyage made to the eastward, though they knew instances of canoes being out two or three weeks at sea, and arriving at places 500 or 600 miles in direct distance from their starting point."---"Hawaii" Hopkins, pp. 65-66.

"Ellis' assertion has been already quoted, that of many stray canoes reaching Tahiti from eastern, unknown islands, the voyages have always been in a westerly direction; the missionaries never heard of one towards the sunrise.

Beechy says: "All have agreed as to the manner in which these migrations between the islands have been affected, and some few instances have actually been met with; but they have been in one direction only, and have rather favored the opinion of migration from the eastward." (Narrative of a Voyage, Vol. I, p. 252.)---"Hawaii" Hopkins, p. 79.

The Humboldt current, a broad ocean stream, springs from the Antarctic region, and pours its cold waters northward off the west coast of South America, until in the neighborhood of the equator it turns westward and becomes a part of the immense equatorial belt of waters flowing ever westward, and pouring between the Polynesian Islands toward the shores of Asia. "A dozen of the crew of the clipper ship "Golden Light," burned in the South Pacific about 1865, just west of Cape Horn, and would have run upon a reef at Leopahoihoi, but for natives who swam off to rescue these exhausted people, all of whom survived." ---"Origin of Chinese Race," Brooks, 1876.

* * *

A castaway from Easter Island, or the west coast of South America, would have been certainly thrown into the equatorial current, and drifted westward into Polynesia, while owing to the Japan current, natives from the west coast of North America, or the Sandwich Islands, would have been carried in the same direction. It is nearly impossible, certainly improbable, for natives from either Easter Island or Hawaii to reach the American coasts, except by design. No such a design has been shown, and no such a fact has been known. No instance is on record of such a voyage by a Polynesian. No fact exists upon which to base such a claim. From Easter or Hawaiian Islands to the American coasts is about the same distance as from Ireland to New Foundland; about the same obstacles of wind and current prevent the voyages, then why claim so much more for the naked Polynesian in his light canoe, than can be accorded to the hardy Norse viking in his many oared great war vessel.

I challenge Professor Thomas to present one fact in support of his Polynesia theory; one instance in which the voyage from Polynesia to America was successfully made; one castaway from Easter or Hawaiian Islands thrown on American shores; one voyage to these continents from the Pacific Isles by natives, either by accident or design; or one tradition, custom, habit or language preserving proof of such a fact. The North Pacific current is the migration route over which that grandest of races, the Mongolian, sent out, either by accident or design, its people to occupy the continents of America; over this same route the islands of the Pacific were inhabited; viewed in the light of facts these matters seem almost self-evident and scarcely admit of contradiction.

SECTION ME: GEOLOGICAL ARTIFACTS

Geological artifacts are those traces of ancient man---usually accidental in character---left behind in the strata, the glacial drift, and other deposits. Geological artifacts are considered "strange" if they tend to indicate unusual dates for ancient man, unusual physical sizes, peculiar bone structure, and similar anomalies.

- MEF Fossil footprints. These may be in unexpectedly ancient strata or in association with animal remains or geological processes at variance with accepted theories of ancient man.
- MES Skeletons. Like footprints, skeletons may be found in strata that contradict current theories. The skeletons may also indicate unusual size or physique.
- MET Technological artifacts. Apparent technological items in "impossibly ancient" geological formations.

GEOLOGICAL ARTIFACTS

MEF-011 CHINANDEGA FOOTPRINTS

Anonymous; Smithsonian Institution Center for Short-Lived Phenomena, Event 51-68, cards 164-166, 253-256, 1968.

The latter set of cards, 253-256, contains the following summary:

The following report from Gladys Leon Quant of the National University of Nicaragua, Leon, Nicaragua, was received 22 November 1968:

"The footprints are found impressed into a matrix which is now of a compact and rocky nature, but which appears to have been of a muddy constitution and soft consistency at the time of the impression of the footprints.

The footprints are distributed in two zones separated by some 10 meters of distance and covered in their greater part by sandy material. The first of these zones, some 90 centimeters in length by 55 centimeters of width, presents four complete prints of the human foot and two which appeared to be heel prints. The footprints in this area are of relatively small dimensions and could have been left by an adolescent. A particular fact which differentiates the footprints of this first zone is that they present an accentuated deepness which confers a clarity to their contours. The 4 footprints are directed all in the same direction from southeast to northeast.

In the second zone which we observed at some 10 meters more to the north, the footprints are distributed on a rectangular surface whose sides measure the longer, 2.8 meters and the shorter, 1.75 meters. In this area one sees very clearly 11 footprints of more or less uniform dimensions and the majority oriented in the direction from southeast to northeast. Nevertheless, some few of these are oriented in rather the contrary direction. As for the depth of the impressions in this zone (of 1 centimeter at the maximum) one could see that this depth is inferior with respect to that observed in the footprints in the first zone, and that the depths of the impressions vary between 1.4 centimeters and 3.5 centimeters. It is to be noted that several footprints of the 2nd zone are filled with a different material from that into which they were impressed, resulting, with respect to this last, in a darker color and a thicker granularity.

Notwithstanding that our observations refer to the two areas mentioned above, these being the areas in which the footprints are encountered in great number and clarity; it is to be observed that similar impressions, some of which are less visible, others superimposed, are to be found distributed likewise in the surface which separates the two zones considered above. Likewise, in this last group of footprints, the majority are found to be oriented with direction southeast to northeast.

In general, the footprints appear to indicate that the place in which they are found had been a point of passage for a rather numerous group of persons who passed in such direction that they cut diagonally across the bed of the present road. According to the information which we were given, the footprints are not restricted to this zone only, there having been reported several more to the north of this place in the neighborhood of Villa Salvadorita.

The footprints have awakened much interest among the people of Chinandega because, depending upon the geological conditions in which the footprints are

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found, the general opinion is that this could indicate the date of the last eruption of Volcano San Christobal.

MEF-012 REMARKS ON THE PRINTS OF HUMAN FEET

Schoolcraft, Henry R.; American Journal of Science, 1:5:223-230, 1822.

I now send you a drawing of two curious prints of the human foot in limestone rock, observed by me last summer, in a detached slab of secondary formation, at Harmony, on the Wabash; together with a letter of Col. Thos. H. Benton, a senator in Congress from Missouri, on the same subject. The slab of stone containing these impressions, was originally quarried on the west bank of the Mississippi river, at St. Louis, and belongs to the elder floetz range of limestone, which pervades that country to a very great extent.



Impressions of human feet in limestone rock. (MEF-012)

These prints appear to have been noticed by the French soon after they penetrated into that country from the Canadas, and during the progress of settlement at St. Louis, were frequently resorted to as a phenomenon in the works of nature. But no person appears to have entertained the idea of raising them from the quarry with a view to preservation, until Mr. Rappe visited that place five or six years ago. He immediately determined to remove the stone containing them to his village of Harmony, then recently transferred from Butler county in Pennsylvania, to the banks of the Wabash; but this determina-

tion was no sooner known than popular sentiment began to arraign his motives, and people were ready to attribute to religious fanaticism or arch deception, what was, more probably, a mere act of momentary caprice, or settled taste. His followers, it was said, were to regard these prints as the sacred impress of the feet of our Saviour. Few persons thought of interposing a charitable remark in favour of religious tenets, of which we can judge only by the peaceful, industrious, and devotional lives; the neat and cleanly appearance; and the inoffensive manners of those who profess them. Still less could be conceded in favour of a personal taste for objects of natural history or curiosity, of which this act is, at least, a proof. Be this as it may, Mr. Rappe contracted with a stone mason to cut out the block with the impressions, paying him at the same time a liberal price for his labour, and ordered it to be transported by water to his residence in Posey county, Indiana. Visiting this place during the last summer, in the suite of Governor Cass, Mr. Rappe conducted us to see this curiosity, which has been placed upon mason work in a paved area between his dwelling house and garden, in the manner represented in figure II. of the drawing. The slab of stone thus preserved, forms a parallelogram of eight feet in length, by three and a half in breadth, and has a thickness of eight inches, which appears to be the natural thickness of the stratum of limestone rock, of which it is a part. This limestone possesses a firm and compact structure, of the peculiar greyish blue tint common to the calcareous rocks of the Mississippi valley, and contains fossil encrinurites, and some analagous remains, very plentifully imbedded. It is quarried at St. Louis, both for the purposes of building stone, and for quick-lime. It becomes beautifully white on parting with its carbonic acid and water, and those who have used it, observe, that it makes a good cement, with the usual proportion of sand.

The prints are those of a man standing erect, with his heels drawn in, and his toes turned outward, which is the most natural position. The distance between the heels, by accurate measurement, is $6\frac{1}{4}$ inches, and between the toes, $13\frac{1}{2}$ inches; but it will be perceived, that these are not the impressions of feet accustomed to a close shoe, the toes being very much spread, and the foot flattened in a manner that happens to those who have been habituated to go a great length of time without shoes. Notwithstanding this circumstance, the prints are strikingly natural, exhibiting every muscular impression, and swell of the heel and toes, with a precision and faithfulness to nature, which I have not been able to copy, with perfect exactness, in the present drawing. The length of each foot, as indicated by the prints, is $10\frac{1}{2}$ inches, and the width across the spread of the toes, 4 inches, which diminishes to $2\frac{1}{2}$ inches, at the swell of the heels, indicating, as it is thought, a stature of the common size.

This rock presents a plain and smooth surface, having acquired a polish from the sand and water, to which its original position periodically subjected it. Upon this smooth surface, commencing in front of the tracks, there is a kind of scroll, which is two feet and a half in length. The shape of this is very irregular, and not equally plain and perfect in all parts, and would convey to the observer the idea of a man idly marking with his fingers, or with a smooth stick, fanciful figures upon a soft surface. Some pretend to observe in this scroll, the figure of an Indian bow, but this inference did not appear, to any of our party, to be justified.

Every appearance will warrant the conclusion that these impressions were made at a time when the rock was soft enough to receive them by pressure, and that the marks of feet are natural and genuine. Such was the opinion of Gov. Cass and myself, formed upon the spot, and there is nothing that I have subsequently seen to alter this view: on the contrary, there are some corroborating

facts calculated to strengthen and confirm it.* But it will be observed by a letter which is transmitted with these remarks, that Col. Benton entertains a different opinion, and supposes them to be the result of human labour, at the same period of time when those enigmatical mounds upon the American Bottom, and above the town of St. Louis, were constructed. The reasons which have induced him to reject the opinion of their being organic impressions are these:

- "1. The hardness of the rock.
- "2. The want of tracks leading to and from them.
- "3. The difficulty of supposing a change so instantaneous and apropos, as must have taken place in the formation of the rock, if impressed when soft enough to receive such deep and distinct tracks."

To those who are familiar with the facts of the existence of sea and fresh water shells, ferns, madrepores, and other fossil organic remains, in the hardest sandstones and limestones of our continent, the hardness of the rock, and the supposed rapidity of its consolidation, will not present objections of that force, which the writer supposes. But the want of tracks leading to and from them, presents a difficulty, which cannot, perhaps be so readily obviated. We should certainly suppose such tracks to exist, unless it could be ascertained that the toes of the prints, when in situ, pointed inland, in which case we should be at liberty to conjecture, that the person making them, had landed from the Mississippi, and proceeded no further into the interior. But no enquiry has enabled me to ascertain this fact, the circumstance not being recollected by Col. Benton, and others, who have often visited this curiosity while it remained in its natural position at St. Louis.

The following considerations, it will be seen, are stated by Col. Benton, as capable of being urged in opposition to his theory of their being of factitious origin.

- "1. The exquisiteness of the workmanship.
- "2. The difficulty of working such hard material without steel or iron."

The strikingly natural appearance of these prints, has always appeared to me, to be one of the best evidences of their being genuine; for I cannot suppose that there is any artist now in America possessed of the skill necessary to produce such perfect and masterly pieces of sculpture: yet, what are we to say of

* The following are the facts referred to. At the town of Herculaneum in Jefferson county, Missouri, two supposed tracks of the human foot were observed by the workmen engaged in quarrying stone in the year 1817. These impressions, at the time, attracted the general notice of the inhabitants, and were considered so curious and interesting that the workmen who were employed in building a stone chimney for John W. Honey, Esq. of that place, were directed to place the two blocks of stone containing these marks, in the outward wall, so as to be capable of being examined at all times. It is well known to those who have visited that section of country, that the custom of building the back walls and the pipe of the chimney, in such a manner as to project beyond the body of the house, is prevalent among the French, and other inhabitants; and consequently, the above arrangement, while it completely preserves, at the same time exposes the prints to observation, in the most satisfactory manner. I examined them in that position on my first visit to Missouri, in 1818, and afterwards in 1821, when I took drawings of both the prints. They are however the impressions of feet covered with the Indian shoe, and are not so perfect and exquisitely natural as those at Harmony. They were situated in the same range of secondary limestone, and distant from St. Louis, 30 miles.

the skill of that people, who are supposed to have been capable of producing such finished pieces of art, without the aid of iron tools? For, let it constantly be borne in mind, that the antiquity of these prints can be traced back to the earliest discovery of the country, and consequently to the introduction of iron tools and weapons among the aborigines. There are none of our Indian tribes who have made any proficiency in sculpture, even since the iron hatchet and knife, have been exchanged for those of flint, and of obsidian. All their attempts in this way are grotesque, and exhibit a lamentable want of proportions, the same which was seen in the paintings, and in the figured vases and pottery of the Astecks of Mexico, when their towns and temples were first visited by the Spanish conqueror. Henry R. Schoolcraft.

To the Hon. Thomas H. Benton, of Missouri.

Washington, April 27th, 1822.

Sir,

"Understanding that you have seen the prints of human feet in the limestone rock, which forms the western shore of the Mississippi river, at St. Louis, and that you entertain peculiar views in regard to them, I beg leave to solicit your reply as to the fact of the existence of those impressions, in situ, at the place indicated; the time at which they were first discovered by the inhabitants, and the subsequent removal of the stone, with such opinion as you may think proper to communicate respecting their origin, and the conclusions to be drawn.

"It is very remarkable that no analogous appearances have been disclosed by the rock strata of any other part of the world: at least, we are not informed that any well authenticated discoveries of the fossil remains or impressions of man, have ever been made, which prove the existence of the species before the consolidation of existing rocks.* But such, it appears to me, is the inevitable conclusion to be drawn, if we are prepared to admit that these prints were produced by the pressure of the human foot upon those secondary strata, during their soft, or semi-pasty state.

"When we reflect upon the period of time which has elapsed since the Mississippi country has been known to Europeans, and the great number of persons, both men of science, as well as men of business, who have visited the town of St. Louis since its transfer to the United States, it is not less remarkable that a circumstance so perfectly unique among natural objects, should not, ere now, have elicited that notice, which the increasing taste for natural science in this country, appears to claim for it. It is the more to be regretted that this inquiry has been permitted to sleep, until the stone itself containing these impressions, having attracted the attention of a religious sect, has been conveyed into a distant part of the country, and there preserved for purposes, which many are free to declare, are totally independent of all scientific considerations.

"The circumstances of this removal, and the insulated state in which only it can now be seen, leave room for doubts, respecting its original position at St. Louis, which no testimony less certain than that of an eye witness of the scene, is calculated completely to remove. It is therefore more with the view of establishing the existence of the facts, than of offering any speculations which may arise from them, that these remarks are commenced; and I hope sir, the subject may be sufficiently within your recollection, and means of observation, to permit you to state, in reply, the principal facts and appearances.

* The fossil human bones of Guadaloupe, are not conceived to form an exception to this remark. They are contained in a porous, shelly rock, on a kind of tufa, of very recent and local formation.

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"The new and interesting views which this discovery is calculated to suggest in regard to the natural history of stratified rocks, and particularly with reference to the geological age and character of the Mississippi valley, must present themselves in the most clear and striking manner to those who have been particularly accustomed to reflect upon these subjects, and will readily occur to you. We infer the different eras, and deduce the character of secondary rocks, with considerable certainty, from the fossil organized bodies which they disclose in the most solid parts. We perceive from the shells, corallines, and other traces of organic structure which are found, that these rocks were once soft and pliable, so as to be capable of admitting these bodies. We point to the fossil trees, and shrubs, and to the beds of mineral coal having vegetable impressions, as evidences of the destruction of forests, which once flourished upon the older series of rocks. The bones of the mastodon, the horns of elks, and the osses and undecomposed remains of other large quadrupeds, birds, fish, and reptiles, which are abundantly found, not only in the alluvial soils, but also occasionally in the rock strata of Europe and America, sufficiently indicate the revolutions and changes which the earth's surface has undergone at comparatively recent periods. We wish only to discover the remains of man, in similar situations, to date these changes subsequent to the Mosaical period of his creation; and here, apparently, we have found them! But the facts demand a careful investigation.

"The drawings which I have taken of these impressions, the inspection of the original, now at Harmony, and the best reflections I have been able to bestow upon attending facts and circumstances, concur in my mind, to establish the conclusion, that they are natural, and genuine, and consequently, that the discovery should be seized upon to erect a new genus of organic remains, of which the specific type should be any portion of the human frame, recognized in the anatomical nomenclature: But it is not conceived to be necessary here, to state the circumstances which induce me to consider these prints as the result of a local submersion of the country extending north of the Grand Tower on the Mississippi.

"I have the honor to be sir, with high respect, your most obedient servant,
Henry R. Schoolcraft."

Col. Benton in Reply.

"Washington City, April 29th, 1822.

"Sir,

"Yours of the twenty-seventh was received yesterday. The "prints" of the human feet which you mention, I have seen hundreds of times. They were on the uncovered limestone rock in front of the town of St. Louis. This rock forms the basis of the country, and is deposited in horizontal strata, and in low water is uncovered to the extent of three miles in length on the bank of the Mississippi, and, in some places, from one to two hundred feet wide.

"The "prints" were seen when the country was first settled, and had the same appearance then as now. No tradition can tell anything about them. They look as old as the rock. They have the same fine polish which the attrition of of the sand and water have made upon the rest of the rock which is exposed to their action. I have examined them often with great attention. They are not handsome, but exquisitely natural, both in the form and position, spread-toed, and of course anterior to the use of narrow shoes. I do not think them "impressions," but the work of hands, and refer their existence to the age of the mounds upon the American Bottom, and above the town of St. Louis. My reasons for this opinion are: 1. The hardness of the rock: 2. The want of other tracks leading to and from them: 3. The difficulty of supposing a change so instan-

taneous and apropos. as must have taken place in the formation of the rock, if impressed when soft enough to receive such deep and distinct tracks. Opposed to this opinion are: 1. The exquisiteness of the workmanship: 2. The difficulty of working in such hard materials without steel or iron.

"A block of 6 or 8 feet long, and 3 or 4 wide, containing the "prints," was cut out by Mr. John Jones, a stone mason in St. Louis, and sold to Mr. Rappe of Indiana, and, under his orders, removed to his establishment, called Harmony, on the left bank of the Wabash. Very respectfully yours, Thomas H. Benton."

MEF-013 IMPRESSIONS OF FEET IN ROCKS

Silliman, Professor: American Journal of Science, 1:33:398-399, 1838.

Those who are acquainted with the earlier volumes of this work, may remember that in Vol. V. at p. 223, there is a full account, with a drawing, of the famous copies of human feet found in limestone near St. Louis. In a letter to the editor, recently received from an eminent English geologist, dated September 9, 1837, are the following striking remarks:

"Lest I should again neglect to call your attention to a subject to which I have long since intended to claim your particular regard, I will in this brief space allude to it. In the 5th volume of your Journal, (1822,) there are remarks on the prints of human feet observed in the secondary limestone of the valley of the Mississippi by Mr. Schoolcraft and Mr. Benton, with a plate representing the impressions of two feet. Ever since my researches on the rippled sandstones, (published in Jameson's Edinburgh Journal,) I felt persuaded the prints alluded to were the genuine impressions of human feet, made in the limestone when wet. I cannot now go on with the arguments that may be urged in proof of my opinion; but rely upon it, those prints are certain evidence that man existed at the epoch of the deposition of that limestone, as that birds lived when the new red sandstone was formed. Pray get all the evidence on this head you can---rely upon it most important results will be the consequence. I am prepared to find man and the contemporary animals much lower down in the series than is generally supposed. My friend Sir Woodbine Parish, (the discoverer of the Megatherium,) tells me that similar impressions have been seen in South America; and there was a dispute among the catholics whether they were the feet of the apostles! But truth often lies hid beneath such strange conceits. I can remember the time when my explanation of the rippled sandstones was ridiculed, now no one doubts it."

To these remarks of our respected correspondent, we add the following fragment, dated Baltimore, Oct. 14, 1836, and addressed to the editor.

"Having lately read in your Journal the communication of Prof. Hitchcock concerning the impressions of birds' feet on the sandstone in the Connecticut valley, I was reminded of having read something of an analogous kind many years ago concerning a locality in Tennessee, which I would beg leave to lay before you under the hope that some of your intelligent readers in that neighborhood may examine into this subject more particularly.

"Extract from the American Encyclopedia, published by Dobson at Philadelphia, 1778 to 1803---Supplement, vol. 3, p. 344. From a meagre account of Tennessee, I extract the following: 'The enchanted mountain, about two miles south of Brass town, is famed for the curiosities on its rocks. There are on several rocks a number of impressions resembling the tracks of turkeys, bears,

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horses, and human beings, as visible and perfect as if they were made on snow or sand, &c. There are other particulars stated which seem to be loose guesses of ignorant people, &c."

We are not aware whether Dr. Troost, the learned and able geologist of Tennessee, has investigated these facts, or whether they have fallen under his observation. If the alledged facts are real, we should be glad to know his opinion of them, and we should be greatly obliged, if in compliance with our English correspondent and with our own, any facts may be communicated relating to impressions on rocks.

MEF-014 FOOT-MARKS AND OTHER ARTIFICIAL IMPRESSIONS ON ROCKS

Adams, W. A.; American Journal of Science, 1:44:200-202, 1843.

In a letter from Prof. W. A. Adams to Prof. Silliman, dated Zanesville, Ohio, Aug 6, 1842. ---I was surprised to find in reading the 87th No. of the "American Journal of Science and Arts," that so many respectable authorities could be found on the affirmative side of the question, whether the human foot-prints found at St. Louis on the limestone rock are real impressions, and not works of art. The reasoning of Dr. Owen appears to me to be conclusive that they are artificial.

I have it in my power to communicate some facts tending still farther to illustrate this subject. In the spring of 1839, the high water in the Muskingum River caused a breach in the embankment of the canal at Zanesville. The embankment is constructed on the bank of the river, and is composed of earth, gravel, and fragments of sandstone, heaped upon similar rubbish placed there nearly forty years before, in erecting a mill-race around the natural falls in the river, the whole resting upon a sandstone rock, which constituted the bank of the stream. When this embankment gave way, a large body of water passed over this rock, sweeping its surface clean, and leaving the rock exposed, and as it appeared before the first settlers began their improvements. Upon the surface of this sandstone rock, elevated only a few feet above the level of the river, and immediately upon its margin, were found engraved the impressions of two human foot-prints, and a number of turkey tracks. That these were the work of art is beyond all question; the human tracks were of the natural size, and accurately drawn; the turkey tracks were of large dimensions. The outlines of the human feet were made by a dotted line, as if a pointed chisel and mallet had been used, and an intaglio attempted by the same instrument. The whole surface within the outline was dotted over, barely removing the original surface of the rock; the form of the turkey tracks was made by a series of dots, and the whole seemed to have been left unfinished. These feet pointed south and down the river.

The discovery excited some curiosity at the time, and the impressions were seen by hundreds of people, who well remember them. Before the embankment was repaired, the part of the rock containing the foot-prints was quarried and broken into fragments. This rock had been covered with earth and loose stone for a period beyond the recollection of any of the inhabitants of the place; there can be no doubt that these sculptures were the work of the Indians. In addition to this, I have been informed that there is the impression of a single foot-

print, in a rock situated on the bottom of Licking Creek, about seven miles below Newark, in this state; I have not seen this impression, but am well convinced of its existence; it is described as being occasionally under water. I am not informed of the kind of stone in which this impression is made; if now extant, it is near the narrows of Licking Creek, and in the vicinity of the "Black hand"---another interesting monument, which was destroyed in constructing the tow-path of the Ohio Canal.

The north bank of the creek, about seven miles below Newark, is formed of precipitous sandstone rock, forming a perpendicular wall about forty feet in height; upon the surface of this wall, which at this spot leaned a few degrees over its base, and about twenty feet from the bottom, was engraved a gigantic human hand: the drawing was exact, and the proportion accurately preserved. The hand, including the wrist, was about eight feet long; the outline was cut or scratched on the stone, and the whole space within the outline was stained or painted black; the color remained until the hand was destroyed, and might have endured for ages, as it was protected from rain by the projection of the rock. This hand had been known for more than fifty years before it was destroyed, and the place is yet designated as the "Black hand." I believe these several marks or sculptures are identical with the celebrated and more perfect specimens found at St. Louis. It may perhaps be difficult, at this period to determine the purpose or meaning of these works of art. I have conversed with some old hunters and surveyors, who are well acquainted with the habits and character of the Indians; by them I am informed that it is the constant habit of the natives, when they quit an encampment, to leave some sign or hieroglyphic, designating the course they intend to pursue, and that the place is abandoned. For these purposes, what sign could be more appropriate than the prints of feet or tracks?

I am assured by an intelligent gentleman, who in early life was engaged in surveying the public lands in the west, that he has often seen such figures; sometimes a hand on a perpendicular surface, and print of feet where the surface is horizontal, as on the bark of a standing tree, or drawn with paint on a flat stone.

From these facts, is it reasonable to conjecture, that when a tribe have been compelled to abandon a permanent home, a more durable memorial of the event may be made by some labored sculpture on a permanent material, such as those found at St. Louis and here? The remarks of Dr. Owen are perfectly satisfactory in explaining the mode in which these works of art could be executed without the aid of iron.

We would add in further illustration of this subject, that Mr. Grey, in his journal of travels in Australia, Vol. I, p. 206, gives a figure and the following description of a head cut in sandstone rock. "I was moving on when we observed the profile of a human face and head cut out in a sandstone rock which fronted the cave; this rock was so hard, that to have removed such a large portion of it with no better tool than a knife and hatchet made of stone, such as the Australian natives generally possess, would have been a work of very great labor. The head was two feet in length, and sixteen inches in breadth in the broadest part; the depth of the profile increased gradually from the edges where it was nothing, to the centre where it was an inch and a half; the ear was rather badly placed, but otherwise the whole of the work was good, and far beyond what a savage race could be supposed capable of executing. The only proof of antiquity that it bore about it was, that all the edges of the cutting were rounded and perfectly smooth, much more so than they could have been from any other cause than long exposure to atmospheric influences."

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MEF-015 THE NEVADA BIPED TRACKS

Cope, E. D.; American Naturalist, 17:69-71, 1883.

It is probable that the contemporaneity of man with the horse and other extinct Pliocene mammals in Western North America will soon be satisfactorily demonstrated. The first evidence on the subject was furnished by J. D. Whitney, chief of the Geological Survey of California, in the case of the Calaveras skull, which was said to be taken from the gold-bearing gravel; and in several other cases subsequently added. From the fact that scientific observers were never present at the unearthing of the remains of man and his works from this formation, the evidence has been generally regarded as inconclusive. The gold-bearing gravel of California is, however, a very peculiar formation, and an object once buried in it, would carry such marks of its origin as to be quite recognizable. This was the case with the Calaveras skull when first discovered, as I am informed by Professor Verrill of Yale College. This gentleman states that the skull was partially filled and covered with the hard, adhesive "cement" so characteristic of the formation.

I here refer to two observations of my own made in 1879, in Oregon and California, which were confirmatory of the existence of man in the Upper Pliocene of both those states, but the evidence is in neither case absolutely conclusive.

The discovery that the tracks of several species of Pliocene Mammalia in the argillaceous sandstones of the quarry of the Nevada State Prison at Carson, are accompanied by those of a biped resembling man, is a further confirmation of these views. The tracks are clearly those of a biped, and are not those of a member of the Simiidae, but must be referred to the Hominidae. Whether they belong to a species of the genus *Homo* or not, cannot be ascertained from the tracks alone, but can be determined on the discovery of the bones and teeth. In any case the animal was probably the ancestor of existing man, and was a contemporary of the *Elephas primigenius* and a species of *Equus*.

MES-007 ALEUTIAN ISLANDS' SKULL OF ABNORMAL SIZE

onymous; Nature, 138:613, October 10, 1936.

Dr. Ales Hrdlicka, it is reported by the Smithsonian Institution, Washington, D. C., in the course of excavations on the Aleutian Islands, has brought to light a skull of remarkable size. Its cubic capacity is said to be no less than 2,005 c.c. This is the second highest skull capacity recorded, the largest being that of Turgenev, the Russian novelist, whose skull has a capacity of 2,030 c.c. Skulls of known capacity ranking next are those of Daniel Webster, 2,000 c.c., Bismarck, 1,965 c.c., La Fontaine, 1,950 c.c., Beethoven, 1,750 c.c. and Kant, 1,740 c.c. The enormous, but imperfect, South African Boskop skull, according to one estimate, has been rated at 1,950 c.c.; but a more conservative figure places it round about 1,700 c.c. Dr. Hrdlicka's excavations on the Aleutian Islands, in the course of which the present find was made, are in continuation of a series of investigations of the archaeology and physical anthropology of the present and former inhabitants of Alaska and the adjacent islands, upon which he has been engaged on behalf of the Smithsonian Institution for successive seasons during a number of years. His object is to elucidate the racial affinities and chronological succession of the early peoples who migrated from north-eastern Asia to populate America. On this problem, unfortunately, his latest discovery, apart from the probability that it is no more than an individual instance of abnormal development, would appear to throw no certain light, owing to the absence of the facial skeleton.

MES-008 A WONDERFUL SPECIMEN OF CREDULOUS IGNORANCE
FOSSIL MAN AND WOMAN

Anonymous; American Journal of Science, 2:19:448, 1855.

A Cincinnati paper of March 23, contains a narration of the discovery of some "very curious petrified human bodies" found in Pennsylvania in the bed of a stream, which is one of the branches of the Alleghany river. The account says: "These remains are supposed to be those of a man and woman, who by the wonderful petrificative process have been turned to solid stone," and they are regarded as "irrefragable proofs of the existence of man upon this revolving globe long before the periods when corals, crinoids and trilobites first made their appearances." * * * But "the man is the great curiosity. Its feet are now wanting; its body and legs are composed of sandstone, and its head of quartz and gneiss"! Thus, according to the narrator, the whole science of geology is upset, over and over. The writer continues, "It is assumed that when first found the feet were on this male petrification, but as they seemed slaty and of a coal-like texture, they were burned by the women, who prefer utility to scientific discovery." * * * "It is certain the man when alive must have inhabited the sandstone for a period, and if, as we think is evident, he was buried with his head downwards, and at just such a depth that his head came in the gneiss, and his body in the sandstone formation, (he might have added, his feet in a coal-bed), then it is easy to conclude that his body petrified into sandstone, and his head into quartz and gneiss." The believer in such nonsense is the most of a wonder.

MES-009 SKELETONS

MES-009 MUMMIFICATION IN AMERICA

Anonymous; Nature, 147:707, June 7, 1941.

Reference has already been made (Nature, April 5, p. 413) to the first part of a description by Dr. Ales Hrdlicka, curator of physical anthropology in the U. S. National Museum, of investigations undertaken in mummy caves and rock shelters in the Aleutian Islands off the coast of Alaska (Scientific Monthly, Jan. - Feb. 1941). It would appear that the aboriginal inhabitants were at some unknown period replaced by the Aleuts, among whom, comparatively lately, Russian penetration took place. The Aleuts practised mummifying, though whether they began to do so after their arrival in the islands or whether they brought the custom with them from their unknown place of origin remains a mystery. The mummies of both sexes were stored in the caves lying upon drift-wood, and differences of physical anthropology among them suggest that a few members of the pre-Aleut people had been allowed to survive, perhaps in a condition of slavery. The finding of one or two objects of Russian origin with some of the mummies seems to indicate that the practice continued until a fairly recent date. A certain amount of cremation also appears to have been customary, and interesting and well-developed industries showing some degree of artistry were collected. The difficulties under which the expedition worked were very considerable, but nevertheless much valuable information has been added to our knowledge of these interesting peoples.

The practice of mummifying the dead, like that of trephination, is always intriguing. Why should these elaborate processes have been undertaken at all? Connected as they often were with magic or religious notions, their discovery sometimes throws a sidelight on the ideas of bygone peoples; whereas a study of the ordinary industries of such folk only determines their material culture---only tells us how they lived, not how they thought. Actually, mummifying has never been a common method of dealing with the dead either in modern or in ancient times. Egypt, of course, furnishes the classic examples, but in the New World there were peoples both in South and North America who practised the rite. The orthodox diffusionist naturally claims that the custom in, say, Peru derived from Egypt; but frankly it is difficult to believe that the two or three prehistoric American peoples really had any connexion either with the Old World or with each other. It would seem far more likely to have been the result of a spontaneous development consequent upon a somewhat similar outlook on death.

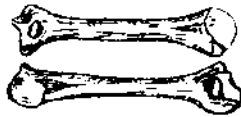
MES-010 THE GUANCHES: THE ANCIENT INHABITANTS OF CANARY

Gambier, J. W.; Smithsonian Institution Annual Report, 1894, Government Printing Office, Washington, 1896, pp. 541-553.

The Guanches have some peculiar features, the perforated arm bone in particular, which has affinities to the North American Moundbuilders.

As regards this structural alteration, it may be briefly said that a certain peculiarity in the elbow joint---which doubtless served some purpose to our arboreal progenitors, but which in parts of Europe where races have been more rapidly mixed, or where civilization has made more rapid strides, and conse-

quently the process of evolution become more determined, has ceased to exist--existed among the Guanches, and is still found among their descendants to this day in a proportion far exceeding that in any other known race. In England, in our days, this peculiarity is practically extinct--in some parts of the world it reaches 2 per cent of the population--but here, among the Guanches, it has been ascertained by actual observation to reach to the astonishing number of 20 per cent. showing a race who have been so little intermixed and so direct in descent from the Stone age as it would be difficult to find except in the most isolated parts of the world, among races such as the Aztecs, or the inhabitants of some of the Pacific Ocean islands, or among the natives of Australia. This is one of the peculiar interests of the Guanche race. (p. 542)



Perforated arm bones of the Guanches. (MES 010)

MES-011 PERFORATION OF THE HUMERUS CONJOINED WITH PLATYCNEMISM

Gillman, Henry; *American Naturalist*; 9:427-428, 1875.

Associated with that extreme development of platycnemism discovered by the writer, some years ago, in the ancient mounds on the Detroit and Rouge Rivers, Michigan, he has found the perforation of the humerus. Allusion is made to that peculiarity of the arm bone in which is presented a communication of the two fossae at its lower end. It is difficult to arrive at the exact amount of the percentage to which this prevails in these mounds; though there can be little doubt that at least 50 per cent. of the humeri have this characteristic. This is of interest as being in excess of that from the mounds in other parts of the country, where it is calculated as being only 31 per cent. It is a characteristic which, significantly enough, exists in the ape, pertains to the negro in a large degree, while it is very rarely encountered in any of the white races.

In a letter received last year from Prof. Busk, F. R. S., he attaches importance to the writer's discovery of this conformation of the humerus being a peculiarity of platycnemic man, and states that he does not think such a coincidence has been noticed elsewhere. At any rate it has not been so absolutely established heretofore.

Transitional states of the characteristic, if they may be so called, are also seen in the Rouge River mound; that is, instances in which the communication between the fossae is not quite completed, the dividing wall being reduced, in some cases to a very thin partition, almost transparent. Even where the perforation is accomplished, there is a great variation in the size of the aperture.

MES-012 SKELETONS

MES-012 [HUMAN SKELETONS WITH 36 TEETH]

Anonymous; Nature, 93:90, March 26, 1914.

The discovery of ancient human remains in German East Africa by Dr. Hans Reck, of the Geological Institute of Berlin University, may prove to be an event of some importance to anthropologists. The report of the discovery, published in the Times of March 19, leaves us in some doubt as to the antiquity and racial characters to be assigned to these East African human remains, but apparently they are of mid-Pleistocene date, and show the distinctive features of the negro. If such prove to be the case, we must conclude that the negro race was already evolved in Africa at an earlier date than is now generally supposed. The Times report also informs us that the man thus discovered had thirty-six teeth---four more than is given to human and anthropoid races. The teeth are also said to show marks of filing; it would indeed be a remarkable fact if the habit of filing the teeth, so common in modern African races, should have been in use at the early date assigned to these prehistoric remains.

MES-013 [UNUSUAL SKULLS FROM NEBRASKA MOUND]

Anonymous; Nature, 75:255, January 10, 1907.

In the January issue of the Century Magazine Prof. H. F. Osborn describes a find of prehistoric crania from a mound in Douglass County, Nebraska. Of the six skulls discovered, two from an interment near the surface of the mound were of the modern Indian type; but beneath these, and covered by a layer of ashes resting on a stratum of silt compacted by the fire above, four skulls of a remarkable character were unearthed. The only implement found with them was a small, broken, triangular flint knife. Unfortunately, the back part of each of these crania is wanting, but the portions which remain exhibit low cranial capacity, and are believed to approximate to the Australian type. The supra-orbital ridges are not more pronounced than those of the Australian, but the forehead is even more flattened and receding. These skulls, which have been deposited in the museum of the University of Nebraska, indicate a race of low cerebral capacity, inferior to the modern Indians or the typical American mound-builders. Their average stature was about 5 feet 10 inches. Compared with typical primitive forms---those of the Havan *Pithecanthropus erectus*, that of Gibraltar, and the Neanderthal skull---the American specimens seem to represent a class more recent than the last. It would be rash to speculate on the importance of this discovery until the missing portions can be recovered or more perfect specimens unearthed. "Even if not of great antiquity," says Prof. Osborn, "it is certain of a very primitive type, and tends to increase rather than diminish the probability of the early advent of Man in America." The same issue of this magazine contains President Roosevelt's enthusiastic account of ancient Irish Sagas, in the course of which he takes occasion to advocate the foundation of chairs of Celtic in the universities of America.

MES-014 A PIGMY CEMETERY

anonymous; Nature, 140:291, August 14, 1937.

The issue of the Gentleman's Magazine of August 1837 contains the following information: "A short distance from Cochocton, Ohio, U.S., a singular ancient burying-ground has lately been discovered. It is situated, says a writer in Silliman's Journal, on one of those elevated, gravelly alluvions, so common on the rivers of the West. From some remains of wood, still apparent in the earth around the bones, the bodies seem all to have been deposited in coffins; and what is still more curious, is the fact that the bodies buried here were generally not more than from three to four and a half feet in length. They are very numerous, and must have been tenants of a considerable city, or their numbers could not have been so great. A large number of graves have been opened, the inmates of which are all of this pigmy race. No metallic articles or utensils have yet been found to throw light on the period or the nation to which they belonged."

ES-015 PYGMY MAN IN INDIA

anonymous; Nature, 135:335, March 2, 1935.

A remarkable report has come from Bombay of the discovery of the fossilised remains of a pygmy man in Boroda State. According to the account from the correspondent of The Times in the issue of February 21, the discovery was made at Vadnagar in the Mehsana district of Baroda. The remains were said to have been found in a prehistoric step-well 150 ft. long, and were those of a man 15 inches high. With them was a cow 18 inches high; nearby was a stock 10 inches high. The correspondent of The Times went on to point out that the discovery might call for a new orientation of theories concerning the cradle of the human race and the origin of civilisation which would no longer be traced to Java, or the valley of the Nile or the Indus, but rather to the valley of the Narmada. He also referred to Homer's story of the battle of the dwarfs and cranes and the report of Ctesias in the fifth century B. C. of the existence of a dwarf race in the heart of India. Even if the report were taken seriously---it has been stated to be a hoax---the discovery of a single specimen of so remarkably an aberrant character would be scant foundation "to prove the existence of an extinct race of pygmies more diminutive than that in Africa". Most ethnologists postulate a negrito strain in the Indian peoples which may have been derived from a diminutive race, not of some unknown extinct form, but analogous to one of the pygmy peoples, which extend, with intermissions, from West Africa to New Guinea; but these peoples are a highly specialised rather than a primitive type and their stature does not, as a rule, fall much below four feet six inches. Ethnological theory, for the moment, remains unshaken.

MES-016 SKELETONS

MES-016 (LATE SURVIVAL OF NEANDERTHAL TYPE)

Anonymous; Nature, 77:587, April 23, 1908.

In the February issue of the Bulletin international of the Academy of Sciences of Cracow, Mr. K. Stolyhwo describes a human skull dating from the historic period which presents strong indications of close affinity with the Spy-Neanderthal type, the so-called Homo primigenius, of the Palaeolithic epoch. The skull, it appears, formed part of a skeleton from a tomb in which was also buried a suit of chain-armour, together with iron spear-heads, &c. In the great development of the supra-orbital ridges and of the notch at the root of the nasals, the skull, which was found at Nowosiolka, closely approximates to the Neanderthal type. It may be added that, in view of Prof. Sollas's recent reference of the latter to the Australian stock, the occurrence in eastern Europe of a late survival of the same type is a matter of profound interest.

MES-017 THE INHABITANTS OF NEW CALEDONIA AND NEANDERTHAL MAN

Anonymous; Nature, 114:291, August 23, 1924.

Prof. Fritz Sarasin has made a detailed comparative study of the osteology of the New Caledonians and Neanderthal man, of which the results are published in L'Anthropologie, xxxiv., Nos. 3-4. He finds that in a large number of their skeletal characters the New Caledonians show a closer affinity to Neanderthal man than do Europeans; but, on the other hand, in certain features they are even more primitive than the Neanderthal group. Among these are irregularities in the region of the pterion, a more pronounced prognathism and the more simian conformation of the nasal skeleton. There are, however, a number of divergences in the two groups. The New Caledonians, for example, have a more vaulted cranium, rectangular orbits, and the radius shows little or no curvature, while all the bones of the skeleton are less robust. The general conclusion is that the New Caledonians form one of a closely-related group, including Australians, Tasmanians, and other Melanesians which is more primitive than the fossil representatives of homo sapiens, Piltown man being set aside as still indeterminate. It resembles closely the primitive ancestor of existing races, Rhodesian man possibly being the proto-Australian type, and the connecting link between the Austro-Melanesian group and a pre-Neanderthaloid ancestor.

MES-018 NEANDERTHAL MAN IN PALESTINE

Anonymous; Nature, 129:712-713, May 14, 1932.

A cablegram has been received from Mrs. Theodore McCown, who, in the temporary absence of Miss Dorothy Garrod, is directing the exploration of caves in Mount Carmel, announcing the discovery of fossil remains of three individuals of the Neanderthal species of mankind. The discovery thus announced is of more than usual importance; it brings to a successful issue a search which has been conducted in Palestine since 1925, first by the British School of Archaeology and latterly by a combined expedition fitted out by that School in conjunction with the American School of Prehistoric Research. Miss Garrod is in charge of the combined expedition, and to her must go the chief credit.

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MES-019 THE ANCIENT MAN OF CALAVERAS

Ayres, W. O.; American Naturalist, 16:845-856, 1882.

In the minds of almost all, the existence of prehistoric man in California is associated mainly with the famous "Calaveras skull," and inasmuch as doubt has been cast on the authenticity of that relic, the whole subject has been badly neglected, and even by men of science has been unreasonably set aside. We will speak of that skull presently, but it is only one of the many evidences to be considered, and we will at first put it out of view. We shall find that if it had never come to light at all, the proofs that man existed when, or rather before, the auriferous gravel was deposited, are so complete that he who doubts them would as readily doubt that Napoleon Bonaparte died on the Island of St. Helena.

The auriferous gravel of the books is the pay-dirt of the miners, and that we may know what the existence of man at the time of its deposit means, we must endeavor to ascertain how long ago that deposit occurred. If we say to a geologist that the gravel is of Pliocene age, he carries back his thoughts over an interval of which the years reckoned by thousands are never counted, though he knows the thousand must be very many. But for those to whom Pliocene and Post-pliocene sound like barbarous terms it may be possible to adduce a form of proof which appears to the eye, and which brings with it therefore, a force which all can appreciate.

It is well to state at the outset that the pay-dirt is manifestly all of one formation and of one geological age, wherever we find it. Some of it is lying opened and exposed; we will let that pass. Some of it is covered by volcanic rock, and of course is itself older than the rock; that is, the lava flowed out and covered the gravel after the gravel was in its present form and position. That is sure, for after the gravel was thus imbedded, it has most certainly never been disturbed until within these last few years the miners have dug into it in search of gold. To the gravel then below the lava, we will turn our attention.

Looking out from Carson hill, in Calaveras county, you see across the Stanislas in Tuolumne, a long mountain ridge. It extends down into the plain, where it ends very abruptly, while its upper limit is out of sight away among the main heights of the Sierra Nevada. It looks like a huge railroad embankment, and suggests to you that idea, but men do not make railroad dykes forty miles long and 1500 to 3000 feet high. That which gives it its smooth even upper surface is basalt, that is, ancient lava; the lower part is of looser materials. The thickness of the basalt varies at different points, being here and there hundreds of feet thicker than it is at other places a mile or two either above or below. This is Table mountain, a name which has been famous in the history of California, as we shall see.

The question occurs to us: How came Table mountain to exist? That basalt, when it was erupted, was fluid like other lava. How could it be piled up so thick and so abrupt (for its sides are often perpendicular) on that high mountain ridge, and remain there? Why did it not spread itself out laterally and cover the plain? But one answer to these questions can be given: There was no plain.

When that eruption took place, and the crater or fissure opened, far up near the summit of the Sierra Nevada, it naturally flowed into the bed of the first stream which crossed its track. This it filled and followed down until, when the eruption ended, the old river bed, away down to the plain, was blocked up by the solid volcanic rock, and the waters which should have been there, were finding their way by some other track.

As time passed on, the side of the mountain range was yielding to atmospheric influences. The flowing water was carrying off the softer material on each side of the hard basalt, which had filled and obliterated the old river-bed; the Tuolumne river on the south and the Stanislas on the north, with their tributaries, were formed, and scooped out their present valleys, and thus Table mountain, which had been deposited in the bed of an old mountain torrent, with high ridges confining it, became itself a ridge, standing like a wall above all which adjoined it. But beneath the basalt lay the stones and gravel and sand and clay which made the bed of the ancient torrent, as they do of the modern streams. And like the modern streams, their predecessor, in age but not in locality, was rich in gold, and thanks to this gold, we know something of the Ancient Man of Calaveras and Tuolumne. We know him because he has left his mark among the stones and gravel.

In what are called the "early days" in '49 and '50, the southern mines were specially noted and productive. Don Pedro's bar and Hawkin's bar on the Tuolumne were crowded with miners, and all the region about Sonora, and Columbia, and Shaw's flat was swarming like a hive. The gold which was obtained had been brought down in company with the gravel from the mountain heights far above, by the rush of water, ages before. Wherever an old channel could be found in which the flow of water had been confined to narrow limits and to whirling eddies, there the gold had been deposited more abundantly, and rich strikes were made. While exploring these surface deposits, an old river-bed was struck at Shaw's flat, in 1854, which showed features quite distinct from the "diggings" adjacent, and in following out this discovery it became manifest that Table mountain, as already stated, was simply a mass of lava filling an ancient torrent canon, and that the gravel thus buried was in various places most wonderfully rich. This was the beginning of Table mountain mining.

The whole matter had very much the character of a lottery, for the expense of running a tunnel under the mountain was very great, and the result entirely uncertain, commonly rich to even a fabulous degree, or on the contrary a total failure. The failures were many and the losses destructive to the fortunes of the men interested, but the wild excitement of golden possibilities lured multitudes along, and for years and years in succession Table mountain was bored and tunneled most completely. It is not for us now to speak of the triumph or the heart-ache which went with the work; we know well that

"No minstrel ever sung or told
A song so sweet as chink of gold,"

and nowhere, even in that land of enchantment, was the wild and fatal fascination of the search more fully felt than at Table mountain. But that goes by us. Out of these tunnels came the tokens of the past, and we see shadowy visions of the ancient man looming up.

But we will first try to measure off the interval since the Table mountain lava flowed; not that we can specify it in figures, but we may learn enough to reverence its extent. We will consider but one feature. This is the magnitude of the work which has been done by streams of water since the period of volcanic eruption of which mention has been made.

The western slope of the Sierra Nevada is furrowed with enormous gorges reaching from the summit ridges to the plains of the Sacramento and the San Joaquin. Any one of them may be taken as a type of all the others. At their upper part they are, of course, shallow and narrow; a few hundred feet deep and a quarter to half a mile wide, more or less, but steadily increasing in both dimensions. Before they reach their debouchure they are ten to twenty miles wide and two to four thousand feet deep. Standing far up among the higher

ranges and following with the eye the stupendous furrow through its windings, fifteen, thirty, forty miles, till all is lost in the blueness of depth and of distance, one often tries to roll back the tide of time and get some glimpse of the days when that plowshare began its work. But the blueness of the chasm is only a faint index of the dimness which comes across the mental vision. It is idle to suggest to one thus standing and looking down the canon of the Yuba, or the American, or the Tuolumne, that water can have done that work (and water certainly has done it) within an interval which, reckoning years by thousands, must not have written against it very, very many. We will not specify how many, but the number surely is great.

And all this scooping out of canons, this furrowing the western Sierra slope into its configuration of the present era, has been done since the Table mountain lava flowed. Of that there can be no question. The evidence is too plain to admit a doubt.

If now we find the remains of man, or works which none but man could have made, among the gravel-beds beneath Table mountain, or in any other place amid the undisturbed pay-dirt, we cannot fail to know that human hands and human brains had done their work before the immense canons of the Sierra Nevada commenced their formation in the little furrows near the summit down which the waters trickled.

We can take the proofs only in brief, and we will take none but those which are absolutely established and authentic.

Dr. Perez Snell, of Sonora, had in his collection (this collection has unfortunately perished by fire) a human jaw which was brought out in a carload of "pay-dirt" from a shaft stretching far in beneath the Table mountain, and with it were several stone implements. Dr. Snell did not himself see this bone in the car as it was drawn to the surface, and in the minds of some a doubt might thus be thrown on its authenticity. The specimen was given to him by a miner. If it were an isolated instance this would be possibly worth considering, but it is only one of many, and at the same time it is only fair to state that there could not well have been found a miner in all that region who would have thought it worth his while to attempt a deception, nor even one who had any doubt in his own mind as to the point we are considering. They saw the products of man's work come out with the gravel too often to pay commonly any attention to them. The only wonder is that he even took the trouble to pick out the bone at all. There can be no question that for one such that has been preserved, dozens and perhaps hundreds have gone down in the current of water in the sluice washing.

In 1857 Col. Hubbs, who was afterward State Superintendent of Instruction, found in a load of "dirt" as it came out from his claim under Table mountain, portions of a human skull. He was on the ground himself, and saw the fragments as they were taken out of the sluice. They had come from a distance of 180 feet beneath the lava. One of the pieces is now in the collection of the Boston Society of Natural History; the other in that of the Philadelphia Academy.

Mr. O. W. Stevens certifies that in 1853 he found in a shaft under Table mountain, "about two hundred feet in," a relic that resembled a large stone bead, of white marble, about an inch and a half long and an inch and a fourth in diameter, with a hole through it a fourth of an inch across.

Dr. Snell had in his collection a stone muller or pestle which he took with his own hands from a car load of "dirt" as it came out from under Table mountain.

Mr. Llewellyn Price certifies that in 1862 he dug up a stone mortar under Table mountain at a depth of about 200 feet from the surface and about 1800 feet in from the mouth of the tunnel.

But why need we specify any further single instances. The witnesses already given were all credible and worthy men, they could have had no possible collusion, they had no motive for deception, and the circumstances were such that they could not well be deceived as to what they stated. If any candid person will not be convinced by the evidence they give, he would be equally incredulous were a hundred more to testify to the same truths.

And the hundred more could be summoned were it worth the while, for the instances in which the products of human workmanship have been washed out of the "gravel" in searching for gold are altogether too numerous for record. Very many of them are now in the Museum of the University of California, and very many more were disregarded and lost, for so common did they become during the days of surface mining, that at length the miners paid no attention to them, and they simply went in with the refuse of the workings.

They were almost universally implements of stone, such as mortars, pestles, rude vases or platters, that is, articles which could be used for grinding food, &c., but all rough in workmanship and evidently fabricated by people low in the scale of civilization. But such as they are, they show with what appears to be conclusive proof, that they were made before Table mountain lava was erupted, and perhaps long before, for they were also surely made before the auriferous gravels were deposited.

One item comes naturally to our consideration here in the line of confirmation. The auriferous gravels contain abundant remains of plants and animals. Mastodons and elephants appear to have specially abounded; in no other part of the world have their bones and teeth been found in greater numbers. With them were found species of rhinoceros, Elothertum, horse, ox, camel, &c., &c. But all of these were of types long since passed away, and the same can be said of the leaves and fossilized wood. Dr. Newberry's report characterizes them as being entirely unlike anything now growing in California, and as belonging to the Tertiary age, the later Pliocene. Now we know that the fauna and flora of a country cannot be completely changed except through the intervention of a very great space in time, or the agency of a sudden cataclysm and reconstruction.

And shall we now compare them in age with the others which are absolutely prehistoric, and which have disturbed the scientific world by their venerable antiquity. Fierce have been the conflicts waged over the Neanderthal skull, the Engis skull, the men of Cro-Magnon and the various other relics gathered from the gravels and bone-breccias of Europe. But their record is dwarfed to comparative insignificance when laid by the side of that to which we have been looking. The days of Table mountain had passed off into the dark realm of the forgotten past, ages before the drift of the valley of the Somme was deposited or the man of the Neanderthal lived. Those European relics have by none been counted older than the Post-pliocene; these of the Sierra Nevada go back to the Pliocene, and as the "new world" of modern style was the very oldest in showing itself above the waste of waters, so perhaps it was also the first to feel the step of man. It is possible that the discoveries of Ribiero in Portugal, and of the English Geological Survey in India may be found to carry us as far back as the times we have been discussing, but they have thus far been strangely ignored.

What manner of man then was this Ancient Man of Calaveras? Let him speak for himself. All notice of the skull described by Professor Whitney has been purposely omitted till this moment, because it is by far the most important "find" yet made, and it is worthy of being considered by itself and in the present connection. The chief point in estimating its value, is its genuineness. It has been the subject of much criticism, and in the minds of very many, its mention barely recalls Bret Harte's ridiculous doggerel,

"My name it was Brown, and my crust it was busted
Falling down a shaft in Calaveras county."

and the request to send the pieces back to old Mazzoura, has relegated the whole matter to the domain of joke. In the belief that Professor Whitney was the victim of a sell, the question is often asked whether there is any evidence that the skull was actually taken from the shaft to which its discovery is credited.



The Calaveras skull (MES-019)

Now with all due submission to previous judgment (or mis-judgment), I maintain that that question is of only secondary importance. The skull speaks for itself, and notwithstanding that its lower jaw is gone, it talks good English, whatever its vernacular may have been in the days of the flesh.

That it came to Professor Whitney from the hands of Mr. Mattison (or as I always heard him called, Matthewson), of Angels Camp, is certain. Where did Mr. Matthewson get that skull? I do not know, nor is the precise spot of much consequence. He says he took it from his shaft near what was then called the Forks of the Road, above Angels. Suppose he did, or suppose he foolishly tried to humbug the geologist, what does it matter? He got the skull somewhere, and wherever it might have been first found, it surely was imbedded in the auriferous gravel, and it had become so imbedded at the time the gravel was originally deposited.

You say, that is a bold assertion; how do you know it? I will tell you; I know it, because the skull told me so. I saw it and examined it carefully at the time when it first reached Professor Whitney's hands. It was not only incrustated with sand and gravel, but its cavities were crowded with the same material; and that material was of a peculiar sort, a sort which I had had occasion to know thoroughly. It was the then common "cement" or "dirt" of the miners; that known in books as the auriferous gravel. This is an article sui generis; it is not easily imitated. No skill possessed by Mr. Matthewson or any one else could have been sufficient to give the skull the characters which it had as I saw it. It is most certainly no fabrication.

But it has been said that it is a modern skull which had become incrustated

MES-020 SKELETONS

after a few years of interment. This assertion, however, is never made by any one knowing the region. The gravel has not the slightest tendency toward an action of that sort. The skull would either decay and waste away, or it would remain unchanged; and added to this comes in the fact that the hollows of the skull were crowded with the solidified and cemented sand, in such a way as they could have been only by its being driven into them in a semi-fluid mass, a condition which the gravels have never had since they were first laid down.

No, no! Let the skull tell its own story, and believe what it says, because it brings its own proof. Whatever age belongs to the gravel deposit under Table mountain belongs to the Calaveras skull, entirely irrespective of the question of honesty or dishonesty in the alleged finder. Wherever he found it, I believe its age to be beyond cavil.

Its degree of fossilization has not been here insisted upon, because that change is more rapid in some localities than in others, but it is an interesting fact that this Calaveras skull is more thoroughly fossilized, a greater proportion of its phosphate of lime has become carbonate than in either of the European specimens which are reckoned of the greatest age.

We seem then fairly entitled to consider the Ancient Man of Calaveras the oldest representative of our race to which we can as yet refer; and being such, is he of a bestial type? Look for yourself. Figures have been published by Professor Whitney in his work. What is there bestial as shown by them? A single skull cannot, of course, speak for a whole race, but so far as this specimen can testify, what man is now, man was then. It manifests no sign of inferiority to the American race as now existing. Barbarous in habit he doubtless may have been. All the relics of workmanship thus far discovered of those coeval with him, indicate a low grade of civilization, and yet one not necessarily much, if at all, lower than that of most of the Indian tribes which formerly occupied the entire breadth of the continent. And in intellectual power, judging from his cerebral development, he might assuredly have claimed a fair average rank.

MES-020 [ANCIENT SKULLS DISCOVERED NEAR SANTA BARBARA]

Anonymous; Nature, 112:699, November 10, 1923.

According to a telegram from New York which appeared in the Times of October 31, an expedition of the Smithsonian Institution, of which Dr. J. P. Harrington is the head, has discovered, at Santa Barbara, in California, two human skulls for which a very high antiquity is claimed. They are said to belong to an era far earlier than that of Neanderthal man. The evidence upon which this claim is based would appear to be a low forehead and very pronounced eyebrow ridges. The mouth cavity is extremely large and the walls of the skull very thick. They are said to be twice the thickness of ancient Indians' skulls. Until more detailed evidence is available, judgment must be suspended as to the likelihood of this claim to a high antiquity being substantiated; but it may be pointed out that skulls exhibiting Neanderthaloid characteristics, especially in the pronounced eyebrow ridges, have been found on more than one occasion in the United States. Although a great age has been attributed to them, upon further examination they have been pronounced to be merely a relatively modern variety of the Indian type. It is significant that the new Santa Barbara skulls were associated with a material culture, implements, fish-hooks, etc., which is said to show a great advance upon any culture that can be associated with Neanderthal man.

MET-001 SINGULAR CIRCUMSTANCE

Anonymous; London Times, June 22, 1844.

A few days ago, as some workmen were employed in quarrying a rock close to the Tweed, about a quarter of a mile below Rutherford-mill, a gold thread was discovered embedded in the stone at a depth of eight feet. How long this remnant of a former age has remained in the situation from which it was taken, will baffle the skill of the antiquary or geologist to determine. A small bit of the thread has been sent to our office for the inspection of the curious. ---Kelso Chronicle.

MET-002 THE COSO GEODE

Maxey, Virginia; Desert Magazine, February 1961. (This contributed item does not check out as to date. It must remain a suspect entry until verified.)

Mike Mikesell, Wally Lane and I are owners of the LM&V Rockhounds Gem and Gift Shop in Olancha, California. On a recent field trip into the Coso Mountains we picked up a geode (a nodule of stone having a cavity of crystals or minerals) which may prove to be a highly significant clue to greater knowledge of our world and universe.

In the opinion of one trained geologist, it has taken at least 500,000 years for this nodule to attain its present form---and yet, when we cut it open, we discovered a manmade object within the geode's cavity.

The Coso Geode's outer crust is of hardened clay containing pebbles and fossil shell fragments. Also in the crust are two nonmagnetic metal objects resembling a nail and a washer. The inner third of the crust is of petrified wood---somewhat softer than agate or jasper. This layer was carved-out (while it was still in wood) in a hexagonal shape to form a casing. Enclosed within this space is a disc of very hard ceramic or porcelain-like material, with a metal core about 2 mm. in diameter. Only this metal core responds to a magnet. It has a slightly brassy appearance. There is some evidence that the ceramic core was encased in copper, a tiny bit of which is still intact, the rest having decomposed.

MET-003 CURIOUS GEOLOGICAL FACTS

Anonymous; American Journal of Science, 1:2:144-146, 1820.

In the Quarterly Review for Dec. 1819, Nov. 43, p. 52, the following very interesting fact is mentioned. It is introduced in giving an account of the quarries of marble from which the blocks are taken for the construction of the celebrated Break-water at Plymouth, in England: "The quarries are situated at Oreston, on the eastern shore of Catwater; they lie under a surface of about twenty-five acres, and were purchased from the Duke of Bedford for L10,000. They consist of one vast mass of compact close-grained marble, many specimens of which are beautifully variegated; seams of clay however are interposed through the rock, in which there are also large cavities, some empty, and

MET-003 TECHNOLOGICAL ARTIFACTS

others partially filled with clay. In one of these caverns in the solid rock, fifteen feet wide, forty-five feet long, and twelve feet deep, filled nearly with compact clay, were found imbedded fossil bones belonging to the rhinoceros, being portions of the skeletons of three different animals, all of them in the most perfect state of preservation, every part of their surface entire to a degree which Sir Everard Home says he had never observed in specimens of this kind before. The part of the cavity in which these bones were found was seventy feet below the surface of the solid rock, sixty feet horizontally from the edge of the cliff where Mr. Whitby began to work the quarry, and one hundred and sixty feet from the original edge by the side of the Catwater. Every side of the cave was solid rock: the inside had no incrustation of stalactite, nor was there any external communication through the rock in which it was imbedded, nor any appearance of an opening from above being enclosed by infiltration. When, therefore, in what manner these bones came into that situation, is among the secret and wonderful operations of nature which will probably never be revealed to mankind.

The perusal of the above brought to my recollection a fact if possible still more astonishing: it is mentioned by Count Bournon in his *Mineralogy*, and as that work has (I believe) never been translated, I will here give the passage entire.

"During the years 1786, 7, and 8, they were occupied near Aix in Provence, in France, in quarrying stone for the rebuilding, upon a vast scale, of the Palace of Justice. The stone was a limestone of a deep grey, and of that kind which are tender when they come out of the quarry, but harden by exposure to the air. The strata were separated from one another by a bed of sand mixed with clay, more or less calcareous. The first which were wrought presented no appearance of any foreign bodies, but, after the workmen had removed the ten first beds, they were astonished, when taking away the eleventh, to find its inferior surface, at the depth of forty or fifty feet, covered with shells. The stone of this bed having been removed, as they were taking away a stratum of argillaceous sand, which separated the eleventh bed from the twelfth, they found stumps of columns and fragments of stones half wrought, and the stone was exactly similar to that of the quarry: they found moreover coins, handles of hammers, and other tools or fragments of tools in wood. But that which principally commanded their attention, was a board about one inch thick and seven or eight feet long; it was broken into many pieces, of which none were missing, and it was possible to join them again one to another, and to restore to the board or plate its original form, which was that of the boards of the same kind used by the masons and quarry men: It was worn in the same manner, rounded and waving upon the edges.

"The stones which were completely or partly wrought, had not at all changed in their nature, but the fragments of the board, and the instruments, and pieces of instruments of wood, had been changed into agate, which was very fine and agreeably coloured. Here then, (observes Count Bournon,) we have the traces of a work executed by the hand of man, placed at the depth of fifty feet, and covered with eleven beds of compact limestone: everything tended to prove that this work had been executed upon the spot where the traces existed. The presence of man had then preceded the formation of this stone, and that very considerably since he was already arrived at such a degree of civilization that the arts were known to him, and that he wrought the stone and formed columns out of it."

SECTION MG: GRAPHIC ARTIFACTS

The graphic artifacts of ancient man that have survived the millennia are generally incised upon stone, hidden in caves, or somehow protected from the ravages of weather and the men who came after. Some graphic artifacts seem to be efforts at communication, such as glyphs, runes, etc. Other artifacts are more like scratch pads or memory joggers, such as the supposed lunar notation found on ancient bones in Europe. The majority of the graphic artifacts, however, seem to be products of the artistic urge. But premature conclusions must be avoided because we have no way to positively interpret the meaning ancient man may have attached to his symbols, drawings, and "art." The modern tendency is to be condescending and base interpretations on the assumption the ancients were superstitious, barbarian, and of low intelligence. Readers should be warned, on the other hand, that recent sensational literature often subscribes to radical interpretations for the Easter Island statues, the Nazca lines, and similar artifacts. No sides are taken in these sourcebooks, but an effort is definitely made to include anomalous material.

- MGM Macroforms. Those graphic artifacts that can be appreciated best "in the large," as from an airplane. Included are the Nazca "lines," the leys or trackways, the Cerne Giant, and effigy mounds.
- MGP Pictographs. Paintings, artwork.
- MGS Symbols and notation. Cupmarks, spirals, crosses, all manner of signs. These may be simply series of scratches or arrangements of signs. Calendars and maps are included here. Also color codes.
- MGT Statues, images.
- MGW Writing. Glyphs, runes, script, hieroglyphics, "talking boards," the Ogham writing.

GRAPHIC ARTIFACTS



Romans in ancient America? (Drawing by John Holden)

MGM-004 ABORIGINAL STRUCTURES IN GEORGIA

ones, Charles C., Jr.; Smithsonian Institution Annual Report, 1877, Government Printing Office, Washington, 1878, pp. 276-282.

The existence of curious effigy-mounds in the southern counties of Wisconsin was noted by Mr. Lapham in 1836. Subsequently, Mr. Taylor, Professor Locke, and Messrs. Squier and Davis furnished additional information in regard to the distinctive characteristics of these unusual structures. It was reserved, however, for the Smithsonian Institution, in the seventh volume of its "Contributions," to furnish, from the pen of Mr. Lapham, the most complete account of these interesting remains. They were quite numerous along the great Indian trail or war-path from Lake Michigan, near Milwaukee, to the Mississippi above the Prairie du Chien. Generally representing men, buffaloes, elks, bears, otters, wolves, raccoons, birds, serpents, lizards, turtles, and frogs, in some instances they were supposed to typify inanimate objects, such as bows and arrows, crosses, and tobacco-pipes. While the outlines of not a few had been seriously impaired, others in a spirited and correct manner declared the objects of their imitation. Constructed of earth, they varied in height from 6 inches to 7 feet. In certain localities the animals were delineated not in relief but in intaglio, by excavations and not by elevations.

Two animal mounds have been observed in Ohio. On an elevated spur of land near Granville is an earthwork known in the neighborhood as the Alligator. Its total length is 250 feet. The head and body, four sprawling legs and a curled tail, were all clearly defined. Across the body it was 40 feet broad, and the length of the legs was 36 feet. Four feet expressed the average height, while at the shoulders the mound attained an elevation of 6 feet. It was manifestly the effort of the primitive workmen to preserve the proportions of the reptile.

Situated on a ridge rising 150 feet above Brush Creek, in Adams County, is a still more remarkable structure, which, from its configuration, has received the appellation of the Great Serpent. "Conforming to the curve of the hill, and occupying its very summit, is the serpent, its head resting near the point and its body winding back for 700 feet in graceful undulations, terminating in a triple coil at the tail." If extended, its entire length would be not less than 1,000 feet. The embankment is upward of 5 feet high, with a base diameter of 30 feet at the center of the body, whence it diminishes somewhat toward the head and tail. "The neck of the serpent is stretched out and slightly curved, and its mouth is opened wide, as if in the act of swallowing or ejecting an oval figure, which rests partially within the distended jaws."

When and by whom these remarkable tumuli were built is not known. The object of their construction is equally a matter of conjecture.

It has been supposed that these animal-shaped mounds existed only in Wisconsin and a few other localities in the West. Our recent observations prove, however, that the primitive dwellers in the South have left similar traces of their constructive skill.

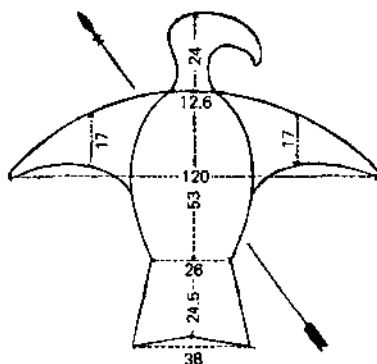
Six miles and a half north of Eatonton, in Putnam County, Georgia, on a plantation owned by the heirs of the late Mr. I. H. Scott, may now be seen a bird-shaped mound of definite configuration. Located in the midst of a beautiful wood, and crowning a high ridge near the headwaters of Little Glady Creek, it is composed entirely of boulders of white quartz rock, gathered from the adjacent territory. Most of these boulders are of such size that they could have been transported by a single individual. For the removal of others two or three persons would have been requisite. These boulders were carefully

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piled one above another, the interstices being filled with smaller fragments of milky quartz. Into the composition of the structure enters neither earth nor clay.

This stone mound represents an eagle lying upon its back, with extended wings. The head is turned toward the east. In the construction of this tumulus respect was had to the object imitated; the height of the tumulus at the breast of the bird being between 7 and 8 feet, its altitude thence decreasing toward the head and beak, where it is not more than 2-1/2 feet high, and also toward the extremity of the wings and tail, where it has an elevation of scarcely 2 feet. The beak is decidedly aquiline, and the tail is indented. Measured from the top of the head to the extremity of the tail this structure is 102 feet long. From tip to tip of the wings, measured across the body, we have a distance of 120 feet. The greatest expanse of tail is 38 feet, the same as the lateral diameter of the body. The proportions of the head, neck, wings, and tail are cleverly preserved. That this tumulus was designed to typify an eagle, we think may be affirmed with some degree of confidence, and that it possesses unusual attractions will not be denied. Surrounded by primitive forest and composed of most durable material, its antiquity is evidently very considerable. If undisturbed, it will preserve its integrity for an indefinite period.

By some curious persons an attempt was made, years ago, to pry into its secrets. A partial opening was effected in the breast, but with what results we could not learn. It excites no surprise that the eagle should have been selected in ancient times as a symbol of all that was swift, powerful, watchful, daring, and noble. Of its feathers was the battleflag of the Creeks made. Their council-lodges were surmounted with carved images or stuffed skins of this regal bird. None among the Cherokees, save approved warriors, were permitted to wear its plumes. To this king of the feathered tribe were religious honors paid by the Natchez, who regarded its feathers not simply as ornaments and trophies, but as marks of dignity and insignia of no common import.



Bird-shaped mound in Putnam County, Georgia, (MGM-004)

About a mile and a half from Lawrence's Ferry, on the Oconee River, and situated on a stony ridge near the main road, on the plantation of Mr. Kinchen D. Little, in Putnam County, is another of these bird-shaped mounds. Like the former, it is composed wholly of bowlders of white quartz rock, collected from the hill on which it stands.

Its dimensions do not materially differ from those of the tumulus on the Scott place. The tail, however, is bifurcated. The head of the bird lies to the southeast, and its wings are extended in the direction of northeast and southwest. The entire length of the structure, from the crown of the head to the end of the tail, is 102 feet and 3 inches. For a distance of twelve feet the tail is bifurcated, and just above the point of bifurcation it is 12 feet wide. Across the body, and from tip to tip of the wings, the tape gave us a measurement of 132 feet. The body of this bird, which is evidently lying upon its back, is stouter than that of the eagle, being 76 feet in diameter. Its wings are relatively shorter. The proportions of the head, neck, and tail are tolerably well observed. What particular bird this tumulus is designed to typify, we are at a loss to suggest. The altitude at the breast is about 5 feet, and from that point the structure tapers to the head and tail, which are some two feet high. At the tips of the wings, which are short and curved, the height is not more than a foot and a half. The ridge upon which this mound rests has never been cleared.

Surrounding this bird-shaped tumulus is an inclosure of rocks similar to those of which the mound is built. This stone-circle is symmetrical in outline, and at its nearest approach passes within a few feet of the tips of the wings.

Crowning the elevated ridges by which this county is traversed, are occasional rock-mounds of artificial origin. Usually from 4 to 8 feet high, and with base diameters of from 30 to 40 feet, they are circular in form, and are composed of the fragments of milky quartz so common in the region. Some have been opened, and from them have been taken human bones and relics of various sorts. Manifestly such are grave-mounds, it being easier in the rocky neighborhood to heap such stone-piles above than to cover the dead with earth. Of this class of tumuli we instance one on the plantation of Dr. J. T. deJarnette, 12 miles from Eatonton and about a mile from the Oconee River, and another on the land owned by Capt. A. S. Reid, four miles from Eatonton and near Little River.

It was intimated by some of the early observers that tumuli of this description were not infrequently temporary in their character, and designed as a protection to the dead who perished away from their homes, until such time as they could be conveniently removed and carried back for interment in the established burial-grounds of the tribe or community of which the deceased were members. While it may be true that some, and perhaps many of the smaller rock-piles so frequent in many portions of Cherokee Georgia, may have originated in this way, we are of opinion that the substantial structures to which we have alluded are permanent in their character, and were erected as enduring memorials of the primitive dead of this region. Surely no more lasting monuments could have been devised at that early period.

The existence of two distinctly marked bird-shaped mounds, of firm construction and excellent proportions, within the territory occupied by the Southern tribes, is deeply interesting, and will attract the attention of the student of American archaeology.

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MGM-005 THE GREAT SERPENT AND OTHER EFFIGIES

Peet, Stephen D.; American Antiquarian, 12:211-228, 1890.

The serpent motif seems universal. Here, Peet concentrates upon American effigy mounds and serpent symbols, but he also brings in dragon lore, Stonehenge, and worldwide diffusion of ideas in ancient times.

One of the most interesting questions in connection with the effigy mounds is the one which concerns their origin. There are two theories in reference to this. First, that they were the embodiment of the totem system of some wild tribe of hunters, and that they were altogether of native origin, purely aboriginal. The second is, that there is embodied in them a system of serpent worship which was introduced from some other continent, but which became mingled with the native totem system, and was here placed in permanent earth form, the two systems---the native and the foreign---being closely associated. The latter is the opinion which has been reached by the writer, after close investigation and long hesitation. The present paper is designed to show the reasons for adopting this conclusion. Let us, however, be understood. We have held all along that the Winnebagoes, a branch of the Dakotas, may have been the effigy builders. We still hold this opinion, but the Winnebagoes, or Dakotas, as a whole, seem to have possessed traditions and symbols which would indicate that a system which was foreign to this country generally was held by them and carried with them in all their migrations. This system was very common in Europe at an early day and has left the impress of itself upon very many of the monuments there. To some it would seem to be a system which was peculiar to the Indo-European race, and was identical with what is called the Druidic faith, belonging to the Celts, who were a purely historic race. To others, however, it seems to be a system which was older than the Celts, and is regarded as a gift of the prehistoric times to the historic, the chief embodiment being in those works which have been ascribed to the Druids, but the origin of which is still very uncertain. We put the two systems together. The effigy mounds in Ohio and Wisconsin are prehistoric. They have no evidence of contact with what are called historic races, certainly not with any races which were familiar with the Christian system, for there are no symbols of Christianity in them. If the symbolism which is embodied in them was in any sense historic, it was introduced before the time of Christianity. It is the same system which would be called native, whether found in Wisconsin, Ohio, Great Britain, France, Scandinavia, Hindostan, or any other part of the globe. This is an important conclusion, for it carries back the age of some of the Mound-builders much farther than some are prepared to admit, and at the same time it accounts for many things which have been regarded as mysterious, and as difficult of explanation. The discussion of the subject will follow the line of a comparison between the works of Ohio, Wisconsin, Dakota and other states, bringing in, however, frequent reference to the symbolism of Great Britain, especially that symbolism which connects itself with serpent worship.

I. First we shall refer to the traditions. It is well known that Catlin, the celebrated painter, maintained that the Mandans, who were a branch of the Dakotas, originally were located in Ohio, the very region in which the great serpent is found, but that they migrated from that region, passing down the Ohio River and up the Missouri, and that they became nearly extinct by the time they reached the head waters of the Missouri. He has given the map, with the route of the migration laid down on it, and the various stopping places designated. He states that he also visited certain deserted village sites, and that he

was able thus to trace back their route toward St. Louis by the village sites, and especially by the depressions in the soil which had been made by their lodges, the Mandans always having a custom of excavating the soil to the depth of about two feet before they erected their earth huts. These lodge circles, or excavations, have also been recognized among the effigy mounds. The ancient city of Aztlan was found by Dr. Lapham to have contained many of them. He calls them cellars. Prof. A. W. Williamson asserts that there was a tradition among the Dakotas that their original home was upon the Ohio River, and he believes that the ancestors of the Dakotas were the original Mound-builders of Ohio. Rev. A. L. Riggs concurred in this opinion. The date of this migration is not known, but it is supposed to have been before the advent of the white man. Rev. Mr. Williamson and Mr. Riggs both state that there was a tradition among the people that they came from the far east, and were familiar with the sea; and Catlin claims that the Mandans not only came from the east, but that they were originally from beyond the sea, that they were the descendants of the former celebrated band of white men which came to this country under the lead of Prince Madoc, the rejected Welsh prince, and refers to the white skin, peculiar form, and remarkable costumes of this people as proof. This theory does not seem to have gained credence, and yet there is interest in it because of its leading one to consider the European origin of the Dakotas.

If there are resemblances in the languages there are also resemblances in the earth-works and effigies. We have already referred to the great system of works at Portsmouth, Ohio, and have shown that these resemble in their general shape the standing stones at Avebury and Stone Henge. The resemblance may be recognized in the bone paths of Dakota, the serpentine line in the bone path being seen here and the eminences in the centre and at either end being also plainly intended. See Plate. Of course there is an inferiority in the later formed avenue, but this is what might be expected. It is the conception which we wonder at more than the execution. In this case the sun circle is lacking. There is no horse shoe to be recognized, and yet the serpent symbol seems to have continued. A feature of this effigy was that the hill and the serpent had the same shape, the peculiar cult of serpent worship being embodied in the hill. This same peculiarity is to be recognized in several places in this country.

1. In the great serpent mound in Adams County, Ohio, 2. In the serpent of standing stones which has been described by several persons as existing in Dakota. 3. The various serpent effigies surmounting serpentine hills, namely, at Mayville, at Green Lake, at Madison, at Potosi, Wis. 4. A serpent effigy has been discovered in Adams County, Illinois, which shows this peculiarity. The bluff is tortuous and the effigy is about 1500 feet long, and is conformed to the shape of the bluff.

One of the most remarkable prehistoric monuments in America is the great serpent mound in Ohio. This mound was surveyed and described by the authors of "Ancient Monuments" as early as 1845. It has been frequently visited and described since then. The last survey was that made by Prof. Putnam in the year 1889. His description was published in *The Century* magazine for that year. Prof. Putnam, it would seem, has taken the same position as did Squier and Davis, and advocates the theory of an European or Asiatic origin. The following is his description: "Approaching the serpent cliff by fording Brush Creek, our attention was suddenly arrested by the rugged overhanging rocks above our heads, and we knew that we were near the object of our search. Leaving the wagon we scrambled up the steep hill, and pushing on through brush and briar, were soon following the folds of the great serpent along the hilltop. The most singular sensation of awe and admiration overwhelmed me, for here before me was the mysterious work of an unknown people, whose seemingly

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most sacred place we had invaded. Was this a symbol of the old serpent faith here on the western continent, which from the earliest time in the religions of the East, held so many people enthralled? Following the ridge of the hill north-erly one is forced again to pause and admire the scene---the beautiful hill-girt valley, the silvery line of the river, the vistas opening here and there, where are the broader and deeper portions of the river, etc. Turning from this view, and ascending the knoll, one sees before him, eighty feet from the edge of the cliff, the western end of the oval figure in front of the serpent's jaws.



Great Serpent Mound, Adams County, Ohio (MGM-005)

The oval is one hundred and twenty feet long and sixty feet in breadth. Near the center is a small mound of stone, which was formerly much larger. Many of the stones show signs of fire. Prof. Putnam says: "A careful examination of sections through the oval shows that both parts of the earth-work were outlined upon a smooth surface, clay mixed with ashes being used in some places, but a pavement of stone to prevent washing used in other places. The whole structure was carefully planned and thoroughly built." Prof. Putnam speaks also of the crescent shaped bank between the jaws of the serpent, the extremities being seventy-five feet apart, but the bank being seventeen feet wide. This crescent is worthy of notice. The head of the serpent is thirty feet wide and five feet high. The serpent itself is 1,254 feet in length, measured from the tip of the jaw to the end of the tail. The average width is twenty feet, and the height from four to five feet. The tail decreases where it begins to coil, and is at the end about a foot high and two feet wide. "The graceful curves throughout the whole length of this singular effigy gives it a strange lifelike appearance, as if a huge serpent slowly uncoiling itself and creeping silently and stealthily along the crest of the hill, was about to seize the oval within its extended jaws. In the oval embankment, with its central pile of burnt stones in combination with the serpent, we have the three symbols everywhere regarded in the old world as emblems of primitive faith. Here we find the Linga in Yoni of India, or the reciprocal principle of nature guarded by the serpent, or life, power, knowledge and eternity. Moreover its position---east and west---indicates the nourishing source of fertility, the great sun god whose first rays fall upon the altar of stones in the centre of the oval."

Prof. Putnam also refers to the remarkable serpent effigy which was discovered by Dr. J. W. Phene in Argyleshire, Scotland, and quotes a description of this, written by Miss Gordon-Cummings. The following is the quotation:

"The tail of the serpent rests near the shore of Loch Nell, and the ground gradually rises seventeen to twenty feet in height, and is continued for three hundred feet, forming a double curve, like a huge letter S, and wonderfully perfect in outline. The head formed a circular cairn, on which there still remains some trace of an altar. Dr. Phene excavated the circular cairn, or circle of stones, and found three large stones, forming a megalithic chamber. From the ridge of the serpent's back, it was found that the whole length of the spine was constructed with stones, regularly and systematically placed at such an angle as to throw off the rain. The spine is, in fact, a long narrow causeway, made of large stones, set like the vertebrae of some huge animal, the ridge sloping off at each side is continued downward with an arrangement of smaller stones, suggestive of ribs. The mound has been formed in such a position that the worshippers, standing at the altar, would naturally look eastward, directly along the whole length of the great reptile, and across the dark lane, to the tripple peaks of Ben Cruachan." Prof. Putnam says: "Is there not something more than a mere coincidence in the resemblances between the Loch Nell and the Ohio serpent. Each has the head pointing west, each terminates with a circular enclosure containing an altar, from each, looking along the most prominent portion of the serpent, the rising sun may be seen. If the serpent of Scotland is a symbol of an ancient faith, surely that of Ohio is the same." Here then we have the full committal of the professor of archaeology in Harvard College to this theory of the foreign origin of the great serpent.

II. The position which we take is, that the system of symbolism which was contained in the great serpent was also extended over the entire region which was occupied by the effigies, and thus proves that the people who built the effigies were serpent worshippers. We have discovered the serpent effigy in many places, and find that it always embodies the same elements, and seems to have been used to serve the same effigies, and is generally connected with the same symbolism. One thing, however, is to be noticed, that the symbolism was more elaborate in Ohio. If the great serpent was erected by the Dakotas, they must have in the course of their migrations, lost much of the symbolism which they then possessed. In fact, they degenerated. The symbolism of Ohio was that of sun worship, as well as serpent worship. In Wisconsin and Dakota, serpent worship seems to have continued, but the emblems of sun worship are by no means numerous. Totemism here gained the ascendancy. Sun worship almost disappeared. Serpent worship, however, retained its original power.

How this superstition arose is unknown. It may have been introduced from the far east, but there is an uncertainty as to the date and means. Serpent worship has prevailed in all parts of the globe. It was formerly very extensive in India, and became incorporated into the Buddhist faith, though it is supposed to be derived from the aboriginal tribes. The Hindoos tell the story of the great serpent which served as the embodiment of the evil principle, Vishnu, the destroyer. There is a sculptured figure in one of the oldest pagodas, which represents Orishna trampling on the crushed head of the serpent--the Creator trampling on the Destroyer. The classical Hercules is represented as contending with a serpent, the head placed under his foot. The gardens of Hesperides is a classical myth in which was the tree with the golden fruit, which tree was guarded by the hydraheaded serpent. In the Egyptian mythology the monster Typhon is represented as a combination of two immense serpents. In the Scandinavian mythology there is the story of the tree with the serpent at its root. This is the Tree of Life, the Ash tree. The great serpent Midgard is said to have been precipitated by Woden to the bottom of the ocean, but he

wound himself around the whole globe and became the serpent of the sea. The Chinese have as a common myth the story of the dragon which threw the universe into confusion. It was born out of an egg that floated on the waters of the great abyss. The Persian Mithras was depicted with a human body, a lion's head, wings of a bird, with the tail of a snake, all of the orders of creation being combined into one. Some suppose these to be derived from the scripture account of the creation, of the Garden of Eden and of the cherubim which guarded the gate. Others would consider that the Scripture account had only preserved the aboriginal myths and given them a new interpretation, making the serpent the embodiment of evil, winged figures the embodiment of good. The Egyptian conception was just the opposite. The serpent Neph was the creator of the world and the source of good. The Phoenicians also considered the winged snake as a symbol of the good Agatho-demon. Among the Hindoos Twashta was the great artificer of the universe and was supposed to bear the form of a serpent. The worship of the serpent was prevalent among the Babylonians. The apochryhal story of Bell and the dragon shows that it was a well known superstition of the Chaldeans. In the mystic theology of the Druids the serpent was venerated as the symbol of the Deity and was the sovereign dragon of Britain. It was typified in various forms and was described as moving around the huge stones of Gaer-Sidi or Stone Henge and as pursuing a fleeting Goddess, who is styled the Fair



Serpent Figure showing rattles. (MGM-005)

One, a myth nearly allied to the legend of Jupiter under the form of a serpent violating Proserpine. Among the Syrians the Great Mother was typified as a serpent as well as a ship. According to the Hindoos an enormous snake is seen opening its jaws, and the god Vishnu is seen driving into its mouth a herd of cattle, the story being that he was in imminent danger from the rage of his enemies, but found shelter for his flocks in this way. Fohi, the reputed first emperor of China, is fabled to have had the body of a man with the tail of a serpent. Vishnu also floats upon the sea, borne upon the body of an immense serpent.

The serpent, twisted in the form of a circle, was a familiar symbol among the Hindoos, Persians, Phoenicians, Egyptians, Britains and the Greeks. The caduceus of Hermes exhibited two serpents wound around a staff, a globe, and wings at the top of the staff. The Phoenician symbol was a serpent coiled around an egg, a symbol which is found in some of the altar stones of Mexico.

The Assyrian symbol was a man rising out of a circle formed by a serpent, with a bow and arrow in his hands. In Mexico the serpent is a common symbol. It guards the temples, forms the balustrades to the stairways of the pyramids, surmounts the walls which surround the temples, and is incorporated into the form of their divinities. The shrines in which the Mexican divinities were contained were in the shape of serpents, with mouths open, the fire lighting up the interior and giving them a ghastly appearance. The altar temples or adoratorios at Palenque and Uxmal had the symbols of the winged serpent covering the facade and surmounting the doorways. In Benares, the great temples have circular domes which cover the sacred piles, and the image of the god stands upon a raised platform or high place beneath the dome.

The figure of the cross is sometimes associated with that of the serpent. It is a cross, however, which has a circle surrounding it, showing that it was associated with sun worship, but at times the figure is also associated with serpent figures.



Serpent effigies near Potosi, Wisconsin. (MGM-005)

There are many strange myths associated with serpent-worship. In India the myth of the churning of the sea; in Britain the myth of the island in the lake; in China the myth concerning Fohi and the mountain, typhoon, etc; in Greece the myth concerning Hercules; in Egypt the myth of Osiris. The following is the story of the churning of the ocean as related by Sir William Jones: Vishnu directed the king of serpents to appear. Then Ananta bore the king of the mountains, with all its forests, into the presence of the ocean. So the mountain was set upon the back of the tortoise. Eendra began to whirl it about as if it were a machine (a fire generator), the mountain Mandar served as a churn and the serpent Vasooke for the rope. The Dewtahs, Assoors and Danoos began to stir up the waters for the discovery of Amrita, or the essence of immortality. The mighty Assoors were employed at the serpent's head, the Soors at his tail. They pulled forth the serpent's head repeatedly and let it go until there issued from his mouth a stream of fire, smoke and wind which ascended in thick clouds, replete with lightning, when it began to rain down upon the heavenly bands. A raging fire was produced, involving the mountain with smoke and flame which spread destruction upon all sides. The forest trees were dashed against each other, the inhabitants of the great abyss were annihilated, a raging fire was produced involving the whole mountain with smoke and flame. Every vital being was consumed in the conflagration. The raging flames spread destruction on all sides, but were at length quenched by a shower, ---a cloud-bourne water poured down by the immortal Eendra. The end was that there arose from the troubled deep, first the moon with ten thousand gleams of light, next the jewel Kowstooeh, a glorious gem worn by Narayan on his breast. Then the tree of plenty, also the horse, as swift as thought; the cow that granted every

heart's desire; the goddess of fortune, whose seat is the white lily. In Great Britain the legend assumes a different shape. A holy sanctuary was on the surface of the ocean, a floating island on the seventh wave, a holy sanctuary surrounded by the sea, a sanctuary with an iron door (a type of the ark), and a city not protected with walls. The divinity entered his earthly cell in the border of the circle. Disturbed is the island of Hu; deplorable is the fate of the ark of Aeddon. The goddess of the silver wheel in behalf of the Britains threw around the sanctuary of the rainbow a stream which scares away violence from the earth and causes the bane of the former state around the circle of the world to subside. Then the masters of the magic wand set the elements at large. The dragon chief was the rightful claimant in Britain. He was seated on his chair in the midst of the island. His belt a rainbow; a protector of the sanctuary.

The legend assumes an historical form in the legend of St. Cuthbert; of Merlin, also of King Arthur and the round table, and forms a very interesting department of mythical literature. He was said to have held the strong beamed plow; he sailed in a wonderful ship; he presided over a stupendous temple which is called the great stone fence, the circle of the world, the mundane circle of stones, the mound constructed of stone work typifying the world, the mundane rampart. The stall of the cow, the ark of the world, the common sanctuary. He places his chair upon the mystic island. He is able to protect his chair in the midst of a general flood.

Many of the stone monuments of Britain were associated with these characters. Each kistvaen was regarded as the mystic stone cell of Ceridwen. The slab in the center of Stone Henge, which has often been taken for an altar, was the mystic tomb of Twain, or the Solar Hu, just as a similar stone in the midst of the Egyptian temple of Nuphis was a sepulchre of Osiris. The symbols which are connected with serpent worship are numerous. Among them are the circle, signifying the sun; the horse shoe, signifying the principle of life, the trident signifying the same; the crescent, signifying the moon and the boat; a crescent with three points, one signifying the prow, another the stern, and another the mast of the boat. They were regarded by some as the symbol of the ark. The cross is also a common symbol. This assumes the shape of the suastika, or the fire generator, the ends signifying the points of the compass. The cross has the circle adjoining the arms, signifying the circle of the sun and the motion of the heavenly bodies. These symbols are repeated over and over again in all parts of the old world, and are all very significant. Many of them are found in this country, though they are not as elaborate, nor are they as closely associated as they were in the old world. Still we have the suastika or fire generator, the crescent, circle, the horse-shoe, as well as the serpent, all of them very significant.

Now our point is that we have all of these symbols in America, the effigy mounds perpetuating most of them; the two, the relics from the earth-works also containing the same symbols. The strange thing about all of these symbols, the cross, the serpent, the circle, the crescent, the bird contained in the circle, the serpent and the horse shoe, are found in the State of Ohio, the very place from which the Dakotas, according to traditions extant among them, are supposed to have migrated, the only exception being that of the bird in the circle, which is located in Georgia, in the very spot where the Tuteloos, a branch of the Dakotas, are known to have dwelt at one time. We can not help, then, associating these symbols with this tribe and concluding that the same tribe when they migrated to the west carried some of these symbols with them. We might go even further and say that the Mound-builders brought into this country that form of symbolism which prevailed in Great Britain, and which belong to the Indo-European race, though they themselves were not of that stock, but were

of the Turanian. Still they may have received from some stray member of the Indo-European race that symbolism which is supposed to have been Turanian, but which were introduced into Great Britain by the Druids. There is a mystery about this whole subject, but there are enough facts constantly coming to light to keep our curiosity constantly awake and to set new inquiries at work. We may call it all visionary and ascribe the theory to credulity, but the opposite theory---that is, the theory of the autochthonous origin---may lead to equal or even greater credulity. We have, at least, the relics and the earth-works, which bear a symbolism which resembles that of Great Britain, and explain it as we will the relics are substantial and genuine. They have never been disputed.

Let us take the figure given above: It is a carved stone which was taken out of one of the mounds in the enclosure on the north fork of Paint Creek. It represents the serpent twined about the bowl of a pipe. Other sculptures of the serpent coiled in like manner have been found. This represents a variety not recognized. It has a broad flat head and a body singularly marked. Now we think that no one can look at this figure without being reminded of the Mahadeo of India, a figure which was very significant, and was often seen in connection with the phallic worship of that country. Dr. Charles Rau says of this: "Mahadeo is worshipped by the Hindoo sect under the form of a phallis, represented by an upright stone pillar, sometimes in conjunction with the Yoni in the shape of a jewsharp." Dr. Rau thinks that the same symbols are found in some of the cup-shaped markings of this country, especially in that found on Bald Friar's rock in West Virginia. Here the serpent's head has the shape of the jewsharp, and above it is the symbol of the concentric circle, the concentric circle being emblematic of sun worship. Prof. Simpson says: Much evidence has been gradually accumulating of late years to prove that there existed pre-Celtic races in Britain, that the race preceded the megalithic builders. But Mr. Tate says of the cup and circle carvings in Great Britain that at the period in which they were made the whole of Britain was peopled with tribes of one race, who were imbued with the same superstitions and expressed them by the same symbols. He seems to have a leaning toward the belief that they originated with the Druids and were connected with the rites of the priesthood. The concentric circles show the motion of the heavenly bodies. It is remarkable that these cup marks are very common in Ohio, though they are not generally regarded as symbolic, a more practical use being assigned to them ---rests for drills or holes for nut cracking. The horse shoe, however, is found in the earthworks at Portsmouth, the concentric circles at one end and the serpent effigy at the other. The carved specimens of shell gorgets found in Tennessee contain figures of the serpent. These serpents are generally represented with their mouths wide open, their tails twisted around, and rings placed at intervals in the bodies. It sometimes seems as if there was a conception of the dragon contained in them, the rings being the place where the legs joined the body, though there are no clearly defined dragons among the mounds. The dragon was a symbol among the Mexicans; it represented the motion of the heavenly bodies, and was used in connection with their chronology. The mounds of Ohio contained no such shells as are found in Tennessee and the Southern States. We conclude from this that they were built by a different tribe. Still the mounds of Ohio are, many of them, built in the shape of circles and crescents, and have the same symbols which are found in the shell gorgets.

III. There is a distinction between the relics of the different localities, and yet it would seem as if serpent worship existed all over the localities. Let us take the relics which have been discovered in the altars near Chillicothe. Squier and Davis have described these altars. There are twenty-four mounds,

all of them altar or burial mounds, or places of sacrifice, in one enclosure. The enclosure contained thirteen acres. There was no exterior ditch, no elaborate gateway. It was merely enclosed by a wall, but it was designed as a burial place. One of the mounds was seventeen feet high and one hundred feet in diameter, but mounds that yielded the most relics were comparatively small. It would seem to be a place for successive burials, as some of the mounds contained two altars, a large one and a smaller one, the large one being about sixty feet in length and forty-five feet across the top, the other one being fifteen feet in length and eight feet square at the top. A basin eighteen inches in depth was found in the altar. It was burned to the depth of two feet, one altar having been built upon the first, both having been used and subjected to heat, one after the other. The contents of this altar consisted of copper and stone implements, spear-heads made of quartz and garnet, arrow-heads of obsidian and quartz, copper gravers or chisels, twenty or more copper tubes, a large quantity of pottery, two vases nearly complete. Another contained an altar which is only six feet long and four feet wide. On this altar was a deposit of two hundred pipes, carved in stone, many pearl and shell beads, numerous disks and tubes of copper, and other ornaments of copper, covered with silver. The pipes were made of red pipestone, had been exposed to the heat, and were many of them broken. They were carved with miniature figures of animals, birds, reptiles, all of them true to nature, and with exquisite skill, representing the peculiarities and habits of the animals. The other is in a characteristic attitude, holding a fish in his mouth. The heron also holds a fish. The hawk grasps a small bird in its talons, which it tears with its beak. The panther, bear, wolf, beaver, otter, squirrel, raccoon, hawk, heron, crow, swallow, buzzard, paroquet, toucan, turtle, frog, toad, rattlesnake, are recognized at first glance. The most interesting and valuable in the list are a number of sculptured human heads no doubt faithfully representing the predominant physical features of the ancient people by whom they were made. Another mound in the same enclosure contained a skeleton and skull of one of the Mound-builders.

Thus we have from this one locality not only the shapes of the animals which were carved upon the pipe and which remind us of the animal effigies and the skill of this people in imitating animal figures, but we have the portraits of the people themselves, and to confirm it the skull of one of the persons that may have been the skillful worker whose hands wrought the relics. One remarkable circumstance connected with one of the portrait pipes is that it very strongly resembles the portraits of one of the Mandan chiefs which Catlin painted when he was among that people and learned from them the traditions concerning their migration. We present the figure of this pipe and a portrait of a living chief, the grandson of the one which Catlin painted. It will be noticed that the last surviving chiefs had features almost exactly like those which are contained in the pipe. This may be by some regarded as mere coincidence and not as proof. If it is a coincidence, it is a very remarkable one. We are ready to acknowledge that the other pipes contained portraits which are very unlike this. And yet one of them, the one with the remarkable head dress, has features which we think are very like the features of Dakota women we have seen. Taking this evidence with that which has already been given, we consider that there is pretty good proof that the Dakotas built the effigies of Wisconsin and the altar mounds of Ohio.

Of course we shall need to connect serpent worship with the altars in Ohio to prove that they belonged to the effigy builders in both states, but we have the animal figures in the pipes to suggest this point, and at the same time we have the serpent effigy, the alligator effigy, the bird effigy, all of them containing altars, thus showing that the practice of building altars and offering sacrifices

was common with the effigy builders of Ohio. The serpent worship was attended with sacrifices. Another argument is found in the fact that altar mounds are not confined to this one locality of Mound City, but they are quite common throughout this district; another locality, that of Clark's Works, being very remarkable for the richness of its deposits. In this place were found several pipes, one of which we have described above. Another remarkable circumstance is that the altars contained such a variety of deposits. The mounds differed in the number and relative position of the sand strata, as well as of the size and shape of the altars and the character of the deposits made in them. The altars were somewhat alike, but the deposits were entirely different. One mound covered a deposit of pipes, another a deposit of spear heads, another a deposit of galena, or calcine shells, another of mica plates. Some of the mounds containing relics had no altars. This was the case with the one which contained the coiled serpent. In place of the altar a level area, ten or fifteen feet broad, was found, much burned, on which the relics had been placed. Hundreds of relics, many of them most interesting and valuable, were found, among which were several coiled serpents, carved in stone, and carefully enveloped in sheet mica and copper; also several fragments of ivory and a large number of fossil teeth and numerous fine sculptured stones. Another mound contained six hundred disks of horn and stone in two layers. Another contained a layer of silvery mica in round sheets, ten inches or a foot in diameter, overlapping each other like the scales of a fish, the whole forming the shape of a mica crescent, giving the idea that the worship of the moon was symbolized both by the crescent and by the glistening color of the mica itself. Traces of cloth, several scrolls from thin sheets of mica, instruments of obsidian, and a large quantity of pearl beads were taken from the mounds at Clark's works. Copper bracelets were taken from another mound in the same locality. This contained an altar which was paved with small round stone laid with the utmost precision. The copper bracelets encircled calcined bones, showing that human sacrifices had been offered.

IV. The following are the elements which we have recognized in connection with serpent worship wherever it is found. These elements are very apparent in the great serpent; but they are also perceptible in other localities.

1st. The serpent effigy always corresponds to the shape of the ground on which it is placed. This is a very remarkable circumstance, the natural and the artificial being always associated. It is perceptible in all localities. The great serpent in Ohio is on a cliff which resembles a serpent in its shape, the very end of the cliff representing the nose, the limestone representing the white throat, the tortuous line of the cliff representing the motion of the serpent, the very shadow on its side making the resemblance all the more striking. The stone serpent in Dakota is on a ridge which resembles a great serpent. It is a ridge which overlooks the prairie on all sides. The stones of which the serpent is composed brings out the resemblance, the two stones in the head of the serpent being very expressive. The two serpents near Potosi, Wisconsin, are situated upon a ridge which, in its shape, is suggestive. Here the two serpents correspond with the shape of the cliff, every bend in the cliff being followed by the effigy, and the line which constitutes the summit being transformed by artificial means into the shape of serpents. It is quite wonderful, for the resemblance is so close that one is left in uncertainty after he has visited the locality whether he has not been deceived. The author, in examining these, was accompanied by Mr. R. S. Foster, who is a graduate of Beloit College and a close observer, being a student of natural science. A gentleman, also, who owns lead mines and who has been familiar with the entire region for many years, was consulted. He seemed to have recognized the serpent shape on the summit of the bluff.

Dr. Lapham has described a row of mounds near Burlington, Wisconsin, which was so arranged as to resemble a crooked snake. What is remarkable at this locality is, that the line of the mounds follows the line of the stream---the Fox River---every turn of the stream being followed by the row of mounds. There are also three oblong mounds near the head of the snake, though it is uncertain whether these were intended to bring out the symbols of the three peaks which are always associated with the serpent effigies in the old world.

The serpent effigy discovered by the author a few miles from his home in Adams County, Illinois, is also conformed to the tortuous shape of the cliff. This effigy is in a very conspicuous place. It overlooks the bottom lands of the Mississippi River for many miles. The effigy itself is a striking object. The head of the serpent rests on the south end of the bluff. The bend of the neck follows the line of the bluff for 600 feet. The roll of the body extends 300 feet further, but is brought out more fully by four high conical mounds. The effigy then follows the line of the bluff for 600 feet more, the rattles of the snake being plainly visible at the northern extremity of the bluff.

2d. Another element of serpent worship is that it was a source of protection to the people. This is seen in the serpent in Ohio. Prof. Putnam discovered an old village site, and lookout and burial mounds in the immediate vicinity. He does not say that the serpent has any protective power here, but merely refers to the burial mounds and their contents. The spot seems, however, to have been occupied for a long time. Evidence of the former existence of habitations was shown by the burnt places and ash-beds marking the sites of dwellings. But the dwellings and burials were of different times. He asks the question: "Does not this burial show that the spot was revered as the home of ancestors, or from its vicinity to the sacred shrine, about which traditions may well have been preserved long after the immediate descendants of the builders had disappeared from the region?" Prof. Putnam mentions a grave containing a pavement of flat stones. He says: "Pages could be filled with instructive details relating to the burial place and village site." He mentions graves which have an antiquity as great as that of the serpent itself, and says we have every reason to believe that the bodies buried at this spot were of the people who worshiped at the serpent shrine. This idea of protection given by the serpent to a village is, we think, embodied more fully in the forts to which we have referred ---Forts Ancient, Hamilton, Colerain. It is also brought out in the stone work near Bourneville. Here the serpent is double, the two bodies forming a circle, the necks coming together forming the entrance, but the heads turning away, the same as they do at Colerain and at Fort Ancient. The tapering piles of stone adjoining this work are symbolic of the rattles of the serpent, but they are doubled. In this we have the same symbolism which is common in Mexico, the tails oftentimes being double. The cross at Teotihuacan illustrates this. In Wisconsin the serpent guards a series of garden beds. Another serpent guards a small council house. The serpent here is very tortuous, the head and the tail coming very near together, and forming the opening to the council house. The peculiarity of this effigy is that it corresponds to the shape of the bluff on which it is placed, every bend of the serpent representing a bend of the bluff, the whole forming an isolated spot on which the council house stood. Squier and Davis have described the works at Portsmouth as having a circle in an isolated spot, surrounded by two small streams, guarded by the parallel walls. The wall of this circle, according to Mr. T. H. Lewis, is in the shape of a crooked serpent, the head and tail coming together, so as to constitute the opening. It may have been a council house.

3d. The accompaniment of a "High place" is a frequent feature of the serpent effigies. We find this in Ohio. According to Mr. T. W. Kinney there was

an altar at Portsmouth, Ohio. It was contained within an artificial mound, which had the shape of a serpent. This mound has been destroyed, as it is the site of an orphan asylum. It was, however, but a short distance from the horse shoe enclosure. Mr. Kinney supposes that there were sacrifices offered on this altar. He says that it shows evidence of heat. A channel also leads from the altar to the edge of the mound, which he thinks was a channel for blood.

The "High place" occupied by the oval near the serpent has been described. It is supposed that this was a spot where sacrifices were frequently offered. The eminence is one which can be seen for many miles. The fires lighted here would at night cover the whole valley with a peculiar glare. It is evident that it was the spot where mysterious ceremonies took place.

The serpent effigy at Madison, Wis., attends a "High place." This altar was also situated on an eminence that could be seen for a long distance from all sides. It is a very peculiar ridge, and one which attracts attention. The lakes are on all sides of it. At present the ridge is unoccupied. It can be seen from the capitol, and from the university, and constitutes the third eminence which marks the site of the city. Fires lighted upon this altar could be seen from all the points where effigy mounds are at present located. There are many burial mounds in the immediate vicinity, but this altar mound is on the highest point, and is very conspicuous. Here we have the same element which was an important feature of the ancient works in Great Britain. The circle at Avebury and the horse shoes at Stone Henge surrounded an altar, the serpent at Avebury forming the passage ways to the altars. This is very suggestive, though there is a great variation in the different localities. This "High place" at Portsmouth is very remarkable. It is near the horse shoe and is on the bluff which overlooks the city. Avenues lead from this bluff in three directions. At the east end of the avenue are the four concentric circles, with four passage ways in the shape of a cross, with a terraced mound in the centre, the whole making a remarkable sun symbol. At the west end is a large square enclosure, with the avenue extending in both directions from it, one of them resembling the head of a serpent, the other the tail, the enclosure giving the impression that it may have been used as a pen in which prisoners were confined and kept for sacrifice. At the great ceremonial day the heights may have been lighted with sacrificial fire, the one where is the altar and horse shoe enclosure being the place of sacrifice, the one where is the square enclosure being the place in which the victims were taken; the other, where the sun symbol is seen, being the place where the offerings to the sun were made, the avenues being in the shape of a great serpent, the whole picture being the scene where processions passed in great solemnity. The river flowing between the place of the sacrifice, and the final place of the offering, the very bend of the river suggesting the shape of a great serpent.

4th. In reference to sacrifices, it should be said that nearly all the effigies in Ohio have altars connected with them. The alligator mound, near Newark, overlooking the site where there were villages around which the works were erected. The fires could be seen from both villages. It had an altar near. There was also an altar inside of the circle which is called the old fort. This altar was covered with the bird effigy. An altar also attended the cross near Tarleton, Ohio. Immediately back of it is a small circular elevation of stone and earth, resembling that in connection with the Granville effigy. Squier and Davis say of the cross that it corresponds in position with the oval at the head of the great serpent. Here then we have all of the symbols of the old serpent worship embodied in the different effigies of Ohio, all of them attended also by an altar, showing that they were evidently used in connection with sacrifices. Whether they are human sacrifices or not is uncertain. The altar mounds in

Wisconsin have only the serpent effigy in connection with them. Much of the symbolism seems to have been lost. Altar mounds are, however, in Ohio associated with the sun symbol, and it may be that the sun worshipers were the people who erected the great serpent, and that they passed off in another direction, possibly to the southwest, the Natchez being their descendents. We are ready to acknowledge that the comparison can not be carried out in the case of the effigies of Wisconsin. In Ohio we have the circle, cross, crescent, horse shoe accompanying the altars. In Wisconsin we have only the serpent effigies. Was it because the people degenerated, or was it because they were of different stock?

5th. The prevalence of forts guarded by serpent effigies is another point. We have referred to the Fort Ancient, and have said that it contained the shape of a serpent embodied in its walls. The same is true of the forts at Colerain and near Hamilton. In both of these forts there are walls which resemble serpents. See Plates. In one case the heads of the serpents formed a gateway which was afterwards closed, the tails forming the guards to two other gateways, which were the regular entrances. In the Colerain works the heads formed the main entrance, and a mound near the heads formed the lookout for the fort and at the same time served as an out-work or protection to the gateways. The question is whether there are any forts in Wisconsin, Illinois, Dakota or Minnesota which have this peculiarity of the serpent embodied in the walls, or guarding the gateways. In reference to this there is some uncertainty, and yet there were at Aztlan certain peculiarly shaped walls built outside the inside of the enclosure which might be taken to be serpent effigies, though their shape has so far been obliterated.

6th. A remarkable coincidence has been mentioned. Mr. Wm. McAdams has described the paths of buffalo bones which were discovered on the prairies of Dakota, and has given a cut which shows the shape which the paths assume, and which brings out the resemblance of the paths to a great serpent, a mound being in the centre of the body, a smaller mound at the head, and a tapering mound at the tail. It may be a mere coincidence, and may seem visionary that we should mention this, and yet there is a resemblance between this modern serpentine path made out of buffalo bones and the remarkable stone path guarded by the double lines of standing stones, which is a peculiar feature of the works at Avebury, England. We place the two pictures side by side to show this. The centre of this path is a high hill called Silbury Hill, the largest artificial mound in Great Britain, measuring no less than 170 feet in height. Here was the great circle, containing two smaller circles and the embankment with the ditch inside of it. At the end of this avenue was another double circle, which was also upon an eminence, called Bennet Hill. The tail of the serpent went in the direction of Beckhampton. The resemblance between the two structures, the one in Dakota and the other in Great Britain, is certainly remarkable, but the tradition which Catlin repeated long before the path of buffalo bones was known, is even more remarkable. It has been a question who built the works at Stone Henge and at Avebury, and it is still uncertain, some ascribing them to the Druids, others to the Phoenicians, and still others to the early Britains. The Celts could not have come to this country, for there are no signs that the Celtic, Saxon, or any of the branches of the Indo-European languages were ever introduced here, the students of the aboriginal languages all being agreed on this point. In reference to the Britains and the Basques the linguists are not so sure. In fact, some of them, Mr. Horatio Hale among them, have claimed that there were many resemblances to these in the Indian languages. We would refer to the connecting link between the peculiar structures in Great Britain and the effigies in Wisconsin and Dakota.

MGM-006 TERRITORIAL ORGANIZATION OF THE LOWLAND CLASSIC MAYA

arcus, Joyce; *Science*, 180:911-916, June 1, 1973.

Summary and Conclusions. Thus far I have discussed ancient Maya socio-political structure from the upper levels of the hierarchy downward. Let me now summarize their territorial organization from the bottom upward, starting at the hamlet level (Fig. 8).

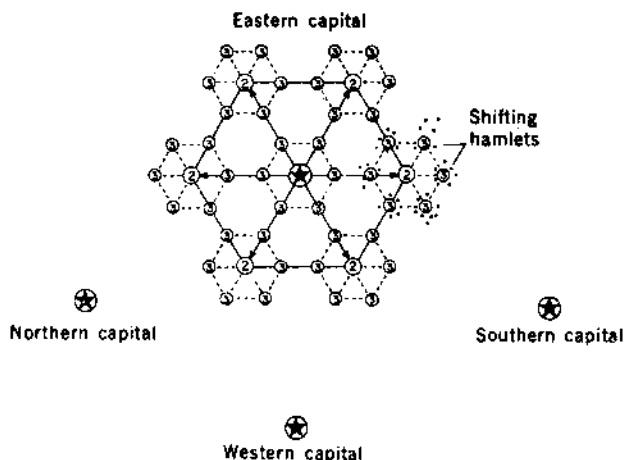


Fig. 8. Idealized diagram of the territorial organization of lowland Classic Maya, from regional capital to outlying hamlet. Circled stars indicate the four regional capitals; circled 2's, the secondary centers; circled 3's, the tertiary centers; small dots, shifting hamlets around tertiary centers. Arrows linking secondary centers to regional capitals indicate marriage alliances. (Although such organization would have characterized all four regional capitals, only the area around the eastern capital is shown in detail.)

The smallest unit of settlement---one usually overlooked by archeological surveys in the lowland rain forest---was probably a cluster of thatched huts occupied by a group of related families; larger clusters may have been divided into four quadrants along the lines suggested by Coe. Because of the long fallow period (6 to 8 years) characteristic of slash-and-burn agriculture in the Peten, these small hamlets are presumed to have changed location over the years, although they probably shifted in a somewhat circular fashion around a tertiary ceremonial-civic center for whose maintenance they were partly responsible. These tertiary centers were spaced at fairly regular intervals around secondary ceremonial-civic centers with pyramids, carved monuments, and palace-like residences.

In turn, the secondary centers occurred at such regular intervals as to form hexagonal patterns around primary centers, which were still larger, with acropolises, multiple ceremonial plazas, and greater numbers of monuments. In some cases, the distance between secondary centers was roughly twice the distance between secondary and tertiary centers, creating a lattice of nested hexag-

MGM-007 MACROFORMS

onal cells. This pattern, which conforms to a western theoretical construct, was presumably caused by factors of service function, travel, and transport. The pattern was not recognized by the Maya at all. They simply recognized that a whole series of smaller centers were dependent on a primary center and therefore mentioned its emblem glyph. Linking the centers of the various hexagons were marriage alliances between members of royal dynasties, who had no kinship ties with the farmers in the hamlets.

Out of the large number of primary centers available to them, the Maya selected four as regional capitals. True to their cosmology, the Maya regarded these capitals as associated with the four quadrants of their realm, regardless of their actual location. Each was the home city for a very important dynasty whose junior members probably ruled secondary centers. Since the hexagonal lattices were probably adjusted to variations in population density, each of the four quadrants of the Maya realm probably controlled a comparable number of persons. So strong was the cognized model that, despite the rise and fall of individual centers, there seem always to have been four capitals, each associated with a direction and, presumably, with a color.

There is still a great deal to learn about the social, political, and territorial organization of the lowland Maya, and parts of the picture presented here need far more data for their confirmation. What seems likely is that the Maya had an overall quadripartite organization (rather than a core and buffer zone) and that within each quadrant there was at least a five-tiered administrative hierarchy of capital, secondary center, tertiary center, village, and hamlet. Perhaps most significant, there was no real conflict between the lattice-like network predicted by locational analysis and the cosmological four-part structure predicted by epigraphy and ethnology. (p. 915)

MGM-007 [GEOMETRIC RELATIONSHIPS OF BRITISH MEGALITHIC SITES]

Anonymous; Nature, 72:16, May 4, 1905.

In one of his recent articles on Stonehenge (vol. lxxi, p. 391, February 23) Sir Norman Lockyer referred to the interesting fact, pointed out to him by Colonel Johnston, director of the Ordnance Survey, that the solstitial line in 1680 B. C. passes through not only the present centre of Stonehenge, but also through Sidbury Hill to the northeast, and the earthworks at Grovely Castle and Castle Ditches to the south-west. This continuation of the solstitial line from Stonehenge to other ancient structures is of great interest; but an even more remarkable relation found by Colonel Johnston is that Stonehenge, Old Sarum, and Grovely Castle occupy the points of an equilateral triangle each side of which is exactly six miles in length. A very definite connection is thus shown to exist between the various primitive works in the neighbourhood of Stonehenge. We notice that Mr. J. H. Spencer describes these relationships in an article in the April number of the Antiquary, but he does not mention that the credit of the discovery of the connecting lines between the various monuments belongs to Colonel Johnston.

Nowadays linear relationships of megalithic sites are called "leys." For other geometrical arrangements of sites, see MGM-006.

MGP-001 ANCIENT ROCK INSCRIPTIONS IN EASTERN DAKOTA

Lewis, T. H.; American Naturalist, 20:423-424, 1886.

On the celebrated map of I. N. Nicollet, of the "Hydrographical basin of the Upper Mississippi river," published by the U. S. Government in 1845, appear, for the first time, two strange names in Eastern Dakota, not far from the sources of the Minnesota river. The first is Wakiyan Hurpi (or thunder's---not lightning's---nest), placed about thirteen miles north-west of the foot of Lake Travers; and the other is Wakiyan Oye, a few miles west of the head of the same lake. The route followed by Nicollet, however, did not pass by either place, so he must have put them down from the general description of his guides, as he makes no mention of them in his text. It is of the latter locality, well known by its translated equivalent of "Thunder Bird's Track"---on account of the incised rocks there---that this article treats; together with another rock of like kind in the neighborhood.

In the month of August 1883, I was engaged in the survey of the sepulchral tumuli, forts and other earth-works of Big Stone and Travers lakes, and thus being brought into the vicinity of the rocks in question, took the opportunity afforded of making careful tracings of the pictographs they showed, considering them of much archaeological interest. These tracings have been reduced by pantograph to one-eighth the size of the originals, and drawings thus made from them accompany this short account of the "track rocks."

The first diagram shows the pictographs constituting "Thunder Bird's Track," as they are engraved on an irregular shaped rock located some six miles west and a little north of the village of Brown's Valley, Minnesota, and within the limits of the Sisseton and Wahpeton reservation of Dakota Territory. The rock lies on the summit of a hill which commands a good view of the country, though there are other hills in the vicinity which have a greater altitude. It is about three and a half feet in diameter, and the characters are grooved in its surface to about one-fourth of an inch in depth. The grooves are, for the most part, very smooth. It will be seen, however, that these figures do not make very good bird-tracks, and I think that they more probably represent human hands. For convenience of reference the separate characters are numbered on the diagram, and may be thus described.

1 and 2. Represent hands placed in different positions.

3. Shows two hands in combination.

4. Is of a nondescript shape.

5 and 6. Are undoubtedly meant for hands, as their outlines can be imitated in shadow on the wall by placing one's own hands in the proper positions.

7. Is another nondescript, though a portion of it represents a hand.

The other rock is known as "Thunder Bird's Track's Brother"---that is, a brother to the "track"---and is situated about two miles east of his elder, on the slope of a terrace bordering the valley of the Minnesota river. As will be seen on comparison the diagrams illustrating the two rocks are entirely distinct from each other in respect to the shapes of the characters, and by no means bear out the close relationship between the localities implied by the names the Indians have given them.

The inscriptions on both rocks are apparently very ancient and it is extremely doubtful whether the present Indians or their immediate predecessors (the Cheyennes?) had anything to do with carving them.

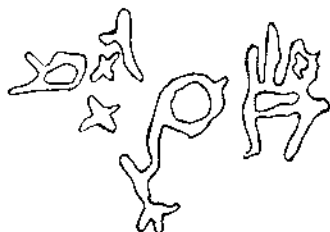
I made inquiry as to any traditions that might be current among the Dakota Indians on the reserve concerning these rocks and obtained certain mythological information now concisely stated.



Thunder Bird's Tracks.

Thunder Bird is said to have had his nest on a high mound which was composed of sticks and brush, and was situated some ten miles north-west of the foot of Lake Travers, in the center of a deep wide gorge. One day there was a great storm which flooded the whole country. Thunder Bird, in his anger at having been driven from his nest by the rising waters, flew away and alighted on this rock---Wakiyan Oye---which was the only place not covered by water, and left the impression of his feet there.

On subsequently looking for printed records of this tradition, the first account I could find of it was in the shape of a short poem from the pen of an Indian trader of 1823, W. J. Snelling (son of the military officer after whom Fort Snelling was named).



Thunder Bird's Tracks' Brother.

MGP-002 INCISED BOULDERS IN THE UPPER MINNESOTA VALLEY

Lewis, T. H.; American Naturalist, 21:639-642, 1887.

The unusual aspects of this article on petroglyphs are the Indians' explanation of their origin and the thunderbird reference.

There are other inscribed rocks in the same region besides those of the Thunder Bird's Track described in the American Naturalist for May, 1886, which, like them, should be preserved from oblivion. The accompanying diagrams and short verbal descriptions will account for three.

This boulder is in the edge of the public park, on the north end of the plateau at Brown's Valley, Minnesota. The plateau is about forty feet above the Minnesota River there. The boulder has a flat surface with a western exposure; is irregular in outline, and is about five feet eight inches in diameter, and firmly imbedded in the terrace.

Fig. 1 is the central figure, and undoubtedly represents a man, although the form is somewhat conventional.

Fig. 2 represents a bird.

Fig. 3 represents a tortoise.

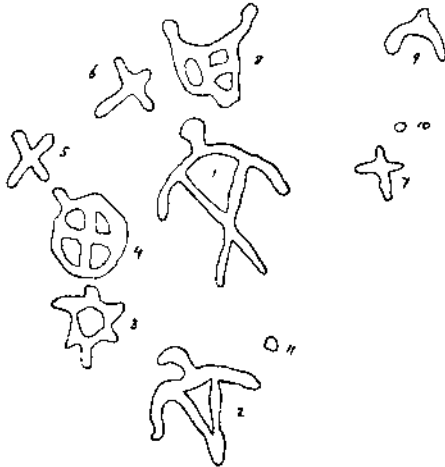
Fig. 4 is a cross and circle combined, but the circle has a groove extending out from it.

Figs. 5, 6, and 7, although somewhat in the shape of crosses, probably represent bird-tracks.

Figs. 8 and 9 are nondescript in character, although there must be some meaning attached to them.

Figs. 10 and 11 are small dots or cups cut into the boulder.

The figures as illustrated are one-eighth of their natural size, and are also correct in their relative positions one to the other. The work is neatly done, although the depth of the incisions is very slight. In 1883, when they were traced, the pictographs were very plain; but during my last visit to this region, in the summer of 1886, the moss was gradually encroaching upon them, and it will be only a matter of a few years before they are entirely covered up.



MGP-002 PICTOGRAPHS

The people of the place call this boulder "the Sacred Rock," and the plateau is also called "Sacred;" but the name has no significance as regards the markings, for two lovers named the boulder without knowing that there were any pictographs upon it.

Strange as it may seem, the Indians of this region have no tradition connected with this boulder, and, in fact, did not know of the existence of the inscriptions until after their discovery by the whites, although the plateau was for many years a general rendezvous for them as a sporting-ground.

As a matter of incidental antiquarian interest here, it may be stated that twelve hundred feet to the eastward of this rock or boulder was situated an ancient enclosure or fort of the mound-builders, of about four acres, with a customary outlying mound near by. One is hardly justified, however, in speculating much on possible relationship between these two interesting classes of relics of the very old times.

This boulder is on a high terrace on the west side of the Minnesota River, one and a half miles south of Brown's Valley, and is in Roberts County, Dak. It is oblong in form, being three and a half feet in length, two feet in width, and is firmly imbedded in the ground.

Figs. 1 and 2 are undoubtedly tortoises.

Fig. 3 is probably intended to represent a bird-track.

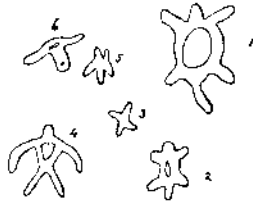


Fig. 4 represents a man, and is similar to the one at Brown's Valley.

Fig. 5 is a nondescript of unusual form.

Fig. 6 is apparently intended to represent a headless bird: in that respect greatly resembling certain earthen effigies in the regions to the southeast.

The figures are about one-fourth of an inch in depth, and very smooth, excepting along their edges, which roughness is caused by a slight unevenness of the surface of the boulder.

This boulder is only a short distance from one previously described as "Thunder Bird's Track's Brother," some four miles northwest of Brown's Valley, and, like No. 2, is in Roberts County, Dak.

The figures here represented are roughly pecked into the stone, and were never finished; for the grooves that form the pictographs on other boulders in this region have been rubbed until they are perfectly smooth. The face of the boulder upon which these occur is about two feet long and one and a half feet in width.

There is a Dakota tradition relating to these incised boulders about as follows:

In olden times there used to be an object that marked the boulders at night. It could be seen, but its exact shape was indistinct. It would work, making sounds like hammering, and occasionally emit a light similar to that of a fire-fly. After finishing its work it would give one hearty laugh, like a woman laughing, and then disappear. The next morning the Indians would find another pictured boulder in the vicinity where the object had been seen the night previous.

The above is only given to show how the Indians account for these incised boulders.

MGP-003 CARS OF THE GODS

Anonymous; Nature, 130:404, September 10, 1932.

The ceremonial car in prehistoric times and its modern survivals are fully illustrated and studied by Dr. R. Forrer in Prehistoire, No. 1. In tracing its various forms and analogies, the author propounds a new theory of the origin of the wheeled cart. According to his view, it was derived from the conceptions of the character and qualities of the sun held by man at the beginning of the age of metal. The sun was then regarded as a revolving disc, which was imitated for magical purposes by a wheel or disc. This wheel was made to revolve first by being thrown in the air, then by being attached to a forked stick, which was used to wheel it about. From this developed the two, three, and four or six-wheeled vehicle, which was used for religious processions and was afterwards put to secular uses. The theory is supported by illustrative examples drawn from rock-paintings, grave furniture, vase paintings, and other material. In the course of time, the solar car of the spring festival was associated with models or miniatures. The occupants of the sacred car take various forms, not only that of deities, but also of symbols, such as the sacred pillar, which appears in an early cuneiform inscription from Boghazkeui, or a sacred bird or animal. There are examples in which the car bears a cauldron, which served as both a fertility and a rain charm. These developments appear in the Bronze Age, and by the Iron Age had spread all over Europe and even beyond. By the Hallstadt period, the ceremonial car was gradually disappearing in Europe, no doubt owing to the spread of other religious ideas. It would appear that it was the car rather than the deity that brought benefit to mankind, and it is the important element in the rite. As, however, the idea of anthropomorphism developed, the divinity assumed first place. The importance of the car wanes, while its secular uses extend.

One cannot avoid relating these "cars" to UFOs and Chariots of the Gods.

MGP-004 [WINGED CREATURES PAINTED ON POT]

Anonymous; Nature, 100:329, December 27, 1917.

In the December issue of Man Mr. A. C. Breton describes, with a photograph, a curious scene from a painted pot found in a mound in British Honduras, and now in the Liverpool Museum. It represents a group of strange winged creatures which appear to be dancing and singing for joy at the coming of vegetation, represented by a seedling in the corner. The humming-bird was the special messenger of the sun to awake and encourage vegetation, and appears prominently in this group. It would seem a natural result of watching the migrating birds in spring that man should endeavour to imitate them in his ceremonial dances. Similar dances have been noticed in Queen Charlotte Islands, and the gestures of the creatures on this pot may be compared with those on British Columbian totem poles.

MGP-005 PICTOGRAPHS

MGP-005 THE NAGA OR HOODED SNAKE IN AMERICA

Anonymous; American Antiquarian, 11:121, 1889.

The question whether there are any evidences of contact with Asiatic countries among the archaeological relics of this continent has been discussed more or less for a long time, but is not yet settled. Various relics, such as jade, chalchihuatls, also idols or images, some of which resemble the image of Buddha, in a sitting posture; also symbols, especially the symbol of the tau and the inverted comma found on the breast of Quetzalcoatl are cited in favor of this supposition. Perhaps the most interesting relic is one which is described by Charnay in the Ancient Cities of America. This consists of a large vase which has moulded on the outside the image of Tlaloc, with the large circle about the eyes and the large teeth below the mouth, and with the thunderbolt held in his uplifted hand. Above this image, near the rim of the vase, and in face forming a handle to it, is a figure which resembles the "Naga," or hooded snake. This consists of four snakes finished in the round, standing with head erect, neck curved back, heads united. This differs from the "Naga" in that there are four necks or bodies and only one head, while the East India Naga has five heads and only one body.

The Naga item above is typical of the evidence used by "diffusionists" to prove cultural interchange between groups of people that conventional wisdom insists are too far apart or separated by difficult geographical barriers.

MGP-006 [ANCIENT AMERICANS KNEW ABOUT THE MAMMOTH AND MASTADON]

Anonymous; Nature, 43:63, November 20, 1890.

Prof. F. W. Putnam lately brought under the notice of the Boston Society of Natural History some fresh evidence of the fact that man was in America contemporaneous with the mastodon and mammoth. This evidence is afforded by a rude figure unquestionably representing a mammoth, scratched on a portion of a Busycon shell found under peat in Clairmont County, Delaware. Around the shell were human bones, charcoal, bones of animals, and stone implements.

MGP-007 [ELEPHANT DRAWINGS IN PRECOLUMBIAN AMERICA]

Anonymous; Nature, 119:132-133, January 22, 1927.

Prof. G. Elliot Smith has announced in the Times of Jan. 14 an interesting discovery which he says "should settle once and for all the century-old controversy regarding the identification of certain elephant-like creatures represented . . . in Mexico, Central America, and elsewhere in the New World." Mr. J. Eric Thompson has just discovered in the Ayer Collection of the Newberry Library in Chicago unpublished water-colour sketches made more than ninety years ago by M. Frederic de Waldeck, a French artist, of four bas-reliefs in stucco found by himself on the floor of a subterranean room in the palace at Palenque, and also a drawing of a part of the wall in the same room. The

drawings on the first of the stucco slabs show two elephant's heads drawn in a floral design which is said to be suggestive of motives of the Chinese T'ang period; the second shows anthropomorphised heads "of characteristic Maya style"; the third, a conventionalised tapir; and the fourth, an egg and *Haliothis* shell. The design on the sculptured wall represents an elephant's head, front face with open mouth, on a serpent's body, with a conventionalised macaw and tapir heraldically grouped on each side. Prof. Elliot Smith also publishes a photograph of a crudely modelled elephant from San Salvador and two views of a painted vase discovered in 1916 at Yalloch, Guatemala, the design on which is considered by Dr. Gann, the discoverer, to represent the long-nosed god B (the feathered serpent Cuculcan, the Aztec god Quetzalcoatl), but which Prof. Elliot Smith holds to represent the elephant in the conventionalised style of Java and Eastern Asia.

As readers of *Nature* are aware, Prof. Elliot Smith, reasoning as a zoologist, has argued ably that certain Maya sculptures represent the Indian elephant; but is it possible in so highly conventionalised an art as that of the Maya to make any attribution at all with certainty? The varied interpretations---tortoise, tapir, macaw, and the like---which provoke Prof. Elliot Smith's amusement, are evidence of the ambiguity of the design rather than of the perversity of the attempts at interpretation. The Waldeck drawings would place the matter beyond question if they could be accepted as accurate. Prof. Elliot Smith quotes vindications of Waldeck's trustworthiness, which had been impugned; but the drawings themselves show the influence of the pseudo-classical Empire style of the French art of Waldeck's day rather than the true spirit of Maya art. It is admitted that Waldeck had a penchant for restoration. In the circumstances, it is perhaps not too much to say that a stylised reproduction of a subject already highly conventionalised needs careful verification by experts before it can be accepted as evidence beyond question.

MGP-008 SCOTTISH ELEPHANT DESIGNS

Mann, Ludovic M., and Smith, G. Eliot; *Nature*, 96:703, February 24, 1916.

Prof. G. Elliot Smith has referred in *Nature* of January 27 to the "conventionalised drawings of the elephant in . . . Scotland," and has been helped by these designs in his building up of an important theory. But, alas! these Scottish drawings are not of elephants.

I have gone most carefully into every known specimen, whole or fragmentary, of these so-called "elephants," for the purpose of attempting an elucidation and reading of the corpus of Pictish symbolism. They are invariably accompanied by other Pictish symbols. From consideration of their positions in series, their varying dimensions, the angles at which they lie, and other factors, I believe I have been able to arrive at a correct solution of the problem of their meaning. I am sure that they never had anything to do with elephants. But whether my solution is right or not, I merely here desire to point out that a close study of the drawings reveals that the supposed trunk consists of two elongated jaws. The other parts of the anatomy are likewise quite non-elephantine in character.

The fancied resemblance of these very early Christian sculpturings to elephant figures was first promulgated some forty years ago by a writer familiar with Indian mythology, who attempted to connect up Scottish with Indian inscriptions and designs. The attempt, however, was speedily abandoned. (Ludovic MacLellan Mann)

Mr. Mann's letter serves as a reminder that the discussion of the significance of the Scotch pictures of the elephant has followed a course remarkably analogous to that which has been waged for a century around the American representations of the elephant.

In both cases all the early scholars, as well as those of our contemporaries who do not claim to have a special ethnological insight, are satisfied to regard them as pictures of elephants; but the ingenuity of modern pundits insists on interpreting these sculptures in some more recondite way. In America the ethnologists are not sure whether the creature depicted was a tapir, a tortoise, or a macaw. In Scotland and Scandinavia the dispute around the elephant is maintained by scholars who are wrangling as to whether it is a walrus, a sun-bear, or a lion-rampant! (For the literature the reader should consult Haddon's "Evolution in Art," p. 194; the Earl of Southesk's "Origin of Pictish Symbolism," 1893; and Hildebrand's "Industrial Arts of Scandinavia," 1882.) Your correspondent tells us he has "been able to arrive at a correct solution of the problem," but with singular modesty he declines to tell us what it is.

In 1856 and 1867 the Spalding Club published two magnificent volumes dealing with "The Sculptured Stones of Scotland," in which the learned editor, Mr. John Stuart, brought his wide knowledge and common sense to bear upon the problems raised by the pictures of the elephant, and, I believe, settled the question for all time. He had no doubt whatever that the animal depicted was the Indian elephant, the knowledge of which "was brought into Europe by the Greeks after the Indian expeditions of Alexander the Great" (vol. ii., pp. xi. and xii.).

"The elephant of the Scotch stones cannot be regarded as a likeness but rather as a conventional representation of the animal, and the unvarying adherence to one form would suggest that the sculptors were unacquainted with the original and were not working from a traditional description . . . but rather were copying a figure with defined form" (p. xii). He adds further that the ornamental scrolls found on the elephant were not found on any other beast. These scrolls were derived from the Indian sea-elephant type of "makara."

Mr. Mann's remark that "the fancied resemblance of these . . . sculpturings to elephant figures was first promulgated some forty years ago by a writer familiar with Indian mythology," presumably refers to Col. Forbes Leslie, who, on the first page of his book on "The Early Races of Scotland," states that Mr. John Stuart's work "has been taken as the basis of the present work."

I presume, therefore, that Mr. Mann is not acquainted with the real evidence upon which my case is established.

There is, of course, a very considerable mass of other literature relating to these elephants, both serious argument and modern speculation; but the only other item that I need refer to now is an episode in one of the Norse fairy tales, as translated by Sir George Dasent, of "an old hag drawing water out of a well with her nose, so long was it."

One might make the same remark about this story as Mr. (now Sir) Edward Tylor made in reference to the American legend of the "great elk," told by Father Charlevoix ("History of New France," 1744, vol. v., p. 187): "it is hard to imagine that anything but the actual sight of a live elephant could have given rise to this tradition" ("Early History of Mankind"). (G. Elliot Smith.)

MGS-008 CUPS AND CIRCLES

Rau, Charles. Nature, 26:126-129, June 8, 1882.

An important addition to the literature of "Cups and Circles" and Cup-marked Stones, has just been issued as part of the fifth volume of "Contributions to North American Ethnology," printed by the Department of the Interior in their series of the publications of the U. S. Geographical and Geological Survey of the Rocky Mountain Region. The literature of the subject as regards the Old World is already extensive, and the object of Mr. Rau's work is to collect and systematise the existing information regarding the "cup and ring cuttings" that have been observed on rocks and boulders in Europe and India, and to add to this systematised knowledge an account of those that are now known in America.

The first monograph on these archaic forms of sculpturings on rocks and stones was that of A. E. Holmberg, on the Lapidary Sculpturings of Scandinavia ("Skandinavian's Hailristningar," Stockholm, 1848), but though copiously illustrated, it remained in a great measure a sealed book, from its being written in Swedish; and it was not all the publication of Mr. Tate's memoir on "The Ancient British Sculptured Rocks of Northumberland and the Eastern Border" (Alnwick, 1865); the exhaustive essay on the same subject by the late Prof. Sir James Y. Stimpson, entitled "Archaic Sculpturings of Cups, Circles, &c., upon Stones and Rocks in Scotland, England, and other Countries" (Edinburgh, 1867); and the larger work, prepared under the direction of the late Algernon Duke of Northumberland, entitled "Incised Markings on Stone found in the County of Northumberland, Argyle, and other Places, from Drawings made in the Years 1863 and 1864" (London, 1869) that the attention of archaeologists generally was awakened to the subject. Since that time a host of enthusiastic observers has arisen over Europe, and innumerable examples of "cups and circles" have been discovered and described. It is difficult to account for the fascination that allures men to the study and pursuit of these "pitted stones." They are neither beautiful, nor intrinsically valuable. They are often earth-fast boulders, too large for transport, and unsuitable for "collections." But there is an element of mystery about them, and the mysterious is often more attractive than the beautiful or the useful. They pique the curiosity of the ordinary observer by the obvious suggestion that they have a story to tell if they could be made to speak; and they whet the ardour of the scientific investigator by the equally obvious suggestions that they are the products of a definite human purpose, which may be discoverable from an examination and comparison of their special characteristics. Probably no series of archaeological remains has been more carefully examined, more minutely described, or more copiously illustrated, and if the accumulation of such a mass of detailed information regarding their typical forms and characteristics over wide areas should ultimately fail in determining the nature of the purpose or purposes for which they were produced it cannot fail to add largely to the extent and precision of our knowledge of an essentially obscure subject.

It is certainly a matter of great interest, whatever may prove to be its general significance, that "cup-stones" and "pitted stones," which are in many cases analogous to those in the Eastern Hemisphere, are found in the United States and other parts of the Western Continent. Perhaps the most remarkable of those found in the United States is one at Ironton, in Lawrence County, Ohio, which was first brought to the notice of European archaeologists by Prof. Daniel Wilson, in the Proceedings of the Society of Antiquaries of Scotland for June, 1875. It is a boulder of grey sandstone 3 feet long, 2 feet 7 inches

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wide, and a foot and a half high, weighing between 1000 and 1200 pounds. The surface of the stone is pitted all over by about 116 cups, whose average diameter is 1-1/2 inches and their depth about 1/2 inch, and on one side of the block there are several grooves 4 or 5 inches long, shallow and circularly hollowed in the bottom, so that "a cylindrical stone applied in the direction of its length would have produced the grooves, and its end by rotation the cup-shaped cavities." Another cupped boulder of granite occurs at Niantic, in New London County, Connecticut. It has only six cups, varying from about 2 inches to 3-1/2 inches diameter, and from 1/4 inch to almost 1 inch in depth. Mr. Rau does not notice a still more remarkable boulder of granite in Forsyth County, Georgia, 9 feet long, 4-1/2 feet high, and 3 feet wide, of which Prof. Wilson has given a figure. Along one side of the boulder is a row or cups, eighteen in number, connected by an incised line or gutter, while the face of the boulder is covered with markings of single or double concentric circles, surrounding small cups in the centre. In some cases two of these circles are connected by a straight gutter. Two very large boulders on the bank of the Ohio, a few miles below Manchester, in Adams County, have been seen by Dr. Hill, but are not more precisely described than that they are of sandstone, the one having twenty-nine and the other thirty-seven cups. A large cupped boulder at Orizaba, in Mexico, has been figured in Lord Kingsborough's "Mexican Antiquities." Two boulders of sandstone in an old Indian town in Santa Barbara County, California, are covered with conical-shaped excavations and cup-shaped depressions. The largest is 25 feet long and 10 feet wide, and shows twenty-five excavations from 6 inches to 26 inches diameter at the surface, and 5 to 16 inches deep. In one instance a groove is cut between two of the basins.

"Cup-stones" or "pitted stones" of small size are also frequently found in the United States. The first of these that has been noticed as obtained from the Indian Mounds in Ohio, was described and figured in "The Ancient Mounds of the Mississippi Valley," by Squier and Davis (Washington, 1848), and is now in the Blackmore Museum, Salisbury. It is a small block of sandstone, 6 inches by 8 inches, weighing between thirty and forty pounds, and presenting on its surface three detached cups---two confluent, one half-finished, and several which are apparently just commenced. They are slightly oval in shape, about 1-1/2 inches in greatest diameter, and seven-eighths of an inch in depth. Still smaller stones, often water-rolled greywacke pebbles, with one or more cup-shaped indentations on their flattish sides are extremely common. The cavities are rough and irregular, and the explanation given of their purpose is that they were probably used by the Indians for cracking hickory nuts. Another variety of "cup-stone" with regularly rounded and well-smoothed cups is regarded as paint-mortars. But while some of the larger boulders with basin-like cavities, such as those from Santa Barbara County, California, may have been used as mortars for tritulating grain, it is obvious that such an explanation cannot apply to the boulders with smaller cups, or to those cases in which the cups are hollowed in the perpendicular surfaces of stone and rocks.

Such cups, often surrounded by concentric rings, or by broken rings with a gutter passing from the central cup outwards through the part where the rings are interrupted, are found abundantly in the British Islands, and in France, Switzerland, Germany, and Scandinavia. They are sculptured on rocks, boulders, on monolithic and on megalithic monuments, on the stones of dolmens and cists, and on stones built into the walls of underground dwellings. Thus they occur in close connection with the habitations and the graves of prehistoric man in central and north-western Europe. In a few cases in Scandinavia they occur on sepulchral structures that are assigned to the Stone Age, but their associations, so far as these are determinable, are chiefly with the Bronze Age. In

Britain, and especially in Scotland, their associations are largely with the Iron Age, and the Age of Bronze; but few, if any well-authenticated instances of their occurrence in association with the typical objects of the Age of Stone are upon record. On the other hand small, portable cupped stones have been found in cists and grave-mounds which are attributed to the Stone and Bronze Ages, both in Great Britain and Ireland. In Brittany the large stones of the dolmens are frequently sculptured with a variety of rude figures, among which cups and circles not unfrequently occur.

Perhaps the most remarkable examples in Scotland are the rock-sculptures at Achabreac in Argyleshire, described and figured in Prof. Simpson's work, and a rock-surface on the shore of Loch Tay, recently described by Mr. J. Romilly Allen. Prof. Simpson described nearly a hundred examples of rock and stone surfaces thus sculptured, but this number has been more than doubled during the last year by two observers, Mr. William Jolly and Mr. Romilly Allen, the former working in the northern, and the latter in the central, districts of Scotland. In England the most curious examples are those on the moor at Ilkley, in Yorkshire, described in the *Journal* of the British Archaeological Association (1879), by Mr. Romilly Allen. In Ireland the most striking groups are those on the stones of the great chambered cairn at New Grange, in the valley of the Boyne, and those associated with the remarkable cairns in the Lough Crew Hills, described by the late Eugene Conwell.

Many theories have been advanced with reference to the presumable purpose of such "cups and circles." It has been suggested that their purpose was useful, that it was ornamental, that it was commemorative, and that it was religious. The utilitarian theory is disposed of by their position in situations where use of any kind is almost impossible. The ornamental theory is negatived by the fact that they occur so often in situations in which they cannot be seen, as for instance on the under sides of cist-covers. The commemorative theory admits of much being said in its favour, but fails to suit all the circumstances of the case. The theory that they fulfilled some purpose in relation to the religious observances of prehistoric man is perhaps the most plausible that has yet been suggested, and has the following arguments in its favour.

If this early system of sculpturing these enigmatic markings on rocks and stones originally had reference to a common idea connected with the religious observances of prehistoric times, the existence of some traces of this connection might reasonably be looked for in the superstitions of the area in which it was formerly prevalent. This, in point of fact, is found to be the case. In many parts of Sweden, these cup-marked boulders are known as *elf-stenar*, and are still believed by the common people to possess curative powers. They say prayers, and make vows at them, anoint the cups with fat (usually hog's lard), place offerings of pins and small copper coins in them, and when they are sick, they make small dolls or images of rags, to be laid in them. These facts are stated in the *Manadsblad* of the Swedish Academy of Science. Miss Mestorf, as quoted by Mr. Rau, is more explicit:-

"The elfs are the souls of the dead; they frequently dwell in or below stones, and stand in various relations to the living. If their quiet is disturbed, or their dwelling-place desecrated, or if due respect is not paid to them, they will revenge themselves by afflicting the perpetrators with diseases or other misfortunes. For this reason, people take care to secure the favour of the 'little ones' by sacrifices, or to pacify them when offended. Their claims are very modest: a little butter or grease, a copper coin, a flower, or ribbon, will satisfy them. If they have inflicted disease, some object worn by the sick person, such as a pin, or button, will reconcile them. A Swedish proprietor of an estate in Uppland, who had caused an elf-stone to be transported to his park, found, a few days afterwards, small sacrificial gifts lying in the cups. In the

Stockholm Museum are preserved rag dolls, which had been found upon an elf-stone."

These superstitious practices are connected with actual cup-stones of prehistoric times, but there are others, for the practice of which cups have been made in modern times. In the Proceedings of the Berlin Anthropological Society, for June, 1875, Dr. Veckenstedt called attention to the existence of cup-markings on the walls of the church of Cottbus, in Brandenburg. Since then, they have been discovered on the walls of churches in more than twenty different localities in Prussia, and also in Germany and Switzerland, and even in Sweden. They are usually on the southern side of the churches, near an entrance, and not beyond the height of a man's arm. According to some accounts, in Germany at least, the cups were believed to possess healing virtues, chiefly for charming away fevers, and in some instances these modern cups in the church walls have been anointed with grease, like the cups in the prehistoric elf-stenar of Sweden. In Posen a tradition refers to the cups on the church-walls as the work of damned souls who ground them out in the night-time.

The existence of this superstitious veneration for prehistoric cup-stones, and the continuance of the custom of forming cups (on the walls of Christian churches) for curative purposes, pre-supposes the religious character of the original system of which these twin superstitions are apparently direct survivals. No evidence exists within the area occupied by the prehistoric cup-stones of Europe by which the precise form of the natural religion with which they were connected can be determined. But a religion exists in whose observances cups and circles are still made on rocks and stones. It does not exist in Europe, and there is no direct evidence that it ever existed within the European area, but it exists in the area which was the home of the Aryan race.

In the district of Nagpur, in India, Mr. Rivett-Carnac found a group of grave-mounds surrounded by stone-circles. The mounds contained burials after cremation, accompanied by urns and implements of iron. The circles round the mound are from 20 to 36 feet in diameter, are mostly formed of trap-boulders, but each circle has a few stones larger and more regularly-shaped than the rest, and on these stones he found sculpturings of cups and circles, which he recognises as analogous to the cups and circles of the European area. He has also found in Kumaon, close to the temple of Chandeshwar, a rock-surface, on which, in a space 14 feet by 12 he counted more than 200 cups, varying from an inch and a half to six inches diameter, and from half an inch to an inch in depth. These cups are occasionally surrounded by rings and connected by grooves, but the usual form is that of a simple cup. All these markings, whether on the rocks or on the stones of sepulchral circles, are old, so old that the natives attribute them to the giants. But in the temple itself the conventional symbols of Siva, as Mahadeva (The Generator), were in some cases represented by rough slabs with a cup and circle, or concentric circles with a radiating gutter rudely incised. The resemblance of these symbols to the European cup and ring cuttings is not so close as their resemblance to some of the sculpturings on Bald Friar Rock, on the Lower Susquehanna in Maryland. Mere resemblance of form, however important it may be in a tentative classification of things whose relations are unknown, is quite insufficient if not irrelevant as evidence of identity of purpose or significance. Symbols that are absolutely similar in form may have had widely different meanings and applications in different places, at different times. Mr. Rau observes that no one who has examined Mr. Rivett-Carnac's papers in the Journal of the Asiatic Society of Bengal (1879) can help admitting the striking resemblance between the cup and ring cuttings of India and Great Britain; and he is probably right in his inference that the close connection between cups and rings implies that both belong to one system of primitive sculpture, the single cup being merely the simpler form.

The argument in favour of both forms being symbols of the *cultus* of the reciprocal principles of nature rests solely on the ground of a similarity of form which does not amount to identity. Even though an absolute identity had been established between the ancient and modern sculpturings, their identity of significance would still remain to be proved.

It appears from this extended survey of the phenomena of cup and ring cuttings on rocks and boulders that more progress towards the elucidation of the subject is to be made by the study of their differences and diversities than by the mere observation of general similarities of form and circumstances. It seems probable that there are some, such as the portable varieties, which had a utilitarian purpose. It is not improbable that others of larger size on boulders, such as the block under the entrance to the tumulus of New Grange, may have been merely ornamental; and there are considerations which forbid the absolute exclusion of the supposition that others may have been commemorative, or in some sense possessed of a religious connection and significance. But none of these conclusions can be reached by mere force of argument. If the problem is ever to be solved, its solution will be reached by research, by comparison of the phenomena of different areas, and investigation of the inferences deducible from them. With regard to the American forms, Mr. Rau observes that as the cups on the Cincinnati boulder are perfectly similar to those on many stones in the Old World, it is probable that they owe their origin to the same motives. If these motives arose from some religious conception, we might feel inclined to trace the origin of American cup-cutting to Asia. But if, on the other hand, the cups were designed for a practical purpose, the custom of excavating them may have sprung up in America, as well as elsewhere.

MGS-009 STARS IN ROCK

Anonymous; *Nature*, 232:148, July 16, 1971.

Ancient rock carvings in Armenia (dating from 8000-1000 B. C.) are reported to have revealed a considerable degree of astronomical knowledge in their makers. The carvings, which have been found at various sites in the Armenian highlands, indicate that the then inhabitants of the region divided the year into twelve parts, revealing a fairly good understanding of the length of the year and of the lunar month.

The most detailed astronomical carving is one in the Martuni region of the Sevkar foothills. Here the carving is exceptionally deep and a great deal of detail is preserved. It shows, on the left, the three bright stars of *Cygnus* in a line, with the sizes of the stars roughly proportional to their apparent brightness. Beside them is a pictogram of two men holding a serpent above their heads. This, says Dr. B. Tumanyan, Director of the Observatory of the State University of Erevan, indicates the great antiquity of the constellation name of the Serpent-Bearer (*Ophiucus*).

In the top left hand corner of the picture, there are numerous dots and crosses representing the stars of *Delphinus* and the part of the Milky Way between *Aquila*, *Delphinus* and *Sagitta*. At the top there are pictograms of a sword, a shield and two crosses and a triangle, in the section where *Cygnus*, *Lyra* and *Vulpecula* should lie. The layout makes it quite clear that the pictograms represent the stars of this area, and thus indicate very primitive groupings and names for these stars.

According to Dr. Tumanyan, detailed study of the carving suggests that it dates from c. 3000 B. C.

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MGS-010 WERE THE DRUIDS IN AMERICA?

Anonymous; American Antiquarian, 12:294-302, 1890.

The study of symbolism in America always brings up a great many enquiries, but none more interesting than one which has relation to a contact with Europe in prehistoric times. This is, to be sure, a point which is constantly arising in connection with all departments of archaeology, but in this connection it is especially suggestive. We therefore propose to speak of the phallic symbol as it is found in this country, especially among the Mound-builders, and to see if this does not prove a pre-Columbian contact with other countries. We shall not, however, confine ourselves to this one symbol, but shall take it in its combination with other symbols, such as the symbol of fire, of the sun, of the serpent, and other nature powers.

The description of the dolmens and menhirs of Western Europe, which was given a year or two ago by Mr. Thomas Wilson, and now again by Prof. A. S. Packard, has brought up the subject afresh. The same is also the result of reading about the remarkable find on the Illinois River. The question is how came the custom of making offerings to fire and water, and other customs in America? Shall we say that the Druids were here during pre-Columbian times, or shall we go farther back and ascribe them to an Asiatic source?

1. We begin with the cup stones or perforated symbols. It forms one of the standing problems for American archaeologists how to account for these. These cavities have been studied by various parties and have been found in many and widely separated countries. It is because of this extensive distribution that they have been regarded as important. The argument is that the prevalence of them in America proves European contact in prehistoric times. The argument is a good one, provided we assign to the cavities a sacred character, and recognize them as the symbols of a widespread faith. This is, however, the point. We imagine that if they were not so widely distributed the thought of their symbol character would never have arisen. The shape of the holes suggests a very simple cause, nothing more nor less than the nut-cracking, which was a natural thing for the natives of this country. The discovery of so many boulders and slabs, filled with these cavities, in Southern Ohio, which is a forest region abounding with all kinds of nuts, naturally suggests that this was the source of the cavities. Perhaps we should say that the question is a faux pas. It suggests a mystery when no mystery exists. Still, as various authors have written upon the subject and European archaeologists, as well as American, have regarded them as symbolic, we take up the subject in all candor. It is noticeable that the matter-of-fact and careful Dr. Charles Rau thought it worth his while to write a book about them, and to recount all the places where such holes have ever been seen. From this book we learn that they are scattered over the continent of America, being very common in the Mound-builders' territory. A few specimens are found in the region of the Pueblos and on the rocks of California, and one specimen has been discovered near Orizaba, Mexico. They are also numerous in France, Brittany, Ireland, Switzerland, Saxony, Sweden, Scandinavia, though in these latter countries they are attended with rings and loops and various grooves and channels, as if a special use had been made of them and strange superstitions had been associated with them, making them sacred symbols. We learn, too, that the same works are numerous in India, and that in that country, where everything seems to have a symbolic character, they are regarded with peculiar veneration, and that even phallic worship has been associated with them and the symbol of the Mahedeo is always recognized in them.

Now the point which we make is this, if we must associate so great a significance with so simple an object as a cavity, which seems to have been used for nut-cracking, then we shall conclude that the evidences of contact with older countries during prehistoric times are very common. We can imagine the practice to have prevailed among a rude people of making a very common thing to seem uncommon. The very tools and weapons and ornaments which they had might become the embodiment of strange superstitions, and even feathers and sticks might be expressive. Perhaps there was the addition of a myth or of a transmitted custom, and this would account for the unusual shapes and combinations by which these cavities are sometimes characterized. Still there are figures on the Black Friar's Rock, in Pennsylvania which resemble serpents, the eyes being cup cavities or perforations, the heads only being visible. In these heads we recognize the jew's-harp pattern, and so we have in America, as in India, not only serpent worship but possibly the phallic symbol, with all of its conventionalities. We are not disposed to minimize the significance of these symbols, and yet we should make a distinction between a practical and a symbolic use.

We find that the symbols are quite widely distributed in America, as widely as they are in Europe, and are sometimes found connected with the cremation of the bodies of the dead, as they are in foreign lands, and are also associated with altar mounds. It is also noticeable that animal figures, human faces and forms, and sun symbols, as well as serpent heads, are associated with the perforated cavities. Dr. Charles Rau has referred to the bird symbol found in the San Pete Valley of Utah and the peculiar figures found among the rock paintings in Lake County, Oregon, and to the human and animal figures on the sculptured boulders in Arizona. These may all have been symbolic, and it is possible that a common symbolism has spread over this entire continent, either from the east or west, and that the connection may be traced even as far away as India. Still we think that a distinction should be drawn, and that the American symbols should be left to themselves until it can be proved that they were transmitted from other lands.

The positions of these cup works are, to be sure, sometimes significant, and the association with various pictures is suggestive. For instance, there is a picture of a Scandinavian boat which reminds us of the Norse sea-kings, and a picture of battle axes and pyramidal stele in the Kivik monument in Scania, Sweden. So there are many cup cavities in the roofs of dolmens in France, and Prof. A. S. Packard has declared that these must be symbolic. So there are peculiar figures resembling Runic letters on the Bald Friar's Rock in this country. There are remarkable coincidences also in the shapes of the rings surrounding the cavities which are found in Denmark and Sweden and in this country. Some would make them symbols of the sun, and would prove a contact with European nations or else a remarkable parallel development. Some would also consider the Dighton Rock as still more conclusive, but this rock Dr. Rau is especially skeptical about, taking the position that it was only fabricated by ordinary Indians. It seems to make a complication with our system if there are resemblances to Old World forms in America. Which shall we do? Shall we take the simple facts and be satisfied with these, or shall we assign a mysterious significance to them? We have seen these perforations on various stones, but have not recognized anything symbolic in either the shapes or locations or relative positions of the holes. At one time we discovered a small stone slab, burned and smoked, near the altar of the celebrated alligator effigy in Ohio, the proximity suggesting that it was once on the altar. This was perforated with a cup cavity, and may have been designed as a symbol. Still other stones, with similar cup-shaped cavities, are

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found in many places. We saw one on the banks of the Ohio at the steamboat landing at Maysville, Ky., a place which was not suggestive of anything sacred. We also at one time examined the great boulder which was taken from the bank of the Ohio near Ironton, and given by Dr. H. H. Hill to the Natural History Society of Cincinnati, and were told that there were one hundred and sixteen of these perforations on this single boulder. Similar stones have been found in Summit County, Ohio, at Portsmouth and Graveport, Ohio, and at various places in Pennsylvania and Tennessee, and the common impression is that they were used for nut-cracking.

The boulder at Cincinnati has certain grooves on its surface, four or five inches long, which have the appearance of being worn by continuous rubbing. But about these we enquire, in what respect do they differ from the marks made by arrow sharpening, which are so common throughout the country. Beauchamp has described such works as being common in New York and Gen. Thruston in his new book has spoken of others in Tennessee, and has given a cut representing the same, but they seem very simple things, and we do not see that any symbolism can possibly be made out of them.

Col. Charles Whittlesey thought that the perforations were made by spindles, and that they were evidences of the domestic art of spinning and weaving. Others have taken the ground that some of them were used for paint cups, especially as pestle and mortars have been found in New Mexico with the cup mark in the pestle. The explanation is that the paint, which had been ground, was placed in the cavity while the process of grinding other paint went on. How could symbolic significance come to such simple objects? We suggest the following: It is possible that the women, who so frequently have left the marks of their handiwork, may have used the cavities as signs, giving them the hidden significance which would be expressive of certain sexual desires. We are aware that the bird amulets and various other objects of personal decoration were symbols of maternity with the aborigines. The spool ornament was also made symbolic of some more spiritual desire, and the axe, especially when made of jade, was symbolic of the immortality of the soul, superstition requiring that bits of jade should be placed in the mouth of the dead.

It is the practice with the women in India to take water out of the Ganges and pour over the cavities and the channels surrounding them, as they have a superstition that maternity will be the result. Dr. Rau seems to think that phallic worship is represented in this way. The question is whether these cup marks in America are to be regarded in the same light. If they are, then we should say that they form only another link in the chain which connects this country with the far east, proving not only that serpent worship, but phallic worship and fire worship and sun worship were all connected and prevailed on this continent in prehistoric times.

II. This point has been impressed upon us by recent discoveries. We now refer to the discovery which we made in connection with the great serpent effigy near Quincy, Illinois. This serpent is a massive effigy, which conforms to the bluff throughout its entire length. Its folds are brought out very forcibly by four conical burial mounds located near the center of the ridge, midway between the head and tail of the serpent. The mounds contained many bodies, none of them remarkable except the one which was cremated at the base of the mound. This was a large body. It was lying on its back, and was partially burned. The bones, however, were preserved, and what was the most singular about the case, on the very center of the body, near the secret parts, a skeleton of a serpent was found coiled up, as if there was an intention to make it significant. The hands were folded over the body just below this skeleton. The body

had its feet to the east, and its face was turned upward, as if to look toward the sun. Thus we have in this cremation scene both the phallic symbolic and the serpent effigy, and we have at the same time some evidence of sun worship. But there was another feature still more remarkable. It was noticed that there were several bodies lying parallel with the central one, and that these bodies had been burned. The fire-bed was about twelve feet across, and contained the remains of at least four bodies, all of them partially burned, all of them cremated and apparently with the faces looking upward. There were also skeletons of snakes found with the bodies, though the position of the snakes was not closely observed. Now the point that we make is, if there was phallic worship at all, it was also attended with the eastern custom of suttee burning. We learn from the early explorers that at the south the fashion was to kill the slaves and wife of a chief when he died and to burn the bodies with the body of the chief. If this was the case among the southern tribes, it may also have been the fashion with this northern tribe. These, we think, are important facts. While everything in this Quincy find was very rude---no relics, no paved altar, no elaborate contrivance further than the effigy itself---still the cremation was remarkable. We acknowledge that there are many things in connection with all the Mound-builders' burials which are of purely native origin. Yet if the phallic symbol is to be seen in one case it is also in many, and, what is more, it is also almost always connected with the serpent symbol.

It is strange that here in America native superstition seized upon the most familiar objects, such as arrow-heads, spear-heads, leaf-shaped implements, pieces of mica, or even pebbles and round stones, and made of these altars which should be symbolic of sun worship; but it is stranger still that native superstition should at times give evidence of contact with the more advanced fashions and customs of countries which have long been historic and that the two systems of symbols should be so near to one another. The find at Virginia City, in Illinois, reminds us of similar deposits in Ohio. It was a simple altar or artificial heap formed out of leaf-shaped relics, the specimens all having come probably from Flint Ridge, but here were used as the resting place of the dead. There was, however, a mica crescent on the breast and copper spoils near the head and stone weapons near the hands. Everything about the find showed a very rude state of art, and yet showed a strange and conventional symbolism. The same is true also of the various altar and burial mounds of Ohio. Here in one place were altars composed of similar flint relics, chipped into leaf-shape, and deposited in two layers, one above the other, the entire heap having been used as a platform on which immense numbers of relics had been placed, but no other relics. In another place, at Mound City, mica plates are laid like scales, one against the other, the whole deposit having made a remarkable crescent, which might be supposed to have glistened with the silvery radiance of the moon. This crescent was situated at the bottom of the largest mound in the group found at Mound City, and was itself placed above a layer of clay, four layers above it composed of sand, the whole being very hard and compact. The mound itself was seventeen feet high and ninety feet in diameter, and overtopped all the rest. The symbolism consisted, however, in the crescent, which was nineteen feet across from horn to horn, the greatest width being about five feet.

Still the two altars---the one formed of leaf-shaped implements and the other containing the crescent---were very large, and it is supposed that both deposits were equally sacred among this mysterious people. In the Ohio mounds were other altars, on which many valuable relics had been placed. At the fort on the north fork of Paint Creek, where the leaf-shaped flints were placed, a large number of pipes had been offered, and among the pipes were some in the

shape of serpents, the very symbol of the Mahedeo being suggested by one of them. This coiled snake may indeed have been a mere mythologic object, embodying one of the myths which have survived to modern times. Still the presence of the serpent effigy with the other features would indicate that phallic worship had been observed. The clay was at the bottom of these altars, and sand layers above just as clay was beneath the flint deposit in Illinois. So there was a fire-bed of black soil beneath the cremated bodies and white soil above, the evidence of a studied design given in both cases. There are, to be sure, no two altars alike and no conventional or stereotyped mode of burial in the mounds, yet with the variety the uniformity is apparent, the uniformity being always confined to the symbol, but the diversity coming out in the mode of burial and the articles deposited. This is also one of the strange features of the Mound-builders' religion. They seem to have been saturated with superstition. It was almost childish in its simplicity, for it seized upon the most trifling things to express itself; it was also held under the control of a fixed and formal symbolism, which constantly reminds one of foreign customs. Stately ceremonies resembling those of Druidic worship were associated with the trifling details of a savage people. The inference is that human sacrifices were made, and that burials of an extraordinary character were practiced in certain cases, but in other cases the commonest things seem to have been laid away as if with all the care of the most sacred treasure. We are puzzled by these deposits, and yet we recognize a strange symbolism in them all. The great serpent in Ohio is only such an effigy as perhaps any superstitious savage might possibly devise; nothing conventional or foreign about its shape, but when we come to the oval and the altar in the oval, we are at once reminded of the phallic symbol and the offering to the fire divinity of the east. So, too, the serpent effigy in Illinois seems like a very rude semblance of a massive snake. Its shape conforms to the bluff in every part. It seems only an effigy, but when we compare its double bend to the curve of the Hindu fire generator and to count the number four in the mounds on its summit, and see the contents as they are, it seems as if the same latent symbolism was strangely present, and so it is everywhere. Superstition degenerated or advanced, one of the two. Symbolism, too, was either gradually lost, being merged into the totem system of the hunter races, or it grew up under the same races and became a complicated system, very like the sun symbols of other countries. The resemblance may have been accidental, but the impression is growing that the symbolism was not a native growth, but was introduced from some other land.

III. It is to be remembered that cremation was in Europe distinctive of the bronze age, and was comparatively unknown in the neolithic age. We are also to remember that the phallic symbol was very common during that age, so common that many think it was introduced into the north of Europe by the Phoenicians, who took long voyages for the sake of finding tin. The Druids also are supposed to have cremated bodies, and to them have been ascribed the horse-shoe symbols which are still recognized in those celebrated temples formed from standing stones. With the Druids, fire worship, sun worship, serpent worship and phallic worship formed a complicated system, which stamped itself upon the megalithic monuments of the land. The discovery of these various forms of superstition in the American continent suggests to us the possibility of a transmission of the same complicated cultus to the western coasts of the great sea. This is an important fact. Was it owing to the extension of the Phoenician voyages or to the zeal of Druidic priests that these things were introduced? The contact seemed to have produced a marvellous effect. It was not a decline from the bronze age which we see in these familiar symbols, but the effect of contact with European voyagers in pre-Columbian times, pre-Columbian dis-

covery in fact. The conclusion is startling, but this is the only way that we can account for the marvellous resemblances. Certainly no ordinary nature worship could produce a cultus which would combine all the elements of the eastern faiths---Druidic, Phoenician, Hittite, all in one, nor could the law of growth account for the details as they are seen. Parallel development might indeed result in the prevalence of animal worship among the hunter races, of sun worship among the agricultural races, possibly of serpent worship; but when all of these are combined and made expressive of a strange esoteric system, with the mystic significance of the sun symbol as the source of life, we are led to say that something else must be brought in to account for the phenomena. Phallic worship is not a simple cult which might be introduced anywhere, nor is it to be expected that the worship of fire, or of the sun, or the serpent, would all come from natural causes. There might be a decline from a previous advanced condition. The bronze age might sink back into the stone age. The absence of tin might result in the substitution of copper for the bronze, and the change go on until savage hunters are seen carrying about with them strange reminders of their previous condition; but we cannot see how the process of growth could bring together on the American tree the varied fruit of the eastern climes or place its many symbols in these western lands. The custom of keeping alive the sacred fire was common among the southern tribes. With them the sun was the great divinity. Idolatry, of a primitive kind, also prevailed among them. They built pyramids of earth, and placed their idols in niches on the sides of those pyramids, with their faces towards the four points of the sky. They kept their dead in sacred charnel houses, and placed images near by to watch the remains or to receive the spirits as they returned, reminding us of Egyptian customs. These are all suggestive facts.

The Mound-builders's cult was as strange as this. Here we see the pipes offered to the sun, but the pipes are covered with animal figures, suggestive of animal worship or totemism. Here also we see the serpent effigy, everything about it expressive of a still higher cult, namely, the worship of fire or the sun. Here we see the sun circle and the crescent, showing that sun worship was very prevalent. Here we see the phallic symbol, a marvellous cult, holding its sway over a united people, Southern Ohio being its chief seat of power. Everything of value which was ever offered to the sun was subject to the action of the sacred flame. Here we see the horse-shoe symbol in the mounds and the phallic symbol in the serpent pipes. And with all this complicated symbolism we learn that the bodies were cremated exactly as they were on Druidic altars, though the flames are smothered beneath the layers of the sacred soil. Surely it is mysterious. Could the Mound-builders have invented all this, and established their system over so great a territory, brought so many strange conceptions into their worship, unless they had received from some source a cult which was not indigenous to the continent. It is said by some that they were nothing more and nothing less than the ancestors of the present race of Indians, but by others that they were gifted with great intelligence; but whichever way we look at them, it does seem that they could not have had such a marvellous symbolism unless there had been among them some one from another continent.

MGS-011 SYMBOLS AND NOTATION

MGS-011 SUPPOSED DISCOVERY OF THE CALENDAR OF THE MOUND BUILDERS

Anonymous; Popular Astronomy, 2:429, 1895.

In a number of the Lyons Republican, published Feb. 22, 1895, Mr. Veeder of Lyons, N. Y., has an article entitled "Pre-historic Man," which calls attention to a curiously engraved stone that has marked upon it the supposed calendar of the ancient Mound Builders. The stone was found in a large mound in Cincinnati with other relics of interest. Its size is reported to be 5 inches long, 2.6 inches across the middle and 3 inches at the ends and can be easily held in the hand. A cut and a description of it will be found in Wilson's Pre-historic Man. Mr. Veeder thinks that this stone has engraved upon it a method of keeping time as it was recorded by the Mound Builders. His reasons are fully given in the paper above referred to.

After some correspondence with able scientists in Ohio about this matter, it seems to us that Mr. Veeder's reasons are not sufficient to raise a probability that his theory is correct.

1. Because the stone has no authentic history.

2. Because frauds of the same kind have been committed in Ohio before. More than 30 years ago, a regularly marked stone was professedly found in large ancient works at Newark, 35 miles east of Columbus. Its markings caused it to be sent from city to city, from one learned society to another, --- it was read as Pheneccian, Chaldean, Coptic, Hebrew and some other languages ---proved this, that and the other, and excited this whole side of the continent. It turned out to be a fraud, manufactured and dely stamped so as to deceive the "very elect." When the fraud was known it caused a great deal of merri-ment.

3. Persons who have followed the work that has been done in trying to decipher hieroglyphic records know something of the extreme difficulty of such a task. Such knowledge makes interpreters exceedingly cautious in assigning meaning to forms they know so little about.

MGS-012 CHINA AND THE MAYA CALENDARS

Chatley, Herbert; Nature, 133:798, May 26, 1934.

With reference to the note on the above subject in Nature of January 13, p. 63, the resemblances in the calendar systems seem to be exaggerated by Dr. Kiang. The Chinese day-count follows the numbers 10 and 12 (L. C. M. = 60). The Maya follows the numbers 13, 20 and 365 for the 'calendar round' of 52 vague years and the further factors 18 and 20 for the long count. Apart from the mere principle of a continuous day-count with more than one concurrent numerator, the agreement is slight.

A more striking 'coincidence' is the use of the 5 epagomenal days and the taboo during them, which agrees with Egyptian practice and so lends support to Prof. Elliot Smith's diffusion theory.

MGT-006 THE ORIGIN OF THE MAYA CIVILIZATION, CAN CHINA
CONTRIBUTE TO ITS SOLUTION?

Lighthall, W. D.; Royal Society of Canada, Transactions, 2:27:47-55, 1933.

The source of the Maya civilization is, and has long been, disputed between two main types of archaeological thought: the one contending that it was autochthonous and arose by itself in Guatemala out of simpler Indian local arts; the other maintaining that it was imported across the Pacific, and is related to the older pyramid-building civilizations of Asia and Egypt. Other hypotheses are minor and are now discarded. The object of the present paper is to introduce a special element into the discussion---the intensive study of early Chinese institutions, which are sprung from Elamite or early Akkadian forms. The paper is introductory to that of Dr. Kiang Kang-hu, the accomplished Professor of Chinese Studies at McGill University.

The subject has aspects of Canadian interest also, partly because the Maya religion had echoes in British Columbia mask ceremonies, partly because Canadian tribes are involved in the Bering Strait migrations into America, and partly because our Iroquois had a Pacific origin and some primitive resemblances to the Maya people.

For a long time it was logical to be satisfied with the theory that the Americas were peopled solely through Bering Strait. The fact is plain that only fifty-six miles there separate Siberia from Alaska; and that two small islands divide even that distance, near the middle. In winter it is sometimes said to be possible to cross by the ice on foot. Eskimos crossed it ages ago; then the Siberian Indians called Chukchis, having pole wigwams, feathered headdresses, and features of Northern American aspect, inhabit that region; and lastly, most of the older North American tribes are of Mongoloid aspect and speak agglutinative languages. Our Dene-dinjies bear marks of being very late comers by this strait. Marius Barbeau has noted likenesses of the music of the West Coast to Chinese.

Besides Bering Straits, the Aleutian Islands are allowed to have taken some part, and perhaps they account for certain Japanese types in Alaska and British Columbia.

To-day, with increasing investigation, the Pacific is more and more admitted to be a source. Since all the Pacific islands have been reached from Asia, America, the greatest target of all, could not escape.

The Japan Current, carrying large ships from regions of Far East Asiatic civilization, early appeared to me to offer the best explanation of the peculiar features of Mayaland---grand stone temples on pyramids, with similar stairways to those of early China and Japan, glyphs, basreliefs, stelae, astronomy, hierarchy. Some Southern routes were possible. The Polynesians, starting in India, sailed all over the Pacific and reached Peru, as Roland I. Dixon has proved. But even Canadian archaeologists have accepted the "autochthonotts" opinion as the authoritative doctrine, asserting that it was obviously true if one saw all the elements together in a large enough collection. Such a collection was the Panama-California Exposition of 1915. I was one of those who continued to doubt. It seemed to me more and more impossible, as I studied the old civilizations, that one so splendid and complex, and with so many astonishing likenesses to Babylonia and Egypt, could spring up of itself.

Ultimately, Dr. Elliott Smith of London, who had shown that the complicated art of mummy-making had crossed the Pacific to Peru by a well-defined "mummy-track", came out with his article on Anthropology in the Encyclopaedia Britannica of 1921, wherein he opposed the autochthonous theory.

He said in part:

"It was formerly claimed in effect that man had a pyramid-building instinct". (elsewhere he termed it "a square pyramid-building instinct")---"which presumably was kept in check by the vast majority of mankind but burst its bounds in a chronological sequence among the peoples scattered along the coasts from Egypt to Central America. The more fully the details of these pyramids are studied the more complete is the demonstration of their derivation one from the other, as the stream of culture moved from West to East. In Ceylon at Polonnaruwa we find pyramids of Mesopotamian design but built of stone, like those of the Egyptians. The less ornate Kmer pyramids, such as Ka-Keo and Bo-Kong of Cambodia, reproduce the Sinhalese models with singular accuracy; and then pyramids of the same type appear in western Peru and Equador, Central America and Mexico." His article was later replaced when the Encyclopaedia Britannica became American.

In 1923 appeared W. J. Perry's notable work "The Children of the Sun", containing an argumentation of his somewhat similar opinion, which, without adopting all his grounds, (he derives all civilizations from Egypt, for example) I condense as follows:

P. 417.---"The archaic civilization is a unity" . . . "The laws of probability make it incredible that the archaic civilization could have originated more than once." P. 418.---"It can hardly be doubted that the original home was in the Ancient East" . . . "The possession of a script by any people is a sign of a high stage of civilization" . . . "Writing moved in an easterly direction" (from Egypt to Sumer!) . . . "The Maya civilization is put at about the beginning of our era, with a possible margin of 200 years either way" . . . "No one maintains that civilization existed in the northerly part of America before 200 B. C." "Since all the arts and crafts of the Maya people, including writing, had been possessed by other people for thousands of years before that time, it seems reasonable to suppose that the movement of culture has been towards America." P. 420.---"No evidence whatever exists to point to the origin of the Maya civilization in America." Its origins in America cannot be traced.

His account of the opinions of distinguished and deeply versed leaders of the autochthonous view are,---like theirs of his,---in a somewhat too controversial tone. He unwittingly underrated the complexity of the problem in America, due chiefly to time, diffusion, and a mixed population, besides the north Asiatic heritage of elements introduced through Bering Straits. And careful perusal of Morley's "Introduction to Maya Hieroglyphs" exhibits other difficult factors. Perry says: "According to S. C. Morley, 'the Maya civilization was a native American product, developed in its entirety in the New World, and probably not far from the region where its extensive remains are now to be found.'" His colleague, Mr. Spinden, writing in 1913, is even more emphatic; he says "The writer does not care to dignify by refutation the numerous empty theories of ethnic connections between Central America and the Old World . . . Except in the matters of stairways and methods of construction, the pyramids of Assyria were not dissimilar from those of Mexico and Central America. Superficial resemblances might also be noted in the assemblages of rooms in the palace structures, and in the marked use of inclosed courts."

An additional argument of the autochthones which has been cited, is that all the sites of Maya cities thus far found are on territory looking toward the Caribbean Sea but none on the Pacific side. But this difficulty is solvable by the facts that Guatemala is exceedingly infertile along its Pacific strip, and that the adjoining mountain ranges are most dangerously volcanic. The Mayas found safer districts on the east side. In later days they warned the Spanish to avoid the volcano country. A strong point for the autochthones is that a fertile country

in the tropics affords an opportunity for a central authority to avail itself of large masses of labour and skill. But Dr. Thomas Gann, of London, one of the best authorities, in his book "Maya Cities", 1927, expresses his strong expectation in favour of the "archaic" theory.

I think that both parties to the "Diffusion Controversy" have learned too much on barbarous tribes as authors of civilizations, whereas their history shows an amazing and incredibly ancient tenacity to their primitive notions, except when in face of a high superior civilization; which itself has to be the slow product of some thousands of years. For example, none of the palisaded village tribes (who spread over the world before civilizations began) can solve the Maya problems. Still less can the wandering hunters.

To both schools immense credit is due, one for its work in the Old World, the other in the New, ---collecting and interpreting great stores of facts, which now constitute a changed basis for debate, and are ready for the application of fresh points of view as was the case in the course of the Darwinian Theory of Evolution. The two are necessary, and ought to be studied together, but fresh sources must still be sought in the search for the whole picture. Those fresh sources must be partly at least in Asia, and the points to be searched for are explanations there of the Maya forms in Central America.

Some of the elements of this attitude are as follows:

1. The Japan Current, the Kuro Siwo or Black Stream, fulfills most, and perhaps all, of the logical conditions as the path and medium of Maya immigration into Guatemala. So does the Equatorial Counter-current, running eastward across the Pacific directly to Central America. Nevertheless the subject of a particular route requires close expert study. The ancient civilization of Asia, ---which is thought to have begun in Elam (South Persia), and to have been carried into Akkadian Mesopotamia, and into Egypt some 5,000 years B. C., was brought to the Pacific by the Chinese or related races (who were Turanians like the Akkadians), in two ways: The main immigration was over the Ta Siuwe Shan Mountains and down the tortuous Hoangho River into China: these left Serindian and other Asiatic branches behind them. The second way to the Pacific was through (Dravidian) India and Ceylon, whence the Kmers of Cambodia later derived the remarkable structures of Angkor. Thus two full-fledged forms of Proto-Chinese culture were set down in reach of the Japan current; or of the North Equatorial Current at the Philippines, where it turns northward into the Japan; or of the Equatorial Counter-Current which goes directly east to Guatemala. The Chinese at first had no ships but later developed them. A strong vessel, disabled by storm, could, and did, many times reach the North American coast, with living persons aboard. H. H. Bancroft quotes Mr. Brooks of San Francisco, who recorded a large number of instances regarding Japanese junks, down to our time.¹

¹ (H. H. Bancroft: The Native Races of the Pacific States, Vol. V---N. Y., Appleton, 1876: PP. 52-53.) He says regarding Japanese visits to the West Coast: "That they have occurred in great numbers is certain. There have been a great many instances of Japanese junks drifting upon the American coast, many of them after floating about helplessly for many months. Mr. Brooks gives 41 particular instances of such wrecks, beginning in 1782, 28 of which date since 1850." (about one a year). "Only twelve of the whole number were deserted. In a majority of cases, the survivors remained permanently at the place where the waves had brought them. There is no record of a Japanese woman having been saved from a wreck . . . The reasons for the presence of Japanese and absence of Chinese junks are simple. There is a current of cold water setting from the

Given a cargo of rice or roots and a crew of fishermen, the elements of a settlement were present.

2. Astronomer priests sometimes accompanied large vessels, guiding the course by the stars, and performing rites of magic and religion. Even the Polynesians and some British Columbians had these. They were the depositaries of learning and authority. All matters of science, building, agriculture and ritual, were theirs. Their caste was sacred and supreme. They were looked upon as descendants of the Sun. These of the Mayas were birettas of the same shape as the Chinese and Khmers. When I mentioned Perry's book to Professor Kiang, he exclaimed, "Where did he get that name?" He understood it at once. Such a caste, on landing, infallibly assumed the direction of all proceedings. The Mayas called this hereditary caste "the real men." The Chinese called the old Taoist priesthood by the same name.

They authoritatively consulted the gods and announced their will and superintended the erection of buildings, first selecting the sites. A small temple would be established, on a mound, with a stairway. Selection of soil and choice of crops had immediate attention. The conciliation of the local tribes would be sought, and a ritual ascendancy be obtained over them, and maize would be adopted from them as a food. The soil along the Guatemala coast is poor and swampy but the rich valleys on the other side of the volcanic mountain ranges would soon have brought a trek across a pass to the eastern side. Thus "The Old Empire" would have been founded in the safe and fertile country looking towards the Caribbean Sea.

There were two races---The Children of the Sun, and the local Indians. Evidently mixture followed, through inter-marriage. The earlier monuments show a few principal leaders with refined Chinese faces and costumes, but in later centuries they are replaced by chiefs of different features, accompanied by the retreating foreheads of the Indian flat-head binding custom. These and the artefacts of the lower class tend to obscure the issues of the discussion.

3. The traditional architecture would have two characters, the sacred and domestic. The thatched huts of the Maya natives represent the latter. The temples and palaces afford a magnificent combination of arts, all of which have their counterparts in the early Chinese civilization. The temples themselves can be briefly compared by examining three typical examples,---each with broad stone stairways, platforms, and three-door shrine on top;---one of the Ziggurat of Ur, as reconstructed in The London Illustrated News of October 25,

Arctic Ocean south along the East coast of Asia, which drives all Chinese wrecks south. The Kuro Siwo, or black stream, commonly known as the Japan Current, runs northward past the East coast of the Japan Islands, then curves round to the East and South, sweeping the whole west coast of North America, a branch or eddy moving towards the Sandwich Islands. A drifting wreck would be carried towards the American coast at an average rate of ten miles per day by this Current. To explain the frequent occurrences of these wrecks, Mr. Brooks refers to an old Japanese law. About the year 1630, the Japanese Government adopted its deliberate policy of exclusion of foreigners and seclusion of its own people. . . . a law, was passed ordering all junks to be built with open sterns and large square rudders unfit to stand any heavy sea . . . Every January there are numbers of these disasters, of which no record is kept. About one-third drift to the Sandwich Islands, the remainder to North America, where they scatter along the Coast from Alaska to California. How many years this has been going on can only be left to conjecture. The information given by Mr. Brooks is of great value, owing to his thorough acquaintance with the subject." (The Japanese law in question was a result of the known effects of the Current.)

1924, page 782; one erected by the Persian Fire worshippers, appearing in Punch, June 15, 1925, page XXI; and the third a common Maya type, as given in The Temple of the Living God at Tulum by Gregory Mason and L. Illust. News of November 1, 1924, p. 816. Let them speak for themselves. It seems impossible to explain this by anything solely Amerind.

4. The astronomer priests would bring with them The system of writing of their Asiatic civilization, in the state it was in at the time. It would consist of hieroglyphs and a shorter script based upon these, as in Egypt and early China. The hieroglyphs were of later stage than those of Egypt, but earlier than the cuneiforms of Akkad. They were written in squares like those of ancient China and Serindia, but of earlier form than those of China proper, even than on the most ancient temple bronze vessels. The priests also used paper books, written in a more cursory hand. My feeling is that their writing will probably yet be interpreted through studies along these lines. But I recognize distinctive mask and idol faces as one element. The earliest writings were all pictures; thence ideographs. Was the Maya system so very different from the others, in its thought by ideograph? Has the idea of the sacred hawk of Egypt not an analogy to the sacred mask of a similar animal god? Masks are closely connected with idols, and originally with animal spirits as well as powers of Nature. Early Maya masks, moreover, link this people with Ceylon, Java, and Melanesia; but especially Ceylon. Did the Mayas turn more to masks where the Archaics turned to phonetics? Maya numbers and chronology have already fallen into the Asiatic linkage, and can be compared with Roman, Akkadian and Arabic. Like the Babylonians and Chinese, they erected stelae, often with figures in low relief, resembling Akkadian and Hittite, with inscriptions concerning historical events. They abandoned the erection of stelae only after seven hundred years.

5. Their gods emphasized a series resembling those of China, and notably included a Plumed Serpent (plumed in both head and tail, and postured as on the chief temple of Jehol, ---in short, the Chinese Dragon). In their ritual they used masks, of snouted and horned forms, akin to those in Tibet, and some of which are still used in Maya festivals. The Tuxtla statuette, one of the few most ancient relics of Maya history---a small old sitting male figure of jade, pictured in Morley's "Hieroglyphics", p. 195, is the Smiling God of China known as "The Laughing Buddha."

6. Their learning specially included an elaborate and advanced astronomy; a system of numbers, known to Chinese scholars, a chronological system and calendar superior to the Julian and referring back like the Chinese to a beginning of things some 3,000 years B. C. and before the earliest event they record; a marvellous sculpture, usually in low relief; like those of the Akkadians, Hittites, Persians and Egyptians; and polychrome tile figures like the Assyrians; brilliant wall paintings on gesso, in excellent colours and design; representing scenes of battle, of worship, and of village life; a hierarchical, figure-decorated pottery of great beauty in paste and decoration, different from the simple ware of the people and having strong resemblances to Old Chinese porcelain forms. And why does the "Beau Relief" chief at Palenque sit on a two-lion throne like that of the Hittite King at Carchemish? Their decorations constantly used the broad and many-curved Chinese ribbon forms. The only arch they had was narrow and pointed, as found at Angkor Thom, and in Java. The mother-of-pearl six-scallop disk, Holmul Plate 35, is the equivalent of the Chinese silk spools; the ornamentation of Holmul Plate 24, is Japanese Ainu; Japanese, too, is the lacquer mosaic plaque from the Temple of the Warriors, it was necessary to bring in a Japanese expert.

7. Having brought no domesticated animals, they had none. A few copper axes have been found; their tools otherwise appear to have been of stone, but

MGT-007 STATUES, IMAGES

few have been discovered. They may, perhaps, have left Asia at a time just before the general use of copper tools. They used much gold for decoration. They valued and revered jadeite in lieu of jade, as in China, and finished it nearly as finely. In mentioning such particulars, I do not pretend to pose as an authority on the subject, still less as one able to contend with the learned leaders, but a good deal of information is now accessible to the public in recent books and the great illustrated publications. Nor will my space permit me to enlarge upon the points I have mentioned, nor to add a number of others. To do so would demand a huge book with many illustrations. But the keys are Oriental. I now give way to Professor Kiang, whose paper is entirely impartial, and does not purport to distinguish the heritage of primitive Mongolian similarities, derived from Bering Strait, from the highly civilized similarities such as writing, sculpture, astronomy, numbers, chronology, ritual, architecture, and the developed arts.

The whole complicated subject deserves thorough research along all its lines, and China appears to us to furnish numerous clues.

MGT-007 ART IN CHINA AND ON THE NORTH-WEST COAST OF AMERICA

Anonymous; Nature, 137:193, February 1, 1936.

Attention was first directed to the resemblances between the style of Chinese decorative art of the Chou period (1122-256 B. C.) and that of ancient Central America by Prof. Perceval Yetts. Dr. Leonhard Adam, who also had already discerned similarities between the Chou and Huai styles and that of the marble vessels from the valley of the Rio Ulua (Honduras) of about the twelfth or thirteenth centuries A. D., now asks for the consideration of anthropologists of his theory that both the Chinese Chou style and the north-west American style in decorative art developed under identical rules (Man, 3; 1936). This comparison, it is thought, may lead to a solution of the problem of the Tao Tieh mask, which is obviously a key to an understanding of the typical Chou decoration. It is evident that the Tao Tieh mask does not always represent the same being, while the decorative elements surrounding it are not identical, but vary considerably. It is suggested that originally it was not a mask at all, but was the head of an animal; and the decorative details around it are not independent, but originally formed part of its structure. In the course of a long development, these details around it are not independent, but originally formed part of its structure. In the course of a long development, these details were separated from the body of the animal, and were distorted in the same way as occurred in north-west America, for example, in the Chilcat blankets, which show the final stage of degeneration. The fact that geometric forms are far fewer in north-west America than in Chou art confirms the view that the American art represents a more recent stage of development. The chronological gap of three thousand years between the two styles precludes the suggestion of a historical connexion between them, but the application of the principles, stylisation, symbolism, etc., to be deduced from studies of the art of the north-west to the art of the Chou dynasty provides an important and very elucidating auxiliary for a reasonable analysis of the Chou style, though it does not solve all problems.

MGT-008 A REMARKABLE INDIAN RELIC

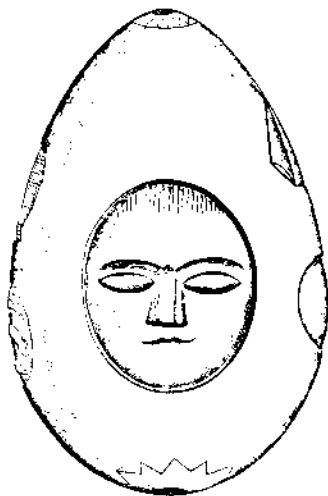
Tapley, D. J.; American Naturalist, 6:696-701, 1872.

Having a few days of leisure, I started on Monday last, in company with my friend, J. F. Bly, Esq., to visit the fish-breeding establishment of Jazael Robinson at Meredith Village, N. H., hoping to make some pleasant additions to my rather limited knowledge of Natural History, to refresh the memories of beautiful scenery about the lake, and breathe again the air of the mountains.

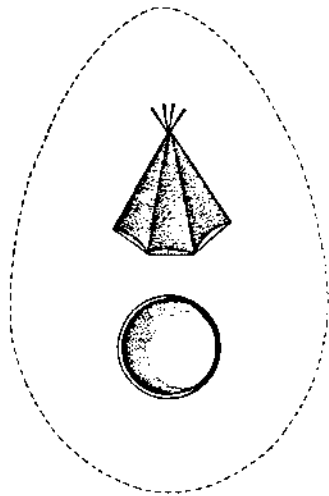
The process of fish breeding and raising was elucidated by our guide with so fascinating an interest that we ceased to wonder at the prevalence of "fish fever." Some five thousand trout in the lower pond were a foot or more in length and ravenous for something to bite. A finger held within an inch of the surface was sure to be jumped at and seized---as was a gentleman's nose which happened incautiously to be held too near the water.

On returning to the village we inquired for any object of scientific interest which might be worth seeing, and were told at once of a wonderful sculptured stone which had been found the week before by some workmen of Mr. Seneca A. Ladd. As Mr. Ladd is quite a naturalist, and has already an extensive private collection of relics and specimens, he was delighted with the new discovery, and exhibited and explained the really remarkable relic with an enthusiasm which only the genuine student can feel.

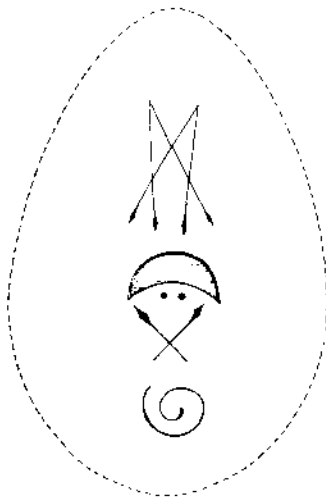
The stone was found at a depth of about two feet, in the sandy drift at the head of the lake, where the ground apparently had not been disturbed for centuries. The location is at the point where Lake Waukewan ("Measly Pond") originally emptied into Lake Winnipiseogee, and was, no doubt, a favorite fishing



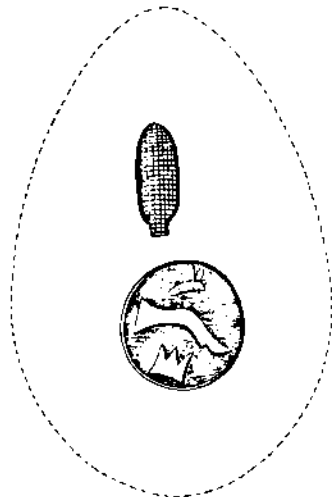
139



140



141



142

ground for the primitive tribes that formerly inhabited that region. The water has been diverted from this channel, and now flows through a canal furnishing the remarkable water power of forty feet perpendicular fall, which carries on the hosiery and other manufactories here. About the first of June Mr. Ladd was causing the digging of post holes for a fence, when one of the laborers threw out what was apparently a lump of clay some six inches in thickness. The occurrence of such a body in this soil attracted Mr. Ladd's attention, and a slight examination revealed a section of the stone. After a careful cleaning process, with water and brushes, the coating of clay was removed and he was delighted to find himself in possession of as interesting an archaeological relic as yet found in New England. It is not to be wondered at that he takes pride in showing it, and preserves it with the greatest care. We were kindly allowed to make sketches of it, and have had the illustrations engraved to which we shall refer.

The stone is of an oval form, smoothly finished upon the surface, and of as perfect contour as if turned in a lathe. Its dimensions are 3-7/8 inches in length and 2-3/8 inches in thickness. The material is a silicious sandstone of a greenish clay-drab color and of fine grain. The sculptures are mostly in bas-relief, upon a ground sunk below the surface of the stone and of a higher grade of art than usual in Indian workmanship. It is difficult to conceive that such work could be done without the aid of metal tools. A hole was drilled through the longest diameter which tapered uniformly from 3/8 of an inch at the larger end to 1/8 at the smaller, the use of which was probably the same as in the class of stones known as "gorgets," to which we should refer it. Around the aperture at each end was a border of points like a star, as will be seen by figure 139.

Figure 139 is intended to give an idea of the form of the stone, the figures at the sides being the profiles of Figs. 140 and 142. The Indian 'mask' has the characteristic outline and projecting mouth seen in other specimens of Indian

art. The wavy lines on the forehead are supposed to indicate the hair. The finish of the whole is quite elaborate.

In figure 140 the dotted line is intended to indicate the position of the picture on the stone. The lines of the 'wigwam' are regularly drawn, and the surface is "pricked up" or roughened. The circle below is perfectly rounded and supposed to represent the full moon, although every one has the privilege of forming his own theories in regard to the significance of the symbols.

Figure 141 has a delineation of four 'arrows' inverted. Underneath this is a 'new moon,' and two round dots that may represent 'stars.' Below this are two 'arrows' crossed and a convolute or coil which may be a 'serpent.'

Fig. 142 shows an 'ear of corn,' nicely cut, and in a depressed circle are three figures, the central one representing a 'deer's leg,' and the others of doubtful interpretation.

As an illustration of the surmises of those who are interested in deciphering such inscriptions we give the following, which is certainly ingenious and even plausible.

It is suggested that the stone commemorates a treaty between two tribes. The reversed arrows in Fig. 141 symbolize peace; the moon and stars the date; the crossed arrows a union of the two forces for aggressive or defensive purposes, etc. The wigwam might indicate the place where the treaty was consummated, and the corn and other emblems the feast by which it was commemorated.

It is to be hoped that the stone, or, at least, casts and photographs of it, may find their way into our collection at Salem.

MGT-009 ARCHAIC SCULPTURE, GORGONA ISLAND, SOUTH AMERICA

Anonymous; Nature, 116:111, July 18, 1925.

Mr. James Hornell, who is the official ethnologist of the St. George Expedition, organized by the Scientific Expeditionary Research Association, gives in Man for June a detailed account of the archaic sculptures which were discovered on Gorgona Island, off the coast of Colombia. These sculptures were on two groups of boulders, the majority of the older examples being below present tidal level. On many of the stones it can only be discerned that designs have existed, but on four they are comparatively well preserved. These form an ordered group around a huge, roughly quadrangular boulder bearing upon its upper surface the representations of a pair of rude ungainly human figures, male and female, each with a number of rays around the head in the shape of a halo. The figures stand side by side. The male measures 1 ft. 10 in. in height. The outlines are formed by broad, shallow, rounded grooves. On another stone is a rudely sculptured stepped pyramid of four superimposed platforms, progressively decreasing in size. Six circular depressions or cups occupy the face of the third storey and the upper half of the second. This pyramid may be a representation of an early form of the Mayan and Aztec temple of the sun, the six cups representing astral deities. Of the other two boulders, each has a representation of a monkey of crude and childish design. Other sculptures, belonging to another and later group, and pottery and stone implements were also found.

MGT-010 STATUES, IMAGES

MGT-010 ON THE OCCURRENCE OF A STONE MASK IN NEW JERSEY, U.S.A.

Abbott, Charles C.; *Nature*, 12:49-50, May 20, 1875.

The occurrence of stone "masks," such as the specimen referred to, has been somewhat frequent in and about the "mounds" of the Ohio and Mississippi Valleys, but not eastward of these localities. Somewhat more elaborate carvings of the human face have been found in Western New York, figures of which are given in the Thirteenth Annual Report of Regents of New York State University. These may or may not be of identical origin with the western mound specimens. The specimen here figured is, I believe, the only one ever found in New Jersey. It is a hard sandstone pebble, such as are common to the bed of the Delaware River, above tide water. It measures six inches in length by a fraction over four inches in greatest breadth. It is concavo-convex, the concavity being shallow and artificial. The carving of the front or convex side is very rude, but shows distinctly that it has been done with stone tools only. The eyes are simply conical counter-sunk holes, rudely ridged, and just such depressions as the stone drills, so common among the surface relics of this neighbourhood, would produce. In the collection of stone implements from Central New Jersey, at the Peabody Academy of Salem, Mass., are several drills sufficiently large to bore as wide and deep depressions as the "eyes" of this mask. The nose is very flat and angular; the mouth merely a shallow groove. The ears are broken, but appear to have been formed with more care than any other of the features. The chin is slightly projecting.

The interest attaching to this specimen is, I think, twofold, and worthy of a moment's consideration. It is interesting from the fact of being found in New Jersey, a point much further east than the mound-builders have been supposed to reach, and there is no reason to suppose that the specimen was ever brought by white men from the west, and lost here. The circumstances connected with its discovery render such a supposition untenable. Its interest, otherwise, is in the fact (as I suppose it) of its being a true relic of the mound-builders. The mystery of this people has certainly yet to be solved, if, indeed, it ever can be, and the relationship they bore to the "Indian" determined. In the prosecution of my investigations into the "stone-age" history of the New Jersey Indians, I was continually struck with the great resemblance of the stone-implements found in New Jersey to those found in the western mounds. The specimens figured by Messrs. Squier and Davis, in the first vol. of Smithsonian Contributions, 1847, were all, or nearly so, duplicated by specimens I gathered in New Jersey; and up to the time of the completion of my second paper on the Stone Age of New Jersey (now in press), I needed but "animal pipes" and stone masks, such as the above, to make the duplication of the mound-relics complete. The occurrence of this specimen brings it to the one form of pipes, and that such have occurred in New Jersey is highly probable; but not having gathered such a specimen, myself, I assume that none have yet been found. It must be borne in mind, however, that as there are no mounds in New Jersey, animal pipes, if found here, must occur as surface relics, or in graves; which latter were, as a rule, very shallow. As New Jersey has been settled for about two centuries, it is probable that such animal pipes would be gathered up, when found, and soon again lost or destroyed, when ordinary "relics" would be overlooked. In this way, such animal pipes would have all disappeared, perhaps a century ago, when their value as archaeological specimens was unknown. This, too, might account for the great rarity of such specimens as the mask here described.

One wonders about the relationship of these stone masks to the famed crystal skulls from Central America.

MGW-006 A "STAMP" TABLET AND COIN FOUND IN MICHIGAN MOUND

Anonymous; American Antiquarian, 16:313, 1894.

A Carson City, Mich., correspondent of the Detroit News writes that the remains of a forgotten race were recently dug up from the mounds on the south side of Crystal Lake, Montcalm county. One contained five skeletons and the other three. In the first mound was an earthen tablet, five inches long, four wide and a half an inch thick. It was divided into four quarters. On one of them was inscribed curious characters. The skeletons were arranged in the same relative position, so far as the mound was concerned. In the other mound there was a casket of earthenware, ten and a half inches long and three and one-half inches wide. The cover bore various inscriptions. The characters found upon the tablet were also prominent upon the casket. Upon opening the casket a copper coin about the size of a two-cent piece was revealed, together with several stone stamps, with which the inscription or marks upon both tablet and casket had evidently been made. * There were also two pipes, one of stone and the other of pottery, and apparently of the same material as the casket. Other pieces of pottery were found, but so badly broken as to furnish no clew as to what they might have been used for. Some of the bones of the skeletons were well preserved, showing that the dead men must have been persons of huge proportions. One of these mounds was partly covered by a pine stump three feet six inches in diameter, and the ground showed no signs of ever having been disturbed.

* The Editor does not endorse this find, for the prehistoric tribes did not place inscriptions on pottery nor coin in boxes, and did not often use "stamps" for their pottery patterns. Will the archaeologists of Michigan investigate and report?

See MGW-007 for further developments. Once again, discoveries are dismissed because they "should" not occur.

MGW-007 FRAUDS IN MICHIGAN

Anonymous; American Antiquarian, 16:384, 1894.

The find of pottery, a stamp and a coin in Montcalm county, Mich., described in our last number, turns out as we predicted, to be a fraud. Our correspondent, H. I. Smith, informs us that it is in the same locality where the remarkable pottery vessels containing Assyrian and Egyptian faces were found a few years ago. Is there no way of suppressing these operations? They do not deceive archaeologists, but, nevertheless, do much mischief.

This dismissal seems too easy. Perhaps the Egyptian and Assyrian faces were on genuine artifacts! See MGW-006 for original description of the discovery.

MGW-008 WRITING

MGW-008 THE ANCIENT INSCRIPTION ON A WALL AT CHATATA, TENNESSEE

Rawson, A. L.; New York Academy of Sciences, Transactions, 11:26-29, 1891.

Mr. J. H. Hooper found what appeared to be a headstone to a grave, on a wooded ridge on his farm, in Bradley County, Tennessee, about thirteen miles from the railroad at Cleveland. He dug around the stone, expecting to find a name, but instead found only curious unknown letters or marks. He dug deeper and uncovered other stones that formed a wall of three courses, in all about two feet thick, eight feet high, and about sixteen feet of its length, as measured from the north end, was covered with the letters, arranged in wavy, nearly parallel and diagonal lines. The wall was traced and examined in many places for a distance of nearly a thousand feet, its course marked on the surface by stones like No. 1, projecting a few inches above the surface of the ground, and twenty-five or thirty feet apart. Seventy-five feet of the south end of the wall was bent at an angle of 15° to 20° east. The wall ended in a hollow of the hill.

In March, 1891, the Cleveland Express printed a short account of the discovery, written by Mr. Carson of that place, who had seen the wall. In the Sunday Sun, New York, June 7th, I published a short notice of the find, with engravings made from my sketches made at the place, May 21st. The engravings in this article are from my sketches corrected by photographs.

The stone is dark-red sandstone, and the wall lies along the crest of a ridge of that kind of stone which trends north and south, flanked by limestone east and west, and extending from the Hiwassee River north to Chattanooga, south where it dips below the bed of the Tennessee River.

The surface of the west side of the inner course of stones is cut into rounded ridges with hollows between, and the characters are raised on the crest of the ridges, and are from two inches to three inches in width, with a few larger groups.

Mr. J. Hampden Porter says, in a letter from Chatata, October 21st: "It is not a wall but a red sandstone ridge, faced with red, slaty, and yellow clays to an unknown depth. No implements and no traces of previous excavations have been found." The faces of the other course of stones are level and not cut into grooves. Between the courses is found a dark-red cement, which is probably formed of red clay with salts carried down by water.

Mr. Porter says: "As a rule inscriptions are intended to be read. . . I do not remember any instance of a designed concealment like this."

The architect of the Pharos at Alexandria, Egypt, cut his name on the stone, covered it with plaster, and moulded Pharaoh's name in the covering. Time tore off the plaster and exposed the builder's name. This concealment in Tennessee may have been effected in a time of invasion or some great social calamity.

Eight hundred and seventy-two characters have been examined, many of them duplicates, and a few imitations of animal forms, the moon and other objects. Accidental imitation of oriental alphabets are numerous.

The rock was chiseled in the form of letter intended, a hard cement worked in and raised above the surface, and a cement placed over the whole, against which the outer course of stones was placed, fitting closely. A piece of this covering cement with the letter-form in its surface is engraved here. The bird or other animal is the largest of that kind of figures that is found on the wall. Some of these forms recall those on the Dighton Rock, and may belong to the same age. How many other hidden inscriptions there may be in this, the geologically oldest continent, it is impossible to say but delightful to conjecture. This wall would be a valuable and interesting addition to the Metropolitan Museum.



Sample of inscriptions on Tennessee well.

MGW-009 A SLAB OF SANDSTONE CONTAINING HIEROGLYPHICS

Anonymous; American Antiquarian, 3:61-62, 1880.

During some extensive mound explorations near Zanesville, Ohio, under the direction of Dr. Everhart, of that city, a somewhat remarkable stone was found. It is a slab of sandstone, 12-1/2 inches long, 11 inches wide, 4 inches thick, and containing two lines of hieroglyphics across its face. The slab was found leaning against the head of a clay coffin, at the bottom of a large mound. The coffin was made of clay, moulded by hand, flat at the bottom, straight on the sides, but arched over the top, and contained a skeleton which is reported to have been of enormous dimensions. The description of the stone and of the hieroglyphics was read at the last session of the American Association, and the slab placed on exhibition. It has been pronounced "very puzzling." It contains among the hieroglyphics certain signs which are quite similar to some on the Davenport Tablets.

Once again we have the skeletons of giant men given special burial.

MGW-010 WRITING

MGW-010 HIEROGLYPHICAL MICA PLATES FROM THE MOUNDS

Squier, E. Geo.; American Journal of Science, 2:4:145, 1847.

You have probably observed a paragraph, going the rounds of the newspapers, credited to a journal published at Lower Sandusky in this state, to the effect that a number of inscribed plates of mica were recently discovered, in excavating an ancient mound near that place. These plates are represented, in the account, as oval in shape, measuring seven by ten inches, and "covered with hieroglyphics of different and beautiful colors, betokening a more advanced and entirely different state of the arts than has heretofore been discovered in the remains of the Indian tribes!" As this announcement has created some degree of interest, and elicited some inquiries, it will not be out of place to observe, that one of the plates has been placed in our hands, through the kindness of a friend, residing at the point mentioned. The form of the plates and their size are correctly represented, but the hieroglyphics are nothing more nor less than discolorations caused either by the infiltration of a mineral solution between the laminae, or by its presence at the period of crystallization. The material is very well known as graphic or hieroglyphic mica, a deposit of which occurs upon the Schuylkill, not far above Philadelphia. Although the discoloration, following the planes of crystallization, falls, in places, into right lines, it seems utterly unaccountable that they were mistaken for the work of man! This is another illustration of the very loose manner in which facts relating to our antiquities have been placed before the world:---a looseness, unfortunately, not entirely peculiar to newspaper statements. The plates are very pretty specimens of the mineral, and are each perforated, near one of the ends, with a small hole. They were undoubtedly used for purposes of ornament. Mica is common in the mounds, sometimes cut into the form of scrolls and other ornamental plates. I have taken a bushel of the sheets from a single mound.

MGW-011 IMMENSE BLOCK OF GRANITE

Anonymous; American Journal of Science, 1:37:352, 1839.

Near Hamadan, the ancient Eabatana, is a block of fine grained red granite of the weight of many thousand tons. Ten feet from the ground there are two square excavations, about five feet square and one foot deep, each of which contains three columns of engraved arrow-headed writing, in the most excellent preservation; hitherto they have never been decyphered. There are granite mountains here, and Elwund is probably of that rock: from its summit are seen the peculiarities of an Asiatic landscape---rock, mountain, desert, and a sky of fire.

MGW-012 A MEXICAN LIBRARY 7,000 YEARS OLD

Anonymous; Literary Digest, 82:24, July 12, 1924.

The discovery of a buried collection of engraved stone tablets near the city of Mexico is described by William L. Stidger in the Dearborn Independent (Dearborn, Mich.). The antiquarians who have discovered and unearthed this find say that it is a prehistoric library, the product of a Mongoloid civilization earlier than that of the Aztecs, or even that of their predecessors, the Toltecs. The situation of the buried tablets with reference to certain lava streams, the time of whose emissions can be estimated, shows their age, we are told, to be at least 7,000 years--possibly much older. Mr. Stidger assures us that the days of the Revolution in Mexico never produced anything more exciting than those of July last, when Prof. William Niven and Dr. J. H. Cornyn uncovered this library, from ten to twenty-five feet under the earth, just beneath a thick layer of volcanic ashes. We read:

"How old would you say the library is?' Professor Niven was asked, as the pieces tumbled out from perfect shelves where they had evidently been placed many thousands of years ago.

"At least seven thousand years old, and possibly ten thousand. We know that the volcanic deluge came about five thousand years ago, for we can measure that by the various strata that are above the volcanic debris. This entire valley was a great volcanic cone with fifty active volcanic mountains, and at least three of these giants constantly threw out streams of lava and ash and fire which inundated this valley like a great flood. It was at that inundation that this prehistoric library was covered and the attendants buried.'

"To the average American mind this seems hard to believe. The prehistoric pyramid near Mexico City is so old that it has no ornaments on it at all. It is just a great, crude pyramid of rough masonry without a sign of cement to hold together the stones with which it is built. They are laid, stone upon stone, but they have stood through ten centuries or more. When I visited this pyramid they showed me a stream of lava which is twenty feet deep. You can see its pathway, as distinctly as you can see the Mississippi River, where it flowed forth from the now dead volcanic cone, winding its way down the valley toward the present site of Mexico City, covering everything in its path twenty feet deep, until it came to this ancient pyramid, which it surrounded as it would a small mountain. Professor Cummings has dug down through this layer of volcanic lava to the bottom of the pyramid, which is ten feet below the lava stream. As to the age of this pyramid, scientists know that the volcanic upheavals must have come at least seven thousand years ago, and the pyramid was erected centuries before that. Human skeletons are found both beneath and imbedded in this lava stream.

"So it is with the library that has just been uncovered by the archeologists. They know that it is at a depth beneath the lava ash and debris, altho no stream of lava came this way.

"The books are tablets, just as the books of the libraries of ancient peoples have always been. These tablets are of all sizes. They have their writings on five sides of stone. Some of the books are crude and some of them show a high degree of stone-book-making skill. They range over a long period of time, just as the books in our modern libraries do.

"How do you tell for a certainty the age and extent of this library?' Professor Niven was asked as we watched the men digging out piece after piece with ancient hieroglyphics telling the story of the past.

"Because we know certain letters and signs and figures. They are stable and certain. We have established them scientifically.'

"What are some of these signs that you know for a certainty?"

"There are more than two hundred symbols that we can recognize in this library. We recognize the symbol of the moon, the symbol of fire, the earth mother, water, lightning, the sun's rays, the symbol of the volcano god, the symbols of morning and evening, the symbols of the various stars and heavenly bodies, of which the people of that period knew much. Many of the books of the Mongoloid library are books on the stars. They knew the heavens."

"When did this Mongolian civilization which left behind it this tremendous library exist?" these men were asked.

"Many centuries before even the Toltec or the Aztec races."

"In this excavated library of the Mongoloid civilization that preceded both the Toltec or Aztec civilizations, a conventional flower is the sign which represented fire; a half circle with a concentric circle represented either the rising or the setting sun; a cross represented the four movements of the sun."

"Mythical animals appear in this library and they are always connected with the fire and sun signs."

"The sun is always shown in yellow or orange."

"The fire is always shown in a deep red."

"The water symbol is always in green or blue."

"The morning symbol is always white."

"Each day new books from this library are being unearthed, and they have these symbols and stories still intact; perfect specimens, with the colors still as brilliant as when they were painted on and baked in clay ten thousand years ago. This set of ancient books tells us that the fire god is the oldest god of the Mongolian civilization. He is always represented as a wrinkled old man. He always wears a pointed hat as a symbol of productivity. The origin of the fire god was the volcanic-shaped cone with fire pouring out, but it evolved into the cone-shaped hat of another symbolism."

"Smoke is always represented by upward-curling rays."

"The mountain god is said by the Aztecs to have an incense pot burning inside of the volcanoes. There are historic evidences of three great volcanoes which ten centuries ago were in constant eruption. These are represented by three circles in all symbolism"

O.....O.....O
sun god..... volcano god..... fire god

"This symbolism came down from the Mongolian civilization up to the Aztec times."

One conventional type of deep dish is found constantly in these ruins. It is a great incense dish. Symbolically it represents the Mexico Valley. On the edge are three volcano gods, each with a hole through his body coming out of the top of his head. In this hole the ancient peoples burned their incense. These three volcano gods were the three great volcanic mountains that at that time were in constant eruption. To quote further:

"This library shows that the various pyramids that were erected in the valley also represented worship of the volcano gods. They are shaped like a volcano and the chief method of worship was to build fires on the tops of these pyramids and keep them burning for fifty-two years, which was the century of these ancient peoples. It was on top of these pyramids that human sacrifices were made to the volcano gods long before the Aztecs came along with their human sacrifices."

"In addition to the books, architectural drawings have been dug up by hundreds."

"They are drawn by the architect in colors and show each dimension and floor of the various pyramids and temples."

MGW-013 UNDECIPHERED SCRIPTS

Anonymous; Nature, 130:502, October 1, 1932.

According to a letter from Sir Denison Ross in the Times of Sept. 21, M. Guillaume Hevesy, a Hungarian resident in Paris, has discovered that a number of the signs of the prehistoric Indian script on seals from Mohenjo-daro also appear in the script of the Easter Island inscribed wooden tablets, while some of the Easter Island signs, not present on the Indian seals, are to be found in the proto-Elamic of Susa. It would now be interesting to hear whether there is any coincidence in the interpretation of the prehistoric Indian signs suggested by Sir Flinders Petrie (see Nature, Sept. 17, p. 429) and those suggested for the Easter Island script in the Report of the Committee of the Royal Anthropological Institute of which Mr. Sidney Ray was chairman. The suggestion of a connexion between the two scripts is not the only attempt to find an affinity between Easter Island and this part of Asia. M. J. Hackin, of the Musee Guimet, has recently directed attention to the resemblance which has been noted between the wooden statues, probably ancestral, which were objects of reverence among the Kafirs of Afghanistan before they were overwhelmed by Islam, of which examples are now preserved in the Kabul Museum, and the well-known statues of Easter Island. The resemblances certainly are strong, although it might be argued that they do not go beyond what may be due to the limitations of an undeveloped technique. It must also be admitted that when the material which it is sought to bring into relation is so widely separated in date as in these instances the comparison, in default of intervening links, carries more interest than conviction.

MGW-014 UNDECIPHERED SCRIPTS

L., W. W.; Nature, 130:741, November 12, 1932.

Referring to the note in Nature of October 1, p. 502, on the similarity of ancient scripts found in the Indus Valley and in Easter Island, it may be mentioned that Prof. Herman Wirth, of Marburg, has also directed attention to a number of similar symbols that have been found in North and South America, Sweden, Southern Andalusia, Mesopotamia, Africa and Oceania. He explains some of these signs on the usual lines of literal interpretation; but the fact that so many ideographs, "even [!] the Svastica" as Sir Denison Ross observes, are found in diverse parts of the world suggests that a certain class of archaic symbol cannot be interpreted as mere pictographs of material objects and local events. They obviously constitute the elements of a universal 'language' the symbols of which represent functions of Nature. The practical scientific knowledge of prehistoric civilisations implies some familiarity with the operations of the dual, positive and negative principle in Nature.

The knowledge of the physicist and biologist, hitherto neglected in palaeographical research, may be required for the interpretation of some of these undeciphered 'scripts'. The geometrical and algebraical 'functions' of stresses, strains, and transformations of 'lines of force', do not vary from age to age; and, although the symbols for these in one era may seem arbitrary to the savants of another age, the man of science is much more likely to find the 'key' than the man of letters.

MGW-015 WRITING

MGW-015 EASTER ISLAND INSCRIPTIONS

Anonymous; Nature, 141:292, February 12, 1938.

Dr. A. Metraux, Bishop Museum fellow, figures and describes in Man of January two inscribed tablets and an inscribed fragment from Easter Island, now in the Bernice Pauahi Bishop Museum, Honolulu, which have not been recorded by those who have written previously on the subject of the Easter Island inscriptions. Sixteen authentic tablets deposited in various institutions are now known. Most of these have been described. When The Easter Island tablets were first discovered the islanders were perfectly willing to part with them; but the modern natives, realizing the interest taken in them by Europeans, have manufactured imitations. The tablet acquired by the British Museum in 1903 is probably modern in origin. The signs are poorly engraved and suggest the style of modern artists. Faked tablets were made in the island even prior to 1882, as witness a faked gorget in the Australian Museum. The two tablets of the Bishop Museum are in poor condition, the wood being partly rotted away. Signs appear on one side only, the other side being decayed. The best preserved specimen is twelve inches long, three and three-quarter inches wide and three-quarters of an inch thick. The signs are incized according to the best classical tradition. The symbols have been engraved with an obsidian or shark's tooth point. The signs form eleven rows; of the characters, one hundred and twenty are legible. The rows of signs are reversed alternately. The second tablet, twenty-seven and a half inches long, three and a quarter inches wide, and one inch thick, contains twenty-five unobliterated signs around a natural hole in the wood. A few years ago it was suggested by Mr. de Hevezy, a Hungarian linguist, that there were striking and incontrovertible parallels between the Easter Island script and the Indus Valley inscriptions from Mohenjo-daro and Harappa. It is now shown that the resemblances were due to inaccurate reproductions of both groups. The only resemblances are simple geometrical signs. The Hungarian author suggested that the Easter Island signs might be thousands of years old; but the largest tablet in existence in the Museum of Brain-Lecombe is carved on a European oar.

MGW-016 EARLY SCRIPT IN INDIA

Anonymous; Nature, 132:200, August 5, 1933.

An interesting inscription in a rock-shelter in the Sambalpur District, Bihar and Orissa, is the subject of a note, accompanied by a series of illustrations, by Mr. K. P. Jayaswal in the Indian Antiquary for March. It appears to be in a script representing a transition from that of Mohenjo-daro to the Brahmi, and is dated tentatively at about 1500 B. C. The inscription occupies a space of 35 ft. x 7 ft. The letters, partly painted, partly incised, would appear all to have been painted before being cut. There is no sign of the use of an iron tool. The inscription is unquestionably writing, and Mr. Jayaswal is of the opinion that the hand responsible for the inscriptions was accustomed to the use of the pen. The writing appears to have reached the syllabary (alphabetical) stage. The script resembles Brahmi more closely than any other, but a number of resemblances to Mohenjo-dara are noted. Notwithstanding the Brahmi cast of the inscription, it does not follow that the language is Aryan, and in view of the locality in which it has been found, it may be a pre-Dravidian Raksasa record, Raksasa being used as a generic term for the peoples dispossessed by the Aryans, now possibly represented by the Gonds.

MGW-017 MOHENJO-DARO IDEOGRAPHS

Anonymous; Nature, 130:429, September 17, 1932.

A bold and entirely speculative attempt to arrive at the meaning of the pictographic designs on the seals found at Mohenjo-Daro, in the valley of the Indus, is made by Sir Flinders Petrie in the course of a notice of the recently published account of the excavations on this site by Sir John Marshall, which appears in Ancient Egypt, 1932, pt. 2. Sir Flinders Petrie justifies his method of attacking the problem by taking the ideographic signs in their primary sense of 'pictures' expressive of ideas, on the grounds, first, that being engraved on stone they escaped transformation and retained their original detail, thus being comparable with the ideographic method of Egypt; and secondly, that the study of official titles and the method of writing them in Egypt has supplied parallels to what may be discerned in India. Thus the recurrence of a number of strokes suggests that parallel to an Egyptian 'Home of Four', 'Five Men', and the like, we have a 'Hall of Four', 'Hall of Six', etc., pointing to a system of naming officials by the number holding office, like the Duumviri, Decemviri, etc., of ancient Italy. There is evidence for this method in Cappadocia. Another set of signs consists of wheels with six or four spokes, that is, chariots and wagons, signifying transport. 'Timber', 'water supply', 'an army', 'game', or 'hunting' are meanings suggested for other symbols, which, in combination with other signs suggesting authority, are interpreted as the designation of officials connected with departments of State; thus, 'Officials of the Registry of Chariots'. Nearly one-half of a hundred symbols are interpreted tentatively on the presumption that they are certainly ideographic signs such as lie at the base of Egyptian, Sumerian, and Chinese writing, but at so early a stage that the forms can mostly be recognised.

MGW-018 [DISCOVERIES AT GLOZEL]

Anonymous; Nature, 118:600, October 23, 1926.

Considerable interest has been aroused among archaeologists by discoveries at Glazel, on the right bank of a rivulet called LeVareille, about twenty miles south-east of Vichy, of which little had been heard in England until attention was directed to them by Prof. S. Reinach in a letter to the Times of September 27, in which he referred to their bearing upon the date of the Magdalenian culture. The excavations, which began in 1924 and were carried out by Dr. Morlet, assisted by a young peasant Emile Fradin, yielded last summer a curious combination of objects in association which is at least puzzling. The objects were of stone, bone, and more or less baked clay without a particle of metal or Celtic or Roman pottery. They consisted of (1) a few polished axes and small flints (there is no flint in the neighbourhood); (2) very thick hand-made vases, one of them decorated with a human head (eyes and nose but no mouth), a fiddle-shaped figurine representing a woman, without a mouth and recalling the so-called owl-vases of Troy; (3) pebbles engraved with outlines of animals or inscriptions or both, in the most degraded Magdalenian style; (4) a

MGW-019 WRITING

large number of clay tablets covered with inscriptions, some long and well engraved. Of these inscriptions some are described as being like the Phoenician, but the greater number are quite different.

Inscriptions from so remote a period are not known if we except some of Piette's earlier painted pebbles from the Mas d'Azil and a few (apparent) graffiti on reindeer horn. The only similar inscriptions of anything like so early a date were found in Portugal in 1894; but these aroused some suspicion and have not been universally accepted. Prof. Reinach, to whom we are indebted for these details of the find, is of the opinion that we have here a religious deposit of early neolithic age associated with a degenerate Magdalenian culture which is thus brought down so late as 4000-3000 B. C., he holds that it points to the western origin of writing. Prof. Elliot Smith, in his presidential address to the Anthropological Society of University College, London, on October 15, referred to this curious association in one deposit of neolithic objects with Cretan affinities, Magdalenian objects, and a linear script. He suggested that if the neolithic phase did not begin in western Europe until the second millennium B. C., there was nothing inherently improbable in the association; but it necessitated cutting off one millenium from the dating on Prof. Reinach's view, that the close of the Magdalenian period might have been so late as 3000 B. C. Further, if the Aegean origin of the pottery was admitted, the claim for the western origin of writing was unjustifiable.

MGW-019 [THE FINDS AT GLOZEL]

Anonymous; Nature, 120:20, July 2, 1927.

The "Glozel problem", like sea serpents and UFOs, never seems completely settled despite the most violent denunciations by reputable scientists. The following items will provide a good review of some of the earlier debates. The subject is not a dead issue in some circles today.

There would appear to be good ground for believing that another sensational archaeological discovery has suffered the fate of many of its kind in the past and has failed to stand the test of examination by experts. The remarkable character of the finds at Glozel, in which objects of neolithic culture akin to the Aegean, inscriptions on clay tablets, and engravings of animals on pebbles were found in association, aroused no little scepticism at the time of their discovery; but Dr. Salomon Reinach was convinced of their authenticity and, relying upon their evidence, put forward the theory that a degenerate Magdalenian culture had lasted so late as 4000-3500 B. C., with the consequence that the Magdalenian must be placed so low as 5000 B. C. The resemblance of the script on the tablets to that alleged to have been found in a Portuguese dolmen in 1894 was immediately apparent. It has been stated that a confession of forgery has appeared in Belgium, but confirmation of this is not yet to hand. In the issue of Antiquity for June, Mr. Crawford gives in some detail the results of an examination of the objects themselves, and subjects the circumstances of the find to a critical scrutiny based upon a personal inspection of the ground. He is persuaded that the objects in question are forgeries. His case is convincing; all the more so in that his opinion coincides with that of the Abbe Breuil.

SECTION ML:

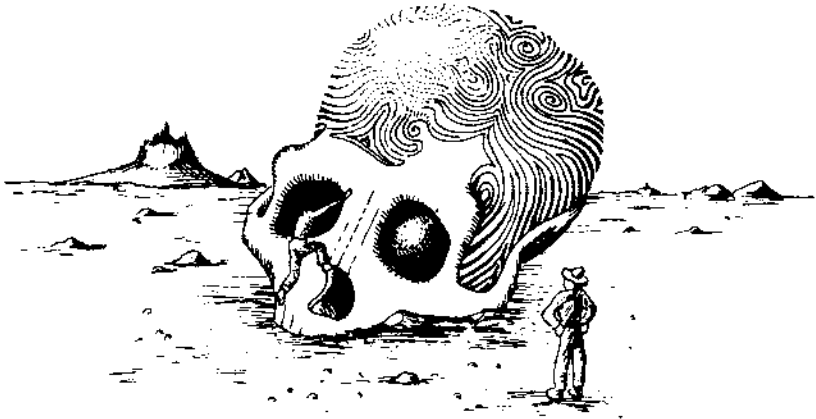
LEGENDS, MYTHS, CONCEPTS

The physical records of ancient man are sparse compared to the immense amount of information transmitted across the gulf of time by word of mouth. Messages and hidden meanings probably abound in myth and legend, especially in those of world-wide distribution. The keys to understanding this body of data seem to have been lost and the tendency is to interpret myth and legend in a condescending fashion. Why, for example, detract from ancient man because we have not discovered vast written records? Perhaps memories were better in those days! Such a surmise, however, is not in the spirit of these sourcebooks, for it is wise to avoid hypotheses; although the purpose here is to accumulate data that tend to support such radical hypotheses.

- MLD Dwarfs.
- *MLE Elementals.
- *MLG Gods, messiahs.
- *MLM Giants.
- *MLO Origin of man.
- MLT Myths of technology.
- *MLW Cosmology, world history. Legends of ancient terrestrial catastrophism are included here; viz., the Deluge.

*This subsection not represented in Volume M2.

LEGENDS, MYTHS, CONCEPTS



There were giants in those days! (Drawing by John Holden)

MLD-001 GIANTS AND DWARFS

ver, W. A.; Harper's New Monthly Magazine, 39:202-210, July 1869.

Only parts of this long article reproduced here are those concerned with old legends of giants and dwarfs. The bulk of the article deals with historical people.

From the days of Adam down to the days of Grant and Seymour, there have been giants. We first read of them in Genesis, vi. 4: "There were giants in the earth in those days; and also after that, when the sons of God came in unto the daughters of men, and they bare children to them, the same became mighty men which were of old, men of renown." After these were the Rephaim, who were defeated by Chedorlaomer. After them the Emims, alluded to in the second chapter of Deuteronomy, and the Anakims, and the Zamzummims; all of whom in time disappeared, leaving only Og, the King of Bashan, a rather lengthy monarch, "whose bedstead was a bedstead of iron; nine cubits was the length thereof, and four cubits the breadth of it, after the cubit of a man." The cubit of a man is the space from the tip of the finger to the elbow, that is, half a yard; therefore Og's bedstead was 13-1/2 feet long. Reckoning the size of men to their bedsteads, Og was probably about 9 feet high. He has furnished material for many Eastern legends, in one of which he is said to have escaped the Flood by wading only knee-deep beside the ark, and to have lived 3000 years. One of his bones is reputed to have long served for a bridge over a river; and he is credited with having "roasted at the sun a freshly-caught fish." Goliath, the famous Gath man, who had a difficulty with David, was in height "six cubits and a span," which would make him 9 feet 9 inches high. His coat of mail weighed 5000 shekels of brass, which is about 208 pounds, and his spear, "like a weaver's beam," about 25 pounds.

In 1718 a French academician named Henrion endeavored to show a great decrease in the height of men between the periods of the Creation and the Christian Era. Adam, he says, was 123 feet 9 inches high; Eve, 118 feet 9 inches; Noah, 27 feet; Abraham, 20 feet; Moses, 13 feet. The allegation about Adam is moderate compared with that made by early Rabbinical writers, who affirm that his head overtopped the atmosphere, and that he touched the Arctic Pole with one hand and the Antarctic with the other. Traditionary memorials of the primeval giants still exist in Palestine in the form of graves of enormous dimensions; as the grave of Abel near Damascus, which is 30 feet long; that of Seth about the same size; and that of Noah, in Lebanon, which is 70 yards in length!

The monkish historians promulgated the idea that the earliest possessors of Great Britain were men of immense stature. John de Warrin, in the "Chronicles of Great Britain," written in 1445, relates that in the time of Jahir, the third Judge of Israel after Joshua, Lady Albine and her sisters came to and settled in an island which they named Albion after her, afterward called Britain. While they were living there the devil assumed the shape of a man, and dwelt among the wicked women, and by them had issue great and terrible, giants and giantesses, who occupied the land until Brutus came and conquered them. At the time of his visit there were two giants more wonderful than all the rest, Gogmagog and Lincorigan. It is the former, it is said, whom Milton had in mind when he wrote:

"His spear---to equal which the tallest pine
Hewn on Norwegian hills, to be the mast
Of some great amiral, was but a wand."

The ancient people of most countries seem to have possessed in the strongest degree a faith in giantology, as evidenced by the vast images of their gods and their colossal monuments of architecture. In front of the portals of the palace of Carnac, in Egypt, are gigantic human statues; and in one of the courts are twelve immense stone figures 52 feet high, which impress upon the beholder that he is entering a home of departed giants. The adjacent palace of Luxor has two granite statues, each 38 feet high, at the entrance. In the ruins near Thebes are three huge figures, now thrown down, one being 64 feet long. In the Parthenon of Athens, many years before Christ, was a statue of Minerva 36 feet high. The temple of Jupiter at Olympia, before Christ, contained a seated statue of a god which rose almost to the ceiling of the building, and that was 68 feet high.

Pliny says that by an earthquake in Crete a mountain was opened, and in it was discovered a skeleton standing upright, 46 cubits long, which was supposed to be that of Orion or Otus. The same author relates that in the time of Claudius Caesar there was a man, named Gabbaras, brought by that Emperor from Arabia to Rome, who was 9 feet 4 inches high, "the tallest man that has been seen in our times." But this giant was not so tall as Posio and Secundilla, in the reign of Augustus Caesar, whose bodies were preserved as curiosities in a museum in the Sallustian Gardens, and each of whom measured in length 10 feet 3 inches.

During the Cretan war there was discovered a body of prodigious size. The rivers rose to an unusual height, and when the floods were gone, in a great cleft of the earth there was found the carcass of a man of the length of 33 cubits, or near 42 feet. Lucius Flaccus, the then legate, allured with the novelty of the report, went with a party of friends to the place to take a view of it; and they there saw what upon hearsay they had imagined to be a fable.

The Emperor Maximus (very much of a man) was 9 feet high, and was in the habit of using his wife's bracelet for a thumb-ring. His shoe was a foot longer than that of any other man, and his strength so great that he could draw a carriage which two oxen could not move. He generally ate forty pounds' weight of flesh and drank six gallons of wine every day. Not at all a desirable or profitable guest for the "St. Nicholas," even at the current price of board; though not so tall as one of whom Josephus tells, viz.: Eleazar, a Jew, who was one of the hostages whom the King of Persia sent to Rome after a peace. This giant was over 10 feet high. But these are pigmies compared with him of whom Kircher writes (though this is what a Yankee philosopher would denominate a whopper!). The skeleton of this giant was dug out of a stone sepulchre near Rome in the reign of the Emperor Henry II., and which, by an inscription attached to it, was known to be that of Pallas, who was slain by Turnus, and was higher than the walls of the city! The same author tells us that another skeleton was found near Palermo that must have belonged to a man 400 feet high; and who, therefore, could have been no other than one of the Cyclops, most probably Polyphemus himself, who might

"Easily have overstepped
Goliath's helmed head, or that huge King
Of Basan, hugest of the Anakim."

To come down one or two hundred feet. Father Jerome de Monceaux writes of the skeleton of a giant 96 feet long, found in a wall in Macedonia. This fact was communicated to him by Father Jerome de Rhetel, a missionary in the Levant, who, in a letter written from Scio, stated that this giant's skull was found entire, and could contain 210 pounds of corn; that a tooth of the under-jaw weighed fifteen pounds, and was seven inches two lines in length! There was a man! Was there a Barnum then extant?

In times more modern (1613), some masons digging near the ruins of a castle in Dauphine, in a field which by tradition had long been called "The Giant's Field," at the depth of 18 feet discovered a brick tomb 30 feet long, 12 feet wide, and 8 feet high, on which was a gray stone with the words "Theobochus Rex" cut thereon. When the tomb was opened they found a human skeleton entire, 25-1/2 feet long, 10 feet wide across the shoulders, and 5 feet deep from the breast to the back. His teeth were about the size of an ox's foot, and his shin-bone measured 4 feet in length.

Plot, in his "Oxfordshire," 1676, says that a skeleton 17 feet high was then to be seen in the town-hall in Lucerne. It had been found under an old oak in Willisau, near the village of Reyden. He instances numerous gigantic bones which had been dug up in England, and adds: "It remains that (notwithstanding their extravagant magnitude) they must have been the bones of men or women; nor does anything hinder but they may have been so, provided it be clearly made out that there have been men and women of proportionable stature in all ages of the world, down even to our own days."

Old Cotton Mather held the belief that there had been in the antediluvian world men of very prodigious stature, in consequence of the finding of bones and teeth of great size, which he judged to be human, in Albany. He describes one particular grinder weighing 4-3/4 pounds, and a broad, flat, fore-tooth four fingers in breadth; also a bone, supposed to be a thigh-bone, 17 feet long, which, with the others, crumbled to pieces as soon as it was exposed to the air.

Giants have always been great favorites with fiction-writers, and they live in the folk-lore of every country. Some of the most popular works in modern literature have had for their heroes these fabulous creations. Spenser, in his "Faery Queene," tells us of

"An hideous giant, horrible and hie,
That with his talnesse seem'd to threat the skie."

Rabelais invented Gargantua. Bunyan found the Giant Despair very useful in his story. Gulliver would not be Gulliver without the giants and dwarfs. And the world of romance would be dull without Blunderbuss, Cormoran, King Arthur, Fingal, and such.

Come we now to the Pigmies:

It is curious that the Bible, which contains so many allusions to giants, contains but one mention of a dwarf, and that is in Leviticus, xxi. 20, where it is commanded that no man who was a dwarf should make the offerings at the altar. This, however, is scarcely true, if taken in a jocular sense. The writer, in conversation with a Doctor of Divinity concerning brief people--- it was at the time of Tom Thumb's nuptials---said Ne-hi-miah (Knee-high-miah) was shorter than Mr. Thumb, as was also Bildad, the Shu-hite (Shoe-height); but neither of the Old Testament little ones was as "short" as the one in the New Testament, who said: "Silver and gold have I none;" for the man who was minus both those commodities was probably as "short" a person as was ever known.

The first record we have of the assumption of the name of Tom Thumb, by a dwarf, was in 1597. In 1630 was printed a poem entitled "Tom Thumbe, his Life and Death," which says, of a later Thumb:

"In Arthur's court Tom Thumbe did live,
A man of mickle might,
The best of all the table round,
And eke a doughty knight:

His stature but an inch in height,
 Or quarter of a span;
 Then thinke you not this little knight
 Was prov'd a valiant man."

Sir John Mandeville, who traveled in Asia and Africa between 1322 and 1356, tells us of a land of pigmies, where there were men only three spans long. Both men and women were fair and gentle, and were married when they were half a year old. They generally lived only six or seven years, and at eight were considered to be old. They were the best workmen of silk and cotton, and of all manner of other things that were in the world. They scorned great men as we do giants, and had them to travel for them and to till the land.

In a rare book by Laurens Andrewes, entitled "Noble Lyfe and Nature of Man," is the following curious description of pigmies:

"Pigmies be men & women, and but one cubite longe, dwellinge in the mountaines of Yude; they be full grown at their third yere, & at their seven yere they be olde; & they gader them in May a grete company togeder, & arme them in theyr best maner; and than go they to the water syde, & where-so-ever they fynd any cranes nestis, they breake all the egges, & kyl all the yonges that they fynde; and this they do because the cranes do them many displeasures, & fight with them often tymes, & do them great scathe; but these folke cover their houses with the cranes feders & egshels."

One of the Hebrides is called the "Isle of Pigmies," where it is reputed that several miniature bones of the human species have been dug up in the ruins of a chapel there. William Collins, in his "Ode on the Popular Superstitions of the Highlands of Scotland," refers

"To that hoar pile which still its ruins shows;
 In whose small vaults a pigmy folk is found,
 Whose bones the delver with his spade upthrows,
 And culls them, wondering, from the hallow'd ground."

Tennessee newspapers, of the year 1828, stated that in that year several burying-grounds, from a half acre to an acre in extent, were discovered in Sparta, White County, Tennessee, wherein very small people had been deposited in tombs or coffins of stone. The greatest length of the skeletons was 19 inches. The bones were strong and well set, and the whole frames were well formed. The graves were about 2 feet deep. The dead were all buried with their heads to the east and in regular order, laid on their backs, and with their hands on their breasts. In the bend of the left arm was found a cruse or vessel that would hold nearly a pint, made of ground stone or shell of a gray color, in which was found two or three shells. One of these skeletons had about its neck ninety-four pearl beads. Webber, in his "Romance of Natural History," 1853, refers to the diminutive sarcophagi found in Kentucky and Tennessee, and he describes these receptacles to be about 3 feet in length by 18 inches deep, and constructed, bottom, sides, and top, of flat, unhewn stones.

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MLT-001 A BIOCHEMICAL DISCOVERY OF THE ANCIENT BABYLONIANS

ris, Leslie J.; *Nature*, 111:326-327, March 10, 1923.

At a lecture given recently in Cambridge by Prof. Okey my attention was directed to a passage written by Galileo in 1623 in which this pioneer of scientific method attacks the doctrines of the classical philosophers with his usual irony and vehemence. I refer to a section of his "Il Saggiatore," in which Galileo replies to his contemporary Sarsi, who had quoted Suida to the effect that the Babylonians used to cook eggs in an emergency and when no fire was available, by rapidly whirling them in slings.

"If Sarsi commands me to believe on the authority of Suida that the Babylonians used to cook eggs by swiftly swinging them in slings--I will. But I will certainly say that the cause of such results is far from that which he attributes; and in order to discover the true cause I will reason in the following way: If we do not succeed in obtaining a result which was successfully obtained at another time, some one factor at least must be lacking which is necessary for the successful production of the result. Now, we have no lack of eggs, nor slings, nor strong men to swing them, and yet they do not cook; on the contrary, if already warmed the swinging would cool them more quickly. Since the only factor that is lacking is that we are not Babylonians, therefore the fact of being a Babylonian is the cause of the eggs solidifying, and not the friction of the air: and this is what I set out to prove." (Galilei, Opere, vi. Also in "Frammenti e Lettere" (1917), p. 66).

If Galileo had actually put his experiment to the test he might have written otherwise. Within the last few years it has been "discovered" that egg white under mechanical strain such as vigorous shaking or very high hydrostatic pressure undergoes coagulation (vide Robertson, "Physical Chemistry of the Proteins," 1918). In a paper to be published shortly in the Proc. Roy. Soc. (read at the meeting of February 15,) I show that chemical changes which occur on heat-coagulation also occur on coagulating an egg by mechanical means.

The myths and anecdotes of the ancients are almost invariably built on some foundation of fact; and it seems highly probable that the Babylonians were aware that eggs could be coagulated by vigorous movement (such as swinging in slings). If this be so, the phenomenon of mechanical coagulation proves to be another example of a former observation rediscovered---in this case after the lapse of thousands of years!

Latin and Italian quotations omitted above.

MLT-002 MAYA ART

G., H.; *Nature*, 93:454-457, July 2, 1914.

One paragraph of this article is pertinent here. In the Series A sourcebooks, reader will find papers on the strange resonance of the orbits of earth and Venus.

It may not be amiss to make a few explanatory remarks about this Maya chronology. They had a ceremonial almanac of 260 days; twenty sections of thirteen days each; twenty day-signs of animals and other natural objects, combined in a certain order with the numerals 1-13, so that every one of these 260

MLT-003 MYTHS OF TECHNOLOGY

days had an absolutely fixed name, number, and position. They reckoned by scores, whilst the number 13, as Foerstemann discovered, is based upon the fact that eight years of 365 days are exactly five years of the planet Venus, which they worshipped. This curious almanac is, in fact, based upon a combination of terrestrial and Venus years. (p. 456)

MLT-003 VIEWS OF THE ANCIENT RABBINS RELATIVE TO THE DIMENSIONS OF THE EARTH

Wackerbarth, A. D.; Royal Astronomical Society, Monthly Notices, 33:576-577, 1873.

On the 14th of November, 1862, the Society did me the honour of reading a paper of mine relative to the history of the theories entertained in different ages concerning the spherical form of the Earth and its rotation on its axis. In that essay I endeavoured to show, that the Rabbins of the Cabbalistic School, e. g. the author of the Zohar (Simeon ben Yochai), and the author of the Imre Binah, entertained just notions both as to the figure and rotation of our planet. I would now add that these old Jewish teachers were also in possession of a very fair approximation to the dimensions of our globe.

The Greek or Egyptian land-surveyors' cubit has been determined by Sir Henry James with (as I believe) all possible accuracy to be 18.2405 inches (English). The Hebrew ordinary cubit will therefore be 6 palms, i. e. six-fifths of this, or 21.8886 inches = 1.82405 feet, which agrees with Arbuthnot's estimate. 1^f.824.

In the treatise, Pesachim, of the Talmud, fol. 94 recto, we find it stated, that the circumference of the Earth is 6000 Parasangs. Now a Parasang, is = 12,000 cubits; whence we have,

$$\text{One Cubit} = 2 \cdot \pi \cdot \frac{\text{Radius of Earth}}{72,000,000}$$

The latest and, I believe, most reliable determination of the dimensions of the Earth, that I know of, is that of the English Topographical Corps, published by Colonel Clarke. If we take the equatorial semidiameter there given as our radius of the Earth, we have

$$\begin{aligned} \text{Cubit} &= 2 \cdot \pi \cdot \frac{20,926,062}{72,000,000} \text{ ft.} \\ &= 1^{\text{f}}.82572, \end{aligned}$$

differing from the true value, 1^f.82405, determined by Sir Henry James only by 0^l.00167 = 0ⁱⁿ.02, or the 50th part of an inch.

To make an exact agreement would require a radius of 20,906,895 ft., which is somewhat greater than the mean between Col. Clarke's equatorial and polar semi-axis.

This, however, at any rate seems to show that the ancient Rabbins were in possession of a very fair approximation to the dimensions of the Earth; one, in fact, that comes within about 19,000 feet of the true length of the radius; but from what source they had obtained their information is more than I am able to explain.

The Hebrew quotations are omitted above.

SECTION MM:

MANUFACTURED ARTIFACTS

All artifacts are "manufactured" in the general sense. Here, however, the emphasis is on utilitarian objects deliberately exploiting nature. Coins, tools, weapons, and technologies, such as metallurgy, are collected here. Items are selected on the basis of their tendency to show precocious technology, outstanding and unexpected skills, and inexplicable processes, such as some ancient stonework.

- MMC Coins, metallic items. Armor and anomalous weapons using metal are included.
- MMF Flints, celts, etc. Carefully fashioned objects made from stone, particularly the stranger items, such as pygmy flints, celts, bannerstones, etc.
- *MMP Pottery, seals, etc. Objects manufactured from clay and other substances.
- MMT High technology. Anomalous artifacts that may indicate precocious technology.

*This subsection not represented in Volume M2.

MANUFACTURED ARTIFACTS

MMC-005 THE HOPEWELL FIND

Moorehead, W. K.; American Antiquarian, 18:58-62, 1896.

In 1847, in the first publication of the Smithsonian Institution, Messrs. Squier and Davis give an account, together with several illustrations of a large enclosure and numerous mounds on Paint Creek. The enclosure was then owned by a Mr. Clarke. His heirs sold it to Mr. Hopewell a few years ago, and, on account of the wonderful finds and the kindness of the present owner, the survey has named it "The Hopewell Group and Enclosure." The fork of Paint Creek referred to by Messrs. Squier and Davis flows half a mile to the south of the camp.

The embankments of the enclosure average four feet in height and twenty feet in width. They have been considerably reduced by cultivation. The distance around the walls is one and three-fourths miles. One hundred and eleven acres are enclosed, on which lie twenty-six mounds and an extensive village site. To the east there is a perfect square, 850x850 feet, the west side being formed by the east side of the main enclosure, as will be seen by reference to the accompanying diagram.

All of the twenty-six mounds above mentioned were carefully examined. Photographs and drawings were made of every skeleton which was surrounded by ornaments or objects, of the various colored strata in the mounds, the altars, and other things of interest. It is the purpose of this paper to describe only one of the mounds explored: the large one indicated in the center of the accompanying plan, around which there is a semi-circular embankment.

Seven thousand two hundred and thirty-two unfinished flint implements, averaging in size 5x7 inches and half an inch in thickness, had been deposited in Mound No. 2, in the form of a layer 20x30 feet and one foot in thickness. This was the most extensive deposit of implements employed by primitive man ever discovered, but, while rivalling in quantity the objects in the Effigy Mound ---also located here---in importance it cannot be assigned first place.

The Effigy Mound is 500x210 feet, with a height of 23 feet, and resembles externally the human trunk. On account of its great size the expedition was compelled to open it in seven sections, each 60 feet in width. The greatest diameter of the mound is east and west. The cross sections were run north and south, and were, therefore, about 200 feet in length, with walls of earth at the center 23 feet high, which gradually sloped toward the ends until they reached the original surface beyond.

Before giving a description of the finds in each cut, it would be well to speak generally regarding the construction of the mound. The builders first selected a level strip of ground, cleared it of underbrush, weeds and grass. They then took clubs or other heavy objects and beat the earth until it was hard and flat, and filled all the little depressions and hollows. The floor being thus far prepared, they built large fires upon it and kept them burning for several days.

All the skeletons taken from the mound, with the exception of one or two, lay upon this hard burnt floor. The mound was erected in eight or nine sections and considerable time elapsed between the completion of one and the beginning of another. When a mound has stood a number of years it becomes covered with underbrush and small trees. If the aborigines decided to make further interments, instead of constructing a new mound, they frequently used the old one. They placed the bodies upon the surface of the ground at the base of the first one and heaped earth above until either the first mound was covered or a structure was formed nearly equaling it in size. The decay of underbrush and logs leaves a dark line between the two mounds conforming to the contour of the first.

This is called the sod line.* Such sod lines were apparent in the Effigy Mounds. In cut No. 1, which was projected through the eastern end of the mound, nothing was found except near the summit. Boulders had been laid about two feet below the summit of the mound extending down the south slope of the structure for a distance of forty feet. They were thought at the time to represent the figures of two panthers. The effigies---if they were intended to represent effigies---were very rude, and while the tails were clearly defined and one or two legs apparent, the head and fore legs had been disturbed by the plow to such an extent that it was impossible to follow them. Boulder mosaics are occasionally found in mounds, particularly in Wisconsin, but their occurrence in the Ohio valley is extremely rare.

In cut No. 2, thirteen or fourteen skeletons were exhumed from the base line. The most important of these was recorded as Skeleton No. 248. It lay with the head to the south, and was five feet eleven inches in length, and fairly well preserved. No skeleton in the mound indicated a person of more importance than No. 248. Copper antlers, 22x23 inches, extended from the forehead upward. The breast and back were covered with copper plates, bear teeth, and other singular ornaments. Strings of beads lay about the ankles and wrists, while at the feet were traces of decayed sandals. The copper horns had been originally fastened to a helmet of copper, covering the skull from the upper jaw to the base of the occipital. A rough cloth skirt extended from the waist to the knees. Where the copper plates came in contact with the fabric it was well preserved. Beautiful pearl beads and large bear and panther tusks were interlaced or strung upon the front of the garment. The other skeletons were covered with shell beads and a few copper plates and celts accompanied them. In cut No. 3 a number of bodies were found surrounded by large ocean shells (*Busycon* and *Pyruia*), plates of mica, lumps of galena, stone pipes, spearheads, and beads. In the centre of the cut upon the base line a deposit of two hundred copper objects and implements was laid. The deposit covered a space 6x10 feet. Among the objects found were an enormous copper ax 22-1/2 inches long and weighing 38 pounds, and copper plates or square sheets of copper used for ornamental purposes. With the deposit were 25,000 pearl and shell beads. Accompanying the copper implements of the more ordinary form were anklets, bracelets, combs, saucers, several fish and suastika and crosses. The discovery of four crosses, which are peculiarly oriental in character, marks a new epoch in American archaeology. M. G. deMortellet, the eminent French anthropologist, refers in his works very generally to the same style of cross found by the survey, and gives numerous illustrations in his works of its occurrence on pottery, sepulchres, and monuments of Brittany, Italy and, particularly, India. The Suastika was used as one of the emblems of Buddha worship before the Christian era, and may have spread later into Phoenicia. This symbol is occasionally found in Egypt and China, but, so far as the writer is aware, not in Yucatan or Mexico. A cross does occur on the Palenque tablet, but it is not the Suastika.

The crosses and the other objects were worked from sheet copper which had been beaten thin in a cold state and not rolled. All the copper was placed in a layer several inches above two badly decayed skeletons. Many of the bones of

* The facts which Moorehead brings out about the gradual enlargement of a burial mound is important. It only confirms what the writer has often advanced; but it here explains some things which would otherwise be difficult to account for, especially the diversity of relics found in the mound.

the skeletons were badly decayed, and the few entire ones were covered with dendritic deposits. Twenty-three feet below the surface, with alternating layers of compact clay and coarse gravel, their decay is unquestionably due to age and not to the action of atmospheric agencies. The copper crosses and effigies were at first thought to be modern; in fact, we would not say positively at the present writing that they are ancient. But if the field testimony is of value (and the survey has had such experience that it is hardly probable its members are easily deceived), it is certain that the objects evince a degree of workmanship beyond the ability of the two tribes of people that inhabited Southern Ohio in pre-Columbian times. This is admitted by even those who are of the opinion that the objects were made by the early traders and trappers who came in contact with the Indians of the Ohio Valley one hundred and fifty years ago. Probably not one of the traders ever heard of the Suastika cross. That the early French met the Ohio tribes on the shores of Lake Erie, in Illinois, and at Fort Duquesne long before the Ordinance of 1787, opening the territory of the Northwest for settlement, is quite true.

That they should have made copper fish, combs, anklets, etc., strangely like the Etruscan and Phoenician designs, and crosses the duplicate of those used so extensively in India is hardly possible. No race of American aborigines were quicker to employ the superior implements and more beautiful ornaments of the whites than the Indians of the Ohio Valley. Had they secured these crosses from the whites they would have undoubtedly buried glass beads, iron tomahawks, medals, and other evidences of European influence, with their dead. The whites would not have issued to the Indians a singular and purely religious oriental emblem and have omitted to present mirrors, beads, and other flashy and more acceptable gifts.*

The copper crosses constitute the first authentic find which casts a certain light upon the origin of man in America. When the voluminous field notes and the numerous photographs of the present survey shall have been carefully examined by those competent to judge, and the proper investigation made of the same symbol abroad, the writer is confident that the conclusion which he has ventured will be substantiated.

The work continues, at present writing, upon the sixth and seventh cuts in the Effigy Mound. Skeleton No. 176 was found in the small mound numbered 20 on the survey map. It was accompanied by many interesting objects, all of copper.

Judging from the large number of skeletons interred in the Hopewell Group, one of the most powerful tribes of Ohio aborigines lived within the enclosure. Upon the site of their lodges or teepees we have found many ash-pits, fragments of their cooking vessels, broken and unfinished implements, and bones upon which they have carved fanciful designs. An inspection of their crania shows them to be of the short-headed or brachycephalic type. We find that they employ mica from North Carolina, copper from Lake Superior, obsidian from the West, fossil shark's teeth from the Florida and Carolina coasts, shells from the sea shore, and other things from a great distance. The field notes from the survey, when published by Mr. Putnam, will go far toward solving questions concerning the manners, customs and habits of primitive man in the Ohio valley.

* There are among the relics in the Field Museum at Chicago not only these oriental symbols, which may be called Phoenician, Etruscan, Trojan, or East Indian, but there are also among them symbols similar to those common in medieval Europe and still common in cathedrals. Crosses in the form of the letter X combine with figures resembling the leaf of the clover, as well as fish, which are Christian symbols.

We have published in this number the abstract of Prof. Putnam's paper read at the Springfield meeting, taken from the Popular Science News for January; also Mr. W. K. Moorehead's account of his remarkable find in the Hopewell mounds. We put these two together because of the discrepancy which appears in the two articles. Prof. Putnam takes the position that the symbolism contained in the relics of the Hopewell mound is the same as that in the Turner mounds, in the Cincinnati Tablet, and the copper relics from the Etowah mound. Mr. Moorehead says nothing about the symbolism of the bone relics which he discovered; though he describes the copper relics and speaks of the oriental character of the suastika and some other symbols which may be recognized, and intimates that this is the first time that the suastika had been seen among the mounds. This is not true, though it is perhaps the first time that it was cut into copper. Mr. Moorehead, however, admits that there have been many doubts as to the prehistoric character of the copper, mica and other relics which were taken from this mound. This doubt has been increased from the examination of the relics which are now in the Field Columbian Museum, having been returned from the Peabody Museum, to which they were taken. It has been two years and more since opportunity has been given for the public to see and examine these relics in their totality. In the meantime the study of the symbolism has been conducted by the curator of the Peabody Museum. There has been considerable inquiry about the relics and a desire to know the nature of the symbols which were so minutely engraved upon the bone relics. The inquiry has been in a degree answered, but there is still a mystery about them.

The symbols on the copper relics strangely resemble the symbols which were common in mediaeval times in Europe, especially the copper sheets which were cut into the shape of the old-fashioned Maltese cross in combination with the clover leaf. The cross is in the shape of the letter X and was common before the Christian era, but the clover leaf is modern European. We say nothing about the composition of the relics in the shape of pulleys, nor the strangely uniform, stereotyped shape of the spool ornaments, which make them look as if they were stamped; nor of the flat pieces of copper with turreted edges, all of which look as if they were cut by a sharp knife or chisel, and all at one time, or the vast quantity of copper which came out of the mound.

We only ask one question: Why do the symbols on the bone implements appear so ancient and the symbols and other art forms on the copper relics appear so manifestly modern? We have tried our very best to follow up the description of the finds given by Mr. Moorehead, both in his book and the Illustrated American, and identify the different finds with the different mounds, but it seems almost impossible to bring order out of such confusion. *

The question now is, Were these bone relics taken from a mound older than the copper relics, or were they not. The report of the commissioner-in-chief of the Department of Anthropology at the Columbian Exposition has not been given, and we do not know that it ever will be. Still the public is entitled to the information. We will ask the parties who know most about this find to clear up the mystery, or at least state the facts intelligibly, so that we can get some clue to it.

* The book which Mr. Moorehead was writing in the field seems to have been finished before the exploration ceased. There is no mention in it of the great number of spool ornaments, or of the peculiar duck pipe, or of the pulley, which strike the eye so strangely, and it is difficult to decide from what part of the mound these singular relics came, or to locate any of these finds definitely. We judge, however, that the bone relics were taken out from the Mound No. 1, near the "dug hole," "where a man was kept at work for three weeks," the same mound from which Squier and Davis took out so many rare relics.

MMF-011 SOME OBSERVATIONS ON THE ETHNOGRAPHY AND ARCHAEOLOGY OF THE AMERICAN ABORIGINES

Morton, Samuel G. ; *American Journal of Science*, 2:2:1-15, 1846.

I shall close this communication by a notice of certain discooidal stones occasionally found in the mounds of the United States. Of these relics I possess sixteen, of which all but two were found by my friend Dr. Wm. Blanding, during his long residence in Camden, South Carolina. These disks were accompanied, as usual, by earthen vessels, pipes of baked clay, arrow-heads and other articles, respecting which Dr. Blanding has given me the following locality:--- "All the Indian relics, save three or four, which I have sent you, were collected on or near the banks of the Wateree river, Kershaw district, South Carolina; the greater part from the mounds or near the foot of them. All the mounds that I have observed in this state, excepting these, do not amount to as many as are found on the Wateree within the distance of twenty four miles up and down the river, between Lancaster and Sumpter districts. The lowest down is called Nixon's mound, the highest up, Harrison's."

"The discooidal stones," adds Dr. Blanding, "were found at the foot of the different mounds, not in them. They seem to be left, where they were no doubt used, on the play grounds."

The disks are from an inch and a half to six inches in diameter, and present some varieties in other respects.

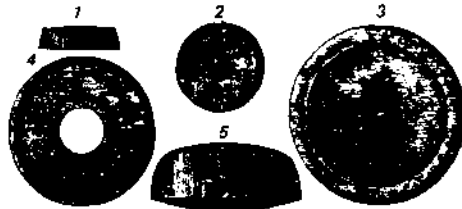
Fig. 1 represents a profile of the simplest form and at the same time the smallest size of these stones, being in diameter about an inch and three quarters. The upper and under surfaces are nearly plane, with angular edges and oblique margin, but without concavity or perforation.

Fig. 2. A similar form, slightly concave on each surface.

Fig. 3. A large disk of white quartz, measuring five inches in diameter and an inch and three fourths in thickness. The margin is rounded, and both surfaces are deeply concave though imperforate.

Fig. 4 is another specimen four inches in diameter, deeply concave from the margin to the center, with a central perforation. The margin itself is slightly convex. The concave surface is marked by two sets of superficial grooved lines, which meet something in the form of a bird-track. This disk is made of a light-brown ferruginous quartz.

Fig. 5 is a profile view of a solid lenticular stone, much more convex on the one side than the other, formed of hard syenitic rock.



MMF-012 FLINTS, CELTS, ETC.

Besides these there are other slight modifications of form which it is unnecessary to particularize.

These disks are made of the hardest stones, and wrought with admirable symmetry and polish, surpassing anything we could readily conceive of in the humbler arts of the present Indian tribes; and the question arises, whether they are not the works of their seemingly extinct progenitors?---of that people of the same race, (but more directly allied to the Toltecs of Mexico,) who appear in former times to have constituted populous and cultivated communities throughout the valley of the Mississippi, and in the southern and western regions towards the gulf of Mexico, and whose last direct and lineal representatives were the ill-fated Natchez?

I have made much inquiry as to the localities of these and analogous remains, but hitherto with little success. I am assured that they have been found in Missouri, perhaps near St. Louis; and in very rare instances in the northern part of Delaware. Dr. Ruggles has sent me the plaster model of a small, perforated, but irregularly formed stone of this kind, taken from an ancient Indian grave at Fall River in Rhode Island; but Dr. Edwin H. Davis, of Chilicothe, in a letter recently received from him, informs me that he had obtained, during his excavations in that vicinity, no less than "two hundred flint disks in a single mound, measuring from three and a half to five inches in diameter, and from half an inch to an inch in thickness, of three different forms, round, oval and triangular." These appear, however, to be of a different construction and designed for some other use than those I have described; and Dr. Davis himself offers the probable suggestion, that "they were rude darts blocked out at the quarries for easy transportation to the Indian towns." The same gentleman speaks of having found other disks formed of a micaceous slate, of a dark color and highly polished. These last appear to correspond more nearly to those we have indicated in the above diagrams.

Besides these disks, I have met with a few spheroidal stones, about three inches in diameter. One of these accompanies the disks from South Carolina, and is marked with a groove to receive the thumb in throwing it. A similar but ruder ball is contained among the articles found by Mr. Atwater in the mound near Huron, Ohio.

What was the use of the disks in question: Those who have examined the series in my possession have offered various explanations; but the only one that seems in any degree plausible, is that of my friend Dr. Blanding, who supposes them to have been used in a game analogous to that of the quoits of the Europeans. It is a curious fact that discoidal stones much resembling these have been found in Scandinavia; whence I was at first led to suppose it possible, especially in consideration of their apparently circumscribed occurrence in this country, that they might have been introduced here by the Northmen; a conjecture that seems to lose all foundation since these relics have been found as far west as the Mississippi. (pp. 12-15)

MMF-012 ON THE DISCOIDAL STONES OF THE INDIAN MOUNDS

Squier, E. G.; *American Journal of Science*, 2:2:216-218, 1846.

In the paper contributed, by Dr. Morton, to the last number of the *American Journal of Science*, reference is made to certain "discoidal stones," some of which are figured. Exact counterparts of these stones, are in the possession of Dr. Hildreth of Marietta; in fact, they occur in considerable numbers, all

over Ohio, and may be found in the cabinets of almost every collector of aboriginal remains. After extensive exploration, I have reason to think it extremely doubtful whether discs of this description were ever found in the mounds, except in cases when they were deposited by the modern (existing) race of Indians. The stones met with in a mound near Chillicothe, to which Dr. Morton alludes, are very unlike those figured in his paper, as they are of horn-stone, rudely blocked out, while the others mentioned, are of great symmetry and manifestly the result of much labor.

Nor is there, apparently, much mystery as to the use made of these stones. I am assured, by Rev. Mr. Finley, "the Wyandot Chief," (distinguished for his zealous efforts in christianizing the Indian tribes of Ohio,) that among the tribes with which he was acquainted, stones of this description were much used in a popular game, somewhat resembling our game of "ten pins." A smooth and well packed area of earth was selected, at one extremity of which a small wooden pin was stuck, while the player stationed himself at the other. The point of the game consisted in striking the pin oftenest in a given number of trials. The form of the stones suggests the manner in which they were held and thrown, or, rather, rolled. The concave sides received the thumb and second finger, the forefinger clasping the periphery.

Adair, in his account of the Indians along the gulf, gives a minute, and graphic account of a game, somewhat analogous to that described by Mr. Finley, in which stones of this description were used. He says:---"The warriors have another favorite game, called Chungke; which, with propriety of language, may be called "Running hard labor." They have near their state house, a square piece of ground well cleared, and fine sand is carefully strewn over it, when requisite, to promote a swifter motion to what they throw along the surface. Only one or two on a side, play at this ancient game. They have a stone about two fingers broad at the edge and two spans round; each party has a pole about eight feet long, smooth and tapering at each end, the points flat. They set off abreast of each other, at six yards from the edge of the play ground; then one of them hurls the stone on its edge, in as direct a line as he can, a considerable distance towards the middle of the other end of the square; when they have run a few yards, each darts his pole, anointed with bear's grease, with a proper force, as near as he can guess, in proportion to the motion of the stone, that the end may lie close to the same---when this is the case, the person counts two of the game, and in proportion to the nearness of the poles to the mark, one is counted, unless, by measurement, both are found to be an equal distance from the stone. In this manner the players will keep moving most of the day, at half speed, under the violent heat of the sun, staking their silver ornaments, their nose, finger and ear-rings, their breast, arm and wrist plates, and all their wearing apparel, except that which barely covers their middle. All the American Indians are much addicted to this game, which appears to be a task of stupid drudgery; it seems, however, to be of early origin, when their forefathers used diversions as simple as their manners. The hurling stones, they use at present were, from time immemorial, rubbed smooth on the rocks, and with prodigious labor; they are kept with the strictest religious care, from one generation to another, and are exempt from being buried with the dead. They belong to the town where they are used and are carefully preserved."---Adair p. 402.

Dr. Morton is, I think, mistaken in supposing the occurrence of these stones to be circumscribed. They certainly occur throughout the west, as do also, the spheroidal stones mentioned, which, it is quite evident, were used for similar purposes.

It will be seen, from the above, that Dr. Blanding was right in his suggestion, that these stones were used in the games of the aborigines.

MMF-013 FLINTS, CELTS, ETC.

MMF-013 ON THE PROBABLE USE OF DISCOIDAL STONES

Hoffman. W. F.; American Naturalist, 12:478-481, 1878.

There is one class of pre-historic relics which has been treated or referred to by nearly every writer upon archaeology, with nearly as many theories and conjectures as to the probable use. Schliemann devotes many pages to illustrations, most of the specimens bearing exquisite designs in ornamentation. England, Ireland and several continental localities have yielded numerous examples of the same style of relics with less ornamentation. The mounds throughout the Ohio and Mississippi valleys have furnished many highly wrought specimens, but rarely any with any attempt at ornamentation. These relics occur of various materials, such as diorite, syenite, quartzite, novaculite, greenstone, jasper, and in a few cases catlinite. They are circular, concave on either side sometimes, and I might say generally have a hole in the middle, varying from one-eighth to one-fourth of the total diameter. The periphery is seldom flattened but usually slightly convex, showing no trace of wear, but on the contrary, perhaps more highly polished, if that be possible, in many of those found.

There are two predominating sizes; specimens of the first class averaging from three to six inches in diameter, while those of the second are generally less than two inches. These may again be subdivided according to their perforation, ornamentation, etc., but it is not our purpose to dwell upon these points. The smaller specimens, which are found to exceed the larger in great proportion, were no doubt used in games, similar to tossing pennies and winning upon certain pre-arranged agreements. There may have been some colors used to distinguish one side from the other, and as colors, manufactured and applied by aboriginal races are easily removed, we can readily account for their absence after years of exposure or burial. Many of our American tribes play games in which four, five, or even six small bodies are employed, upon one or both sides of which lines or other characters are cut or burned to serve the purpose of ready identification. The Dakotas make beautiful specimens from the seeds of Prunus virginianus, upon which lines are burned so as to give the stone the appearance of a beetle.

These stone relics were not employed in hunting, by throwing at birds or game, as some have ventured to suggest, as the time and labor employed in their manufacture would have been more than lost. I doubt if any were suspended as ornaments or charms, as the constant wearing of a cord would eventually leave its impression upon the sharp edges, and then for a warrior to be impeded by any weighty and unnecessary ornaments is inconsistent with aboriginal customs. A disk made of catlinite, measuring about three inches in diameter, was recently found among a sub-tribe of Utes in south-western Colorado. The specimen is little more than half an inch thick, having a perforation in the centre around which are cut a series of narrow circles extending nearly to the outer edge. The opposite side is perfectly smooth. As this was used in gaming, by tossing into the air and betting upon the side to turn up, we are led to suppose that similar relics were used by other tribes for similar purposes. That the relics of the mound-builders are of much superior workmanship is granted. None of the implements of the modern Red race will compare with them, therefore we can scarcely expect to find any relics of this class in a good condition, or as perfectly finished.

The larger discoids were used for another style of amusement. The materials employed in their manufacture are usually of the hardest species of stones or rocks, as they were in greater danger of being broken. These larger discoidal stones were undoubtedly used in playing what is now termed the chunge or

chung game. To illustrate my reason for the supposition I shall submit some remarks and references from a recent report made to Prof. F. V. Hayden. Catlin gives a description of the chung-kee game as one of the amusements of the Mandans. This was played with a stone ring two or three inches in diameter. Prince Maximilian also noticed this among the Mandans and Manitaries (Minneta-rees). The Abbe Em. Domenech describes a game of this character as observed in the extreme western portion of the continent. Adair describes the national game of the Cherokees under the name of chungke, and gives a detailed description. Jones says, "The great game upon which the Southern Indians stake both personal reputation and property was the chungke game." For further reference to this game, and the tribes by whom it was played, I would refer the reader to works by DuPratz, Brackenridge, Lewis and Clark, Turner, Morgan and Prickett. I saw a game of this sort played by the Coyotero Apaches, which will be described farther on. As far as I am able to learn, it is indulged in, to-day, only by this tribe. The Cuchanos (Yumas) played a game of this kind until recently; which they called mo-upp, the Mexicans termed it redondo. Lieut. Whipple in speaking of the Mojaves says, "Some of the young men selected a level spot forty paces in length, for a play ground, and amused themselves in their favorite sport with hoop and poles. The hoop is six inches in diameter, made of an elastic cord. The poles are straight and about fifteen feet in length. Rolling the hoop from one end of the course, two persons chase it half way, and at the same instant throw their poles. He who succeeds in piercing the hoop wins the game."

As far as I was able in ascertaining, this game was not played by the Mojaves in the immediate vicinity of Camp Mojave (A. T.) in 1871, at which time I had occasion to visit that locality in a scientific capacity.

Since enterprising traders and settlers have established themselves at or near all the Indian reservations in the country, the aborigines have almost entirely discontinued the manufacture of implements and weapons of stone, substituting such articles as can be purchased to answer the requirements of the game. Thus instead of spending days of patience and labor on a stone ring or discoid, one can be constructed of twisted raw-hide or wood in a few hours, which answers the purpose as well or even better.

The Coyotereros above mentioned play a game similar to that of the Mojaves, corresponding in all particulars also to the so-called chung-kee game. A perfectly level piece of ground is selected, which is afterward retained for this game only. A distance of about twenty-five paces is marked off, having a width of about four feet. Two play the game, and the necessary materials required are a pole for each of the players, and a hoop made of a branch of tough wood nearly an inch thick, which is formed into a ring having a diameter of about six or seven inches. This is sometimes wrapped with raw hide or sinew. Then there are two cords running horizontally across the inner space, intersecting two similar ones attached vertically, giving the middle the appearance of the cross-wires in an engineer's transit. The poles are each about fifteen feet long, consisting of spliced pieces of cottonwood, and having the general appearance of a good sized fishing rod with the thin end slightly turned upward. When the players are ready, they take their positions at one end of the course, and one of them placing his forefinger on the periphery of the hoop and grasping the sides with his thumb and fingers, rolls it with sufficient force to drive it to the other end of the course. When it is half way the players start abreast, pushing their poles on the ground before them. When they reach the middle of the course the poles are pushed ahead so as to pass through one of the spaces between the cords, the game resulting upon some previous agreement as to what was required in counting. This is repeated from the end where the first attempt terminated, and continued for hours. I have seen men lose blankets, horses, bows and

MMF-014 FLINTS, CELTS, ETC.

arrows, and in fact almost everything of which they were possessors.

Similarities between this and closely allied games formerly practiced might be noticed, but it is not the object of the writer to more than refer to the probable use of the discoids as mentioned in the beginning.

MMF-014 SOME RELICS OF THE INDIANS OF VERMONT

Perkins, George H.; American Naturalist, 5:11-17, 1871

Fig. 6 seems to be a badge of office, amulet, or something of the sort. It is made of a very pretty breccia composed of light and dark material. It is finely wrought and very smooth, though not polished. The upper side is worked to a sharp edge, from which the sides round outwards towards the rectangular base, which latter has a hole at each end running obliquely through the ends. The length of the relic is 4.5 inches and the height nearly 2 inches. This was found about a mile north of Burlington, Vt. All these articles, except Fig. 2, are in the Museum of the University of Vermont. Besides such remains other traces of the Indian tribes are seen in the hieroglyphics. At Bellows Falls two rocks were found many years ago on which were rudely traced heads, a large group on one and a single head on the other. Some of these had rays coming from the top. Near Brattleborough, by the side of the river, a large rock was found which was covered with tracings of animals, as snakes, birds, etc., in all, ten figures, some not recognizable as representing any animal.

Such are some of the works which tell us of the former occupants of Vermont. (p. 17)



Figure 6 (MMF-014)

MMF-015 GIANT CRESCENTS: A NEW STONE AGE INDUSTRY FROM SOUTH AFRICA

Anonymous; Nature, 128:36, July 4, 1931.

Mr. C. van Riet Lowe describes a new stone age industry from South Africa in the Trans. of the Royal Society of South Africa, vol. 19, pt. 3. It consists of an assemblage of stone implements hitherto unrecorded from Mazeppa Bay, at the mouth of the Kogha River, halfway between the Great Kei and Bashee rivers on the Transkeian coast of the Cape Province. The implements are all found on the surface, so that there is no actual evidence of date; but their technique suggests a late Middle [Palaeolithic] Stone Age. Material, debris, technique, weathering, show that they belong to a single industry practised from Mazeppa to Algoa Bay and as far inland as the south bank of the Orange River, that is over an area of approximately 20,000 sq. miles. This is a new culture. It is a typical blade industry, including characteristically long blade-like implements, principally more or less isoscelene (acute angled) in shape and variants of these. Associated with the points, scrapers, and graters, and by far the most characteristic and interesting product of the industry, is a type of implement only one of which had hitherto been found and recorded in the Union. It is an implement shaped like the quarter of an orange. The flat surfaces meet to form a more or less straight cutting-edge, and there is a strongly curved upper surface away from the cutting edge, coarsely flaked and retaining a portion of the original surface untouched in the middle. The implement may be regarded as a giant crescent. The specimen originally described came from the Kasougu River and was unassociated; but similar and finer specimens are now associated with a definite industry, the present collection coming from Mazeppa Bay. The average size for five specimens is 9.65 cm. by 3.35 cm. by 1.73 cm. Probably the industry represents a transition from the Middle to the Later [Palaeolithic] Stone Age, and is an integral part of a cultural admixture from a contact between neanthropic and palaeanthropic man.

MMF-016 STONE YOKES FROM MEXICO AND CENTRAL AMERICA

Anonymous; Nature, 112:217, August 11, 1923.

Excavations in Mexico and Central America have disclosed certain objects of unusual and definite shape and of wide distribution, the function of which is unknown. The stone yoke is shaped like the letter U and is about two feet in height, with the bevelled outer surface often carved with elaborate designs. It has been impossible to identify these objects either in native manuscripts or in the many available examples of sculpture in stone and clay. The evidence now collected by Mr. S. K. Lothrop in the July issue of Man shows that the stone yoke was worn round the waist and that it served no utilitarian purpose. The suggestion now made is that the yoke may represent the underworld, because the outline resembles the Mexican symbol for that region, and also because the yoke is associated with death and sacrifice in the Santa Lucia sculptures. But the proof of this theory must await the presentation of new facts.

MMF-017 FLINTS, CELTS, ETC.

MMF-017 WEST INDIAN STONE COLLARS

Anonymous; Nature 119:26, January 1, 1927.

An interesting suggestion relating to the origin of the 'stone-collars,' which are a problem in West Indian archaeology, is made by Mr. A. D. Russell in Man for December. The collar stone is an object in shape much like a horse collar, but obviously too small for that purpose, and unsymmetrical in shape, being bent to one side at the narrower end. Various theories as to their origin have been put forward. Mr. T. A. Joyce has suggested that a wooden mechanism is indicated, two unequal ends of the fork of a tree being bent round and fastened together, the part of the tree cut off below the fork being represented by the protuberance called by some archaeologists the 'shoulder.' It is here suggested that this wooden mechanism was a tree climber, which is symbolised by the stone collar. This might more accurately be termed a belt or cincture. The palm climber of West Africa and the West Indies, with which the collar is compared, is made in two pieces. Two lengths of supple wood are bent into a long oval hoop, the two ends on the right side being secured by a permanent fastening, those on the left being done up and undone as need requires. The identity of the palm climber in West Africa and the West Indies is scarcely to be explained as introduced by the slave trade, since the archaic stone collar proves its existence in the latter area before slaves were introduced.

MMF-018 ARE THEY TWISTING STONES?

Abbott, Charles C.; American Naturalist, 7:180-182, 1873.

Associated with the various forms of stone implements and weapons found upon the surface of the fields in New Jersey are certain flat, quadrangular plates of stone of varying density, having one, two or more holes drilled through them. The outlines of these stone plates vary considerably, as may be seen by the reference to the drawings of seventeen specimens given by Squier and Davis, in "Ancient Monuments of the Mississippi Valley," p. 237, Fig. 136; and the position of the holes will also be seen to vary to a considerable extent. Of the two-holed specimens found by the writer, in the neighborhood of Trenton, N.J., the majority are about six inches in length by one and one-half inches in breadth; and the perforations are in most instances about an inch from either end. Such specimens as these are by many archaeologists considered "twisting stones," or "for condensing the raw hide or sinews used as bowstrings." We have, however, looked upon them as "breast plates;" using that term not to designate a protective covering, but as an ornament that was suspended by a cord so as to rest upon the breast; or by the perforations, sewed or fastened securely to the skin mantle of the red man.

We have considered this to be the case, because in the "surface" burials---that is, graves originally on the surface, and now but little beneath it---which we have frequently discovered, we have found these perforated stones, of various shapes, lying upon the strip of black mould which once was a human body, always in such a position as to show that, whatever the object's use, it was placed upon the breast of the dead man, when the burial took place, or was one of the ornaments about him during life, and so was buried with him; and it seems strange, that if such a stone had been used solely as a "twister," that

it should be placed upon the breast, instead of at the feet where the domestic implements are found, or at the right side, where we find the arrowheads, an axe or two, spears, knives and lanceheads.

Very many of these perforated stone relics, too, have but a single hole drilled through them, and being of such small size, and variously outlined, it is no stretch of the imagination to set them down as ornaments for suspension from the nose and ears. These single-holed specimens run into the others, as it were, just as the spear and lancehead are but large arrowpoints. Again, there are other specimens of this class of relics, which have more than two holes, sometimes as many as seven; as though the stone had been drilled again, when coming into the possession of another. At the ends of these many-holed specimens particularly, there is often found a series of well-cut notches, too small and closely set for any special use; but it seems to us very suggestive of a record that the owner of the stone has kept; and if so, the use of the stone as an ornament, worn at the breast, becomes the more probable, the specimen having additional value given it by the record, if such it was, that is engraved upon its margin.

Mr. Evans, in his work, "Ancient Stone Implements of Great Britain," figures, on pages 380-1, specimens allied to those we have described, but having the holes drilled in pairs, at each end. They differ further from the American forms, by being usually "round on one face and hollow on the other;" while as a rule, at least in New Jersey, they are flat upon each side, with more or less bevelling of the edges.

With reference to the use of these plates, Mr. Evans quotes Rev. Canon Ingram, as suggesting "that these British plates were bracers or guards, to protect the left arm of the wearer against the blow of the string in shooting with the bow." Had this been one of the uses to which some of the American forms had been put, would it not have been retained by the Indians until now? And does any tribe of our aborigines use such a guard when hunting or fighting with the bow? There seems to be much reason, indeed, to believe that these plates were "bracers," in England, and it may be that many of the American forms were used in twisting cord and in condensing sinew; but as we have found so many in graves, in the position we have described, we cannot but think that the vast majority were merely for ornamental purposes.

MMF-019 SINGING STONE

Garrido, Pablo; Americas, 11:30-31, June 1959.

Compiler's Summary: A peculiar stone in an Incan wall is described. It possesses three holes which produce musical notes when blown into or struck with the palm of the hand.

MMF-020 FLINTS, CELTS, ETC.

MMF-020 [LARGE CACHE OF FLINT IMPLEMENTS]

Anonymous; Nature, 45:20, November 5, 1891.

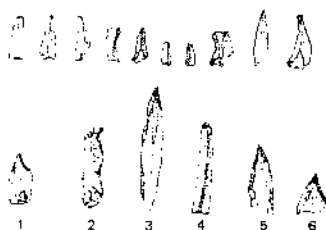
Extensive excavations of the prehistoric mounds in Ohio and Indiana have lately been carried on under the supervision of Prof. Putnam. In one mound, near Anderson Station, Indiana, 7232 flint spear-heads and knives have been discovered. They were found in a layer one foot thick, extending over a space of twenty by thirty feet. They are made of grey flint found only in Indiana. The largest find of flint implements previously made in America did not include more than 1800 specimens.

Immense concentrations of stone implements exist elsewhere, but the purpose of such hoards has never been discovered.

MMF-021 SMALL FLINT IMPLEMENTS FROM BUNGAY

Dutt, W. A.; Nature, 77:102-103, December 5, 1907.

The small flint implements figured in the accompanying drawing were found in a sandy hollow about 2 feet deep at Bungay, in Suffolk. The sand in this hole was littered with minute flakes; in a few minutes I picked up between fifty and sixty, of which the figured ones are typical examples. I hesitate to describe the implements as "pigmy flints," because their fine secondary chipping is not confined to the thicker edge or "back" of the flakes, but, judging from photographs I have seen, they closely resemble some pigmies found recently near Brighton by Mr. R. S. Toms. So far as the untrimmed flakes are concerned, it is impossible to distinguish them from typical pigmy flakes, while the trimming of implements 3 and 5 is identical with that of the pigmies.



In consequence of nearly all the English pigmies having been found on the surface of the ground, it has been impossible to say with any confidence whether they belong to the Neolithic, Bronze, or Early Iron period. In view of this, it is interesting to know that the small flakes and implements from Bungay were found in association with a polished axe of grey flint, a black flint lance-head of very delicate workmanship, one of the rare and finely chipped triangular "knives," and some small convex scrapers showing very delicate secondary chipping. These implements were found in the same sandy hole when the small implements were found in the same sandy hole when the small implements were discovered, and from an examination of the sides of the hollow it was evident that they all came from what might be called a "Neolithic floor" about 18 inches from the surface of the ground. Nowhere on the surface of the surrounding ground could I find a single flake or implement, and if the ground had not been disturbed in order that a small quantity of sand might be carted away, not one of the implements would have been brought to light. As it happened, they were all found within an area of about six square yards. Some small bones found on the same site have been identified as those of a girl or a small woman.

The makers of the small flint implements evidently had their home or their "workshop" on a sandy knoll only a few feet above the level of the marshes of the Waveney Valley. On this knoll and a neighbouring one there are some saucer-shaped depressions in the ground very suggestive of hut-circles.

MMF-022 'DIMINUTIVE' FLINT IMPLEMENTS

Anonymous; Nature, 135:1079, June 29, 1935.

Diminutive flint implements---to be distinguished both by their form and their cultural associations from the microlith of upper palaeolithic and early neolithic age---have been found in pliocene and pleistocene deposits in Suffolk, Lincolnshire and the Thames Valley. In describing their characteristics, Messrs. J. Reid Moir and J. P. T. Burchell point out (Antiquaries J., 15, 2) that on two previous occasions only, so far as they can ascertain, have similar implements been recorded, the first being by M. E. Pittard in 1908 in the valley of the Rebieres, Dordogne, and the second in the account of the implements found with the relics of Peking man in the cave in Chou Kou Tien. These diminutive implements do not show the characteristic forms of the microlith, but are rather diminutive forms of the industries with which they have been found in association. As regards their age, the specimens now described belong to four different periods, of which the latest is much older than upper Aurignac. The earliest of the Suffolk implements are of pliocene age and pre-palaeolithic type, coming from the Suffolk bone bed beneath the Red Crag. Next comes St. Acheul and early Le Moustier series from the 'Middle Glacial Gravel' (held to be of second Interglacial age) underlying the upper chalky boulder clay. Next are implements from the Upper Chalky Boulder Clay; and lastly those from the Lower Floor of late Le Moustier or early Aurignac age in Bolton and Co.'s brickfield, Ipswich. The Lincolnshire implements come from the 100 ft. and 50 ft. raised beaches below the brown boulder clay, and are middle to upper Le Moustier; and those from the Thames Valley come from the base of the 50 ft. terrace of post-Combe rock age, while others may be derived from the Boyn Hill 100 ft. terrace and possibly from the 50 ft. terrace of pre-Combe rock age. The maximum length of these flints is two inches and the minimum is 5/8 in. Their purpose seems beyond conjecture.

MMF-023 FLINTS, CELTS, ETC.

MMF-023 MICROLITHS FROM THE CENTRAL PROVINCES, INDIA

Anonymous; Nature, 141:208, January 29, 1938.

The excavation of a rock-shelter, Dorothy Deep Shelter No. 1, west-north-west of Pachmari in the Mahadeo Hills, Central Provinces, India, by Dr. G. R. Hunter has brought to light an extensive series of microlithic quartz implements. An important feature is that the finds are stratified. In interim and final reports (Nagpur Univ. J., 1, 1935; 2, 1936), the excavation of the shelter, which began in 1932 and was continued in 1934 and 1935, is described in detail. Two periods of occupation were distinguished: one of a later people using pottery, and an earlier civilization with quartz implements of characteristic Tardenoisian geometric form, without pottery or any trace of metal.

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MMF-024 CHINESE JADE IN AMERICA

Anonymous; American Naturalist, 21:96-97, 1887.

In the "Proceedings of the American Antiquarian Society," vol. iv. p. 62, Mr. Frederick W. Putnam makes a report of jade objects which have a double interest. Twelve specimens are reported from Nicaragua and Costa Rica, ten of which were ornaments made by cutting celts into halves, quarters, or thirds, a portion of the cutting edge of the celt remaining on each piece. The method of sawing the objects is indicated. The first query, therefore, is, For what reason should a celt of such hard material be cut up and perforated? Let us suppose that the original blade belonged to the outfit or accoutrement of a celebrated warrior, hunter, or artist. The pieces of that blade would become powerful medicine or influential fetiches and highly prized.

Greater astonishment is excited when we read the report of Mr. O. W. Huntington upon the nature and source of the material in these ornaments. It is as follows: "The specimens which you left with me are unquestionably Chinese Jade, having all the characters of that mineral, although the largest specimen from Costa Rica is rather unusual in its color, and would not be taken for jadeite at sight."

No. 33,395, Costa Rica, H. = 7. Sp. gr. on 166 grms., 3.281. A small fragment before the blow-pipe fused readily below 3 to a glassy bead.

No. 33,391, Costa Rica, H. a little under 7. Sp. gr. on 54-1/2 grms., 3.341. Fused quietly below 3 to transparent glass, not acted on by acid.

No. 32,794, Costa Rica, H. a little under 7. Sp. gr. on 13 grms.,

3.326. Fused quietly below 3 to a transparent glass, not acted on by acid.

The day has gone by for hasty conclusions, and Professor Putnam would be one of the last to jump at one. The Naturalist will shortly give account of evidences of connection of Costa Rica with Polynesia by means of a witness in another kingdom of nature. It will now be in order to collate during the next ten years the evidence for and against contact between the Orient and the western shores of America which will speak for itself.

MMF-025 DEPOSITS OF FLINT IMPLEMENTS

Snyder, J. F.; Smithsonian Institution Annual Report, 1876, 433-441, Washington, 1877.

In the "Ancient Monuments of the Mississippi Valley" is mentioned a strange class of deposits of stone implements and other objects, differing in the motive of interment from the simple caches which I have described. The interest of that valuable work culminates in the chapter devoted to "sacrificial mounds," the arrangement and contents of which exhibit the plane of religious thought attained by the moundbuilders. The "altars" of burnt clay; the votive offerings, through fire, of their choicest works in stone, copper, mica, and shell, doubtless together with many articles of less durable materials which were consumed by the intense heat; the cremation of human bodies; the heaping of earth upon the glowing mass; and the introduction of strata of sand in the enveloping turulus, with the outward covering of coarse gravel, together constitute a record wonderful and unparalleled. Certainly the most plausible solution of this interesting problem rests in the view ascribing the origin of this class of monuments to ideas of propitiation or devotional fanaticism. In either case we feel tolerably certain of the fact that the inclosures of the so-called sacrificial mounds were intended by their constructors to be final. We have here no stores of hidden goods to be withdrawn at pleasure, for use or traffic, but a deposit of objects made in accordance with some superstitious rite or religious notion, and designed to remain there undisturbed to the end of time.

Associated with the sacred mounds which covered the burnt offerings, and in the same inclosure, Squier and Davis, (page 158, l. c.) describe one which contained no burnt altar, but in the place of it a great number of curiously wrought disks of black flint, which appeared to have been buried without the accompaniment of fire, but with the same precision, and covered by the same strata of sand and outward layer of gravel as were the clay altars of the other mounds with their treasures of polished implements, utensils, and ornaments. The account given by Mr. Squier of this deposit, on page 158, "Ancient Monuments," &c., is as follows: "Another singular mound, of somewhat anomalous character, of which a section is herewith given, occurred in the same inclosure with the above. It is remarkable as being very broad and flat, measuring at least 80 feet in diameter by 6 or 7 in height. It has two sand strata, but instead of an altar there are two layers of disks chipped out of hornstone, some nearly round, others in the form of spear-heads. They are of various sizes, but are for the most part about 6 inches long by 4 wide, and three quarters of an inch or an inch in thickness. They are placed side by side, a little inclining, and one layer resting immediately on the other. Out of an excavation 6 feet long by 4 wide not far from six hundred were thrown. The deposit extends beyond the limits of the excavation on every side. Supposing it to be 12 feet square, (and it may be 20 or 30,) we have not far from four thousand of these disks deposited here. If they were thus placed as an offering, we can form some estimate, in view of the fact that they must have been brought from a great distance and fashioned with great toil, of the devotional dervor which induced the sacrifice, or the magnitude of the calamity which that sacrifice was perhaps intended to avert. The fact that this description of stone chips most easily when newly quarried, has induced the suggestion that the disks were deposited here for the purpose of protecting them from the hardening influences of the atmosphere, and were intended to be withdrawn and manufactured as occasion warranted or necessity required. It is incredible, however, that so much care should be taken to fashion the mound and introduce the mysterious sand strata, if it was

designed to be disturbed at any subsequent period. There is little doubt that the deposit was final, and was made in compliance with some religious requirement. An excavation below these layers discovered traces of fire, but too slight to be worthy of more than a passing notice." It may be here noted that the disks in this deposit had never been used.

In the year 1860 a similar deposit of hornstone disks was discovered in this vicinity, in the town of Frederickville, in Schuyler County, on the west side of the Illinois River. This locality was a favorite abiding-place of the Indians, and the center of a dense population. Relics of their works are still found in abundance throughout this region. A small ravine near the foot of a bluff, one day, after a heavy rain, caved in on one side, and the displacement of a large quantity of earth in consequence exposed to view a few strange-looking flints. They had been buried about 5 feet below the surface of the hillside, laid together on edge, side by side in long rows, forming a single layer of unknown extent. The discovery of such novel objects attracted some of the villagers to the place, who dug out about thirty-five hundred of the unique implements, and, their curiosity satisfied, abandoned the work without reaching the limits of the deposit. From diligent inquiries of persons who were present at the time, I learned that the flints had apparently been placed in an excavation made for the purpose at a point of the bluff above the highest water-level, and about two hundred yards from the river-bank. No traces of fire above or below were seen, and no peculiar arrangement of the superincumbent earth was noticed, nor was any mound or other mark of any kind discernible over or about the place to designate their hiding-place. It was several years after this occurrence when, in 1871, I first heard of it. Several visits to the place were rewarded with but a few badly mutilated specimens of the disks which I obtained from the citizens; the rest of the large number had disappeared. At length I found in the possession of Mrs. Charles Farwell (whose husband owns the premises where the deposit was found) ten of the flints, two of which she kindly gave me. The stone of which these disks are made is a dark, glossy hornstone, undistinguishable from the disks of the sacrificial mound in Ohio, and, like that deposit, these Frederickville flints had been buried without having been used.

On the eastern bank of the Illinois, below the confluence of the Sangamon River, and four miles below Frederickville, is the city of Beardstown, in Cass County. Immediately on the bank of the river at this place can yet be seen the remnant of a large mound of artificial construction, which formerly rose 30 feet or more above the level of the surrounding country, and afforded from its summit an uninterrupted view for miles up and down the river. This fine monument has succumbed to the progress of modern civilization, and almost entirely disappeared.

In the summer of 1872, I received intelligence that a deposit of the same sort of flints had been found at Beardstown. In excavating a cellar for a new building on Main street, the laborers had reached the depth of 4 feet, when they struck the flints, and soon threw them all out, about a thousand in number, a large portion of which I secured. The disposition of the flints in this deposit was different from that in the Ohio mound, and that of the Frederickville deposit also. These were imbedded in the bank of the river, above the reach of highest water, and about 300 yards up the bank of the stream from the large mound. An excavation about 5 feet deep had been made through the sand to the drift-clay, and, instead of being placed on edge, as in the two other deposits, a layer of the disks had been placed flat on the clay, with points up stream, and overlapping each other as shingles are arranged on a roof. Over the first layer of flints was a stratum of clay 2 inches in thickness; then another layer of flints was arranged as the first, over which was spread another 2-inch stratum of clay, and so on, until the deposit comprised five series or layers of flints, when the

whole was covered with sand. The area occupied by these buried flints was an ovoid, corresponding in outline with one of the implements, and measured in length about 6 feet, and in width 4 feet. But the apex, estimated to be one third of the area, was cut off by the cellar-wall of the store-house which had been erected there twenty years previously to this date. On inquiry I learned from an old citizen who was present when the cellar was dug, that the deposit of flints was then discovered, and about five hundred of them were thrown out; and that the discovery at that time attracted but little attention, "for," he remarked, "Indian flints and stone axes were as common here then as brick-bats are now." No traces of fire were visible, nor had there been within the recollection of the oldest settler of the place any mound or other external object to mark the place of deposit. The flints from this lot are identical in material, color, style of execution, and general outline and dimensions with those I have seen from the deposits at Frederickville and Clark's Work in Ohio. None of these bore any marks of wear or use. A few of them are almost circular in shape. Some are rough, but the majority are very accurately proportioned and neatly furnished, which we may accept as proof that the implements were manufactured by several artisans, who possessed unequal degrees of skill. Their average length is 6 inches, their width 4 inches, and they are three-fourths of an inch thick in the middle. Their average weight is one and a half pound. The fixed pattern which they are all intended to approximate is an ovoid with pointed apex and regularly curved base. Many of them are flat; others are a little concave on one side and convex on the other, though a very large majority of those I have examined are equally convex on both sides, and all are carefully chipped to a sharp edge all around. They were all made from globular or oval nodules of black or dark-gray hornstone, which were first split open and each part again split or worked down by chipping to the shape and size required. In several of the specimens the first fracture of the nodule forms the side of the implement with but slight modification beyond a little trimming of the edges. Many of them retain in the center the nucleus around which the siliceous atoms agglomerated to form the nodule. In a few the nucleus is a rough piece of limestone; in others it consists of fragments of beautifully crystallized chalcedony, surrounded by regular light and dark circles of eccentric accretion, and the exterior of the rock was encrusted with a compact, drab-colored calcareo-siliceous coating half an inch in thickness, which in some of the specimens has not been entirely removed. Nearly all the Beardstown disks were roughened and discolored with patches of calcareous concretion almost as hard and solid as the flint itself, indicative of undisturbed repose in their clay envelopes for a great period of time. The raw material of which these objects were wrought was imported from some locality remote from their hiding-place. An Illinoisian myself by birth, I have nowhere in this State, during thirty years' observation of its geology, found any number of hornstone nodules in any of its strata. Among the disks of the sacrificial mound at Clark's Work, Ohio, nodules of hornstone were found, but none, so far as I could ascertain, were met with in the Frederickville deposit, and I am certain there were none with the Beardstown flints. The nodules of hornstone found buried at East Saint Louis, near the deposit of agricultural flint implements, are the same in texture and color as all the disks. Nodules of this variety of flint, I am informed, are quite common in some parts of Indiana, and I have often seen them in Southwestern Missouri. Mr. Squier thinks the Ohio disks drew their supplies of flint from a locality known as "Flint Ridge," which extends through Licking and Muskingum Counties in that State. "This ridge," he says, "extends for many miles and countless pits are to be observed throughout its entire length, from which the stone was taken. These excavations are often 10 or 14 feet deep, and occupy acres in extent."

The buried flint nodules of East Saint Louis are the only ones of the kind I have ever heard of in this State. In all my hunts for Indian relics I have met with no such masses of flint here; nor have I seen any place where fragments or "chips" of this stone would indicate, by their quantity, the site of a workshop that turned out hornstone disks from the crude bowlders. Consequently, I infer that the buried implements of Frederickville and Beardstown were imported ready made, and not manufactured in this region from imported masses of stone.

Unlike all other stone implements, these have been found only in large deposits, singularly uniform in size, material, shape, and workmanship, and presenting the further remarkable feature of being buried new; thus far not one of them having ever been found isolated or bearing marks of use.

A deposit of flints, somewhat approaching the disks in size and shape, was found a few years ago near Trenton, J. J. Dr. Abbott, who described them in the *American Naturalist* (vol. iv, 153-5) and previously in the *Proceedings of the Academy of Sciences, Philadelphia*, (1863, page 278.) styles them "hatchets." His description of them in the *Naturalist* is as follows: "Prominent in this list stands the magnificent brown jasper specimen, (Fig. 22.) There we have a carefully chipped hatchet, well edged on all sides, of a nearly perfect oval outline. Its greatest width is 3-3/4 inches; greatest length 6 inches, and its greatest thickness scarcely 3/4 of an inch. This specimen is one of a hundred and fifty that were discovered in plowing a piece of newly-drained meadow near Trenton, N. J. The one figured is somewhat shorter and broader than the others, which might have been hatchets or lance-heads."

The description and drawing given by Dr. Abbott in the *Naturalist*, would answer well for many of my Beardstown disks; and the similarity of the two sets of implements is strengthened by the parallel fact that none like his have as yet been found isolated.

The explanation first suggested to account for the astonishing number of flints in the sacrificial mound at Clark's works, was that it constituted merely a magazine of "roughly blocked out spear-points," convenient to be withdrawn and finished at leisure, and buried, in order to keep the stone damp and the more easy to chip. But this hypothesis fails to account for certain peculiarities of their occurrence. For what purpose they were made, and why buried in such vast numbers and with such care, are points yet undetermined.

Among these flints, occasionally one is found longer and narrower than the others, and very much resembling in form some of the flint hoes used in the cultivation of maize by the Indians down to the days of the early French missionaries. It is probably this chance similarity which has led Dr. Patrick to regard all the hornstone disks of the three deposits as agricultural tools. If they were designed for agricultural implements, or for weapons of war or the chase, or for tools to be used in any of their mechanical arts, it is evident that they had not yet passed into general use, as all yet discovered were new, and none have been found isolated, as we find specimens of all other objects of stone used by the people, who we feel certain also made and deposited the disks.

The most rational theory in explanation of the disks in the mound at Clark's Work is, that they were deposited there in obedience to some superstitions or religious idea; especially when viewed in connection with the strange contents of the other mounds in the same inclosure. But why similar disks, which we have the best reasons to believe were from the same locality and made by the same people, should be transported to the banks of the Illinois River, and there receive final entombment, is not so easy of interpretation.

Until further research has thrown additional light upon the origin and design of these curious flints, they are entitled to be ranked among the most interesting and problematical of aboriginal stone implements.

MMT-007 THE ANTIQUITY OF MAN IN AMERICA

Anonymous; American Antiquarian, 9:49-53, 1887.

This article covers many areas controversial at the time; the Trenton artifacts, discoveries in California's auriferous gravels, Nevada's footprints, etc.; but it is placed in this subsection because of the technological items reported in the beginning and the general appreciation of early man's capabilities.

The meeting of the Anthropological Society of Washington, Nov. 16, was devoted to the reading of two papers bearing on the antiquity of man in America. One of them by Mr. G. K. Gilbert of the U. S. Geological survey, based on the "finding of an ancient hearth on the southern shore of Lake Ontario at the bottom of a well about thirty feet deep." The other by Mr. W. J. McGee, based on the "finding of an obsidian spear head or knife, four inches long and beautifully chipped, in Walker River Canon, Nevada." Mr. John Murdock also reported at the same meeting the discovery of a pair of "wooden snow goggles" in a shaft which his party dug, at the depth of 27 feet below the surface at Point Barrow.

Prof. O. T. Mason in Science, Dec. 10, speaks of these discoveries as if they furnished "Archaeological enigmas." He calls two of them "neolithic finds of an advanced type" but the other a paleolithic, and classes with it as paleolithic a civilized implement, called a Spanish rallador or grater from British Honduras. "It consists of a plank of hardwood, 18 inches long and 10 inches wide, into which have been driven nearly 2000 bits of quartz no larger than tiny arrow heads, only they are not chipped in the least and are less shapely." The rallador he compares to the tribulum or threshing sledge from Tunis. In reference to the finds Mr. Mason concludes, "with such material as the Gilbert hearth, the McGee spear head, the Murdock spectacles, the Tunis tribulum, and the Honduras grater, the question does not seem to be as to the antiquity of man but whether archaeology will help us in ascertaining his primitive condition on this continent." "We have evidence which would satisfy some minds that at the end of the glacial epoch there lived men who built fires, chipped obsidian beautifully, and wore snow goggles; while in this Nineteenth Century men are still in the lowest story of the stone period." Mr. Gilbert, however, in Science, Dec. 17, makes a correction. He says: "The local relations indicate that the hearth was made during the accumulation of the shore deposits, so that its antiquity is somewhat less than that of the culmination of the last general glacial of North-eastern America. Its antiquity is virtually identical with that of the Niagara river. The estimate of 7000 years is based upon the hypothesis that the rate of the recession of the falls has been uniform; a hypothesis not yet fully examined." He adds "The hearth was discovered by Mr. Daniel Tomlinson of Gaines, N. Y., and our knowledge of it is based entirely upon his oral evidence." He says also that the formation described by Mr. Murdock is unquestionably littoral and not greatly elevated above the present coast. What we know of recent oscillations of coasts in Arctic regions and of the rate of formation of littoral deposits, tends to the opinion that the Point Barrow goggles have an antiquity far less than that of the other finds."

We desire to express our gratification with the candor and the conscientious regard for truth which both of these writers exhibit. Prof. Mason, we judge, rather leans toward the belief in the extreme antiquity of man, but he has the candor to acknowledge that there is an inconsistency in the use of the terms neolithic and paleolithic, the neolithic relics in these cases being older than

the so-called paleolithic. This is a point to which we have referred in the Antiquarian when speaking of the paleolithic relics in the gravel beds of Trenton, and the stone ollas or stone mortars and other relics found beneath the lava beds in the auriferous gravel in California. As we understand it, Prof. Whitney claims the auriferous gravels to be older than the Trenton gravel in which Dr. Abbott found so many so-called Paleolithic relics; in that case the neolithic specimens are older than the paleolithic. Certain geologists say that there is great uncertainty about the lava beds and the auriferous gravels to be older than the Trenton gravel in which Dr. Abbott found so many so-called Paleolithic relics; in that case the neolithic specimens are older than the paleolithic. Certain geologists say that there is great uncertainty about the lava beds and the auriferous gravels, and the date of any relic found in them cannot be established, but geologists also state that the Trenton gravel is not so old as Dr. Abbott first claimed it was. This leaves the case about as it was. Neolithic relics hypothetically older than paleolithic. The liability threatens the archaeologists who are making these remarkable finds that their discoveries will prove too much; they put the wooden goggles farther back in time than the obsidian spear heads; and the polished stone mortars farther down in the ground than the rude argillite implements and so will make a progress backward. We would say also that there are other difficulties which come up in connection with these finds and which make the problem still more complicated. These difficulties arise from the archaeological side and not the geological. The discovery of so many argillite relics has a tendency to throw doubt upon the artificial origin. On this point archaeologists seem to be divided. Prof. F. W. Putnam thinks that all of Dr. Abbott's relics are genuine paleolithics; several thousand of them have been discovered; he even goes so far as to describe how they were hafted. Dr. Rau also endorses this position and says: There is no evidence but a probability, that some of the argillite specimens were used with handles." On the other hand, quite a number of the members of the Philadelphia Academy of Science, have expressed serious doubts about Dr. Abbott's finds and so we must suspend judgment.

The quartz relics which Miss Babbitt claims to have discovered among the gravel beds of Minnesota, have undergone the same experience. Dr. C. C. Abbott and Prof. Putnam agree upon their artificial origin and endorse them as confirming the Trenton finds. While on the other hand Prof. N. H. Winchell of Minnesota, in his letter expresses himself uncertain as to their artificial origin, though their geological position would indicate that they were very ancient. Accidental fractures we think might account for the majority of Miss Babbitt's relics, and we doubt very much if they should be taken as furnishing evidence of the presence of paleolithic man in the pre-glacial period. These finds of paleolithic and neolithic relics in wells and gravel banks on the edges of bluffs and littoral deposits are not so convincing as they might be. Many of them are mere accidental finds and nearly all of them lacked the careful supervision of a scientific man who understood the points at issue, when they were taken out of their so-called matrix. European Archaeologists do not rely upon such haphazard discoveries and why should we?

We do not believe that they prove so great antiquity even if they were all of artificial origin and genuine finds. We here quote from Sir. Wm. Dawson who has recently written upon the subject:

"If the earliest men were those of the river gravels and caves, men of the "mammoth age," or of the "Paleolithic" or Palaeocosmic period, we can form some definite ideas as to their possible antiquity. They colonized the continents immediately after the elevation of the land from the great subsidence which closed the Pleistocene or Glacial period, in what has been called the "continen-

tal" period of the Post-glacial age, because the new lands then raised out of the sea exceeded in extent those which we have now. We have some measures of the date of this great continental elevation. Many years ago, Sir Charles Lyell used the recession of the falls of Niagara as a chronometer. Estimating their cutting power as equal to one foot per annum, he calculated that the beginning of the process which dates from the Post-glacial elevation was about thirty thousand years ago. More recent surveys have, however, shown that the rate is three times as great as that estimated by Lyell, and also that it is probable that a considerable part of the gorge was merely cleaned out by the river since the Pleistocene age. In this way the age of the Niagara gorge becomes reduced to perhaps seven or eight thousand years. Other indicators of similar bearing are found both in Europe and America, and lead to the belief that it is physically impossible that man could have colonized the Northern Hemisphere at an earlier date. These facts render necessary an entire revision of the calculations on the growth of stalagmite in caves, and other uncertain data, which have been held to indicate a greater lapse of time. The value of the demands made on other grounds is uncertain and fluctuating. Egyptian chronology is constantly varying as new discoveries are made. Anthropology cannot precisely measure the rapidity of variation in the infancy of mankind, and Hale has recently shown that American facts respecting language prove that it may vary much more rapidly than has heretofore been supposed.

It is farther to be observed that these demands for long time relate to the Post-diluvian period, about which there is a consensus of historical evidences limiting it to at most 3000 B. C., and that there is no geological evidence of any considerable change, either physical or vital, within that time."

Against these opinions of the eminent Geologist we suppose some will place the discoveries of the foot-prints in Nicaragua concerning which so much has been said. [See MEF-015] Prof. F. W. Putnam has taken issue with us in reference to these foot-prints and has sent us photographs of them to show that they were genuine human foot-prints.

Dr. Earl Flint, however, speaks of the geological age of the foot-prints as follows: "After the fifth eruption there was a repose of many centuries during the accumulation of the clay. Above this and under the ash of the sixth eruption we find fossil leaves and plant stems distinct from those of the lower layer on which the foot-prints occur." In reference to these finds we think Prof. Putnam himself mainly relies upon his own study of the slab, and says nothing about the geological position and age of the footprints.

Before the foot-prints are brought into the case as proof, there should be a study of the deposit by some professed geologist. Prof. Putnam speaks as an archaeologist and pronounces the foot-prints human. We do not dispute his conclusions and yet we remember that when the Carson foot-prints were discovered, there were a number of men who at once decided that they were human, and we found that they were mistaken, and we think that there is a possibility of Prof. Putnam being mistaken in this case. We will not undertake to say what animal has a foot-print resembling man. We only say this, that Prof. E. D. Cope brought into the Anthropological section at Philadelphia in 1884, a tooth which he claimed to be a human tooth taken out from the Miocene. We happened to hear an English naturalist say "it may have been a monkey's tooth." We would rather rely upon the opinion of Dr. Dawson than any of these hap-hazard finds for he seems to have considered the subject carefully and based his opinion upon substantial evidence. He says:

"It is true that announcements have been made from time to time of the discovery of remains indicating the existence of man in deposits as old as the Miocene period; but these alleged facts have broken down on investigation, so

MMT-008 HIGH TECHNOLOGY

that no certainty can be attached to them. Nor has any one discovered in the Tertiary formations older than the modern or later Pleistocene any animals nearly related to man which might be regarded as his precursors.

To this recency of man we have to add the farther fact that the earliest known men are still members of the human species, not exceeding in their variation the limits presented by the various races of men in the present day. Nor do the bones or the works of the earliest men present any approximation to those of lower animals. In physical development and cranial capacity the oldest men are on a par with those who have succeeded them, and, in some respects, superior to the average."

MMT-008 ON A ROCK-CRYSTAL LENS AND DECOMPOSED GLASS FOUND IN NINEVEH

Brewster, David; American Journal of Science, 2:15:122-123, 1853.

Sir David said that he had to bring before the Section an object of so incredible a nature that only the strongest evidence could render the statement at all probable:---it was no less than the finding of a rock-crystal lens, in the treasure-house at Nineveh, where it had for centuries lain entombed in the ruins of that once magnificent city. It was found in company with several bronzes and other objects of value. He had examined the lens with the greatest care and taken its several measurements. It was not entirely circular in its aperture, being 1-6/10ths inches in its longer diameter and 1-4/10ths inches in its shorter. Its general form was that of a plano-concave lens, the plane side having been formed of one of the original faces of the six-sided crystal of quartz, as he had ascertained by its action on polarized light,---this was badly polished and scratched. The convex face of the lens had not been ground in a dish-shaped tool in the manner in which lenses are now formed, but was shaped on a lapidary's wheel, or in some such manner. Hence it was unequally thick, but its extreme thickness was 2/10ths of an inch, its focal length being 4-1/2 inches. It had twelve remains of cavities which had originally contained liquids or condensed gases; but ten of those had been opened probably in the rough handling which it received in the act of being ground; most of them therefore had discharged their gaseous contents. Sir David concluded by assigning reasons why this could not be looked on as an ornament, but as a true optical lens.

Sir David then exhibited specimens of the decomposed glass found in the same ruins. The surface of this was covered with iridescent spots more brilliant in their colors than Peacock copper ore. Sir David stated that he had several years since explained how this process of decomposition proceeded, on the occasion of having found a piece of decomposed glass at St. Leonard's. It had contained manganese, which had separated from the siliceous glass, at central spots around which circles of most minute crystals of true quartz had arranged themselves; founded by irregular jagged circles of manganese, these being arranged in several concentric rings. When this process reached a certain depth in the glass it spread off laterally, dividing the glass into very thin layers, and new centres seemed to form at certain distances, and thus the process extended.

MMT-009 CARTHAGINIAN LENSES

ymous; Nature, 126:445, September 13, 1930.

The July issue of the British Journal of Physiological Optics contains a communication from Mr. H. L. Taylor on "The Origin and Development of Lenses in Ancient Times", which ascribes the development of the lens to the Cretans of 1800 B. C. His examination of the contents of museums of the eastern Mediterranean has led him to the conclusion that ivory and steatite, the materials used for beads prior to 2000 B. C., were replaced at a later period by rock crystal, onyx, agate, and cornelian. The discovery of the magnification produced by a bead of rock crystal, led to the production of lens-shaped beads, and eventually of lenses such as those of the "royal gaming board" found in the palace at Cnossus and to the perfect lenses, found also at Cnossus and at Mount Ida, now in the museum at Candia. They are all plano-convex with powers between 5 and 8 diopters. The Phoenicians appear to have carried such lenses to the mainland, to Troy, Tyre, Nineveh, and Britain. At Carthage five glass lenses have been unearthed at the ancient necropolis, two of them, of power 5.5 diopters, in the sacrophagus of a prominent individual, who it is presumed suffered from presbyopia and wished to protect himself against this disability in his next existence.

MMT-010 A LINK TO MAYAS FOUND IN DAKOTA

Anonymous; New York Times, IV. 11:8, May 24, 1936.

The influence of Mayan culture upon the primitive peoples of the Great Plains has been further corroborated in North Dakota with the discovery of a stone "telescope" in a gravel pit north of Grand Forks in the Red River Valley.

Edward A. Milligan, North Dakota archaeologist directing excavating of Indian village sites for the WPA, announced the discovery. He estimates the instrument was used by the aborigines who roamed this area about 4,000 years ago.

Hewn from a form of limestone that has become almost as hard as marble, the telescope is 8 inches long and 1-1/3 inches in diameter; it has a conical cylinder 1/2-inch in diameter at the eye end. On the exterior is a single carved symbol, the nature of which is unexplained.

From a Graveyard

The telescope was one of the numerous artifacts recovered from the gravel pit, a graveyard of prehistoric people. Archaeologists know tubes of this kind were employed for astronomical purposes, because carvings on the Mayan pyramids of Central America depict people of that era studying the heavens with the tubes in connection with their worship of the heavenly bodies.

Mr. Milligan believes that the Mayans, their relatives or offspring migrated by way of the West Indian islands to Florida, thence along the Appalachians to Ohio, and thence along the Ohio, Mississippi and Missouri Rivers. He points out that artifacts of Mayan character have been found along this supposed route and as far west as Yellowstone National Park.

MMT-011 HIGH TECHNOLOGY

MMT-011 A PRIMITIVE LENS

Paget, R. A. S.; Nature, 112:326, September 1, 1923.

If a wire of 1/2 to 3/4 mm. diameter be bent into a closed circular loop of about 8 mm. diameter and dipped in water, or a transparent oil such as castor oil, a stable liquid film can be readily obtained covering the loop. A thin dished metal disc with a circular hole in the centre is a convenient alternative to the wire loop. Liquid can be easily added or removed without breaking the film, so as to vary the curvature of the liquid lens so formed. Such a lens, though far from perfect, may be made to give a magnifying power of nearly 5 over a small field.

It is conceivable that some of the very fine work done in Egypt, long before the invention of "optical" glass, may have been made possible by the use of a liquid lens of this kind. The phenomenon might easily have been accidentally observed; for even a drop of water lying on a greasy surface gives a small but appreciable magnification of the surface which it covers.

By using a thicker wire (about 2 mm. diameter) and less liquid, a diminishing lens may be made in the same way.

MMT-012 [ETRUSCAN ARTIFICIAL TEETH]

Anonymous; Nature, 31:564, April 16, 1885.

The use of artificial teeth is not so modern as is generally believed. Cosmos states that in the museum of Corneto, on the coast of Italy, there are two curious specimens of artificial teeth found in Etruscan tombs probably dating to four or five centuries before our era. These graves contained the bodies of two young girls. On the jaw of one is still to be seen two incisors fixed to their neighbours by small gold rings; in the other the rings remained, but the artificial teeth had fallen out. The teeth, carefully cut, had evidently been taken from the mouth of some large animal. The dentist's art amongst the ancients was not confined to drawing teeth, and replacing them by artificial ones, for natural teeth have been found which have evidently been treated in various ways. That this curious fact has escaped notice so long, is due to the rarity of Etruscan skeletons, the Etruscans employing cremation generally, and also to the circumstance that modern inquirers are more interested in objects of Etruscan art and industry than in the remains of their ancient owners.

MMT-013 A SILVER AND IRON MASK FOUND IN MISSOURI

Anonymous; American Antiquarian, 3:336, 1881.

Mr. Hannibal Fox, of Milton, Sullivan county, Mo., wrote us Dec. 5, 1879, in reference to the finding of a mask, made, as he says, of silver and iron, and enclosed a photograph of the same. "Melting silver and iron in a crucible, and preparing a matrix by placing clay over the face after death, and pouring the metal so that the vessel tipped," &c., do not seem to be operations which are usual among the aborigines, or, as far as we know, even among the Mound Builders. The mask was plowed up in a field, and is now in the possession of Mr. Fox.

MMT-014 MEXICAN ARCHAEOLOGICAL EXHIBITS AT CHICAGO

Anonymous; Nature, 132:274, August 19, 1933.

An extensive selection of the remarkable series of relics found in the tombs of Monte Alban in the state of Oaxaca, Mexico, is being shown at the Century of Progress Exposition, Chicago. It includes ornaments in gold, jade, pearl, and other precious, or semi-precious, material. The exhibit is in charge of Senor Alfonso Caso, the excavator and director of the expedition by which the tombs were first discovered. One of the most remarkable exhibits, recently described in a communication from Science Service, Washington, is a human skull covered with a mosaic of small flat pieces of turquoise and fitted with eyes of pearl shell and a nose of flint. The skull is a representation of the god Tezcatlipoca, the god of the sky and Nature. Only one other skull treated in this way is known. This is now in the British Museum. The exhibits also include a number of objects which are considered to point to a knowledge in ancient Mexico of the art of the turner. A chalice of rock-crystal and several pairs of large spool-shaped earpendants, of the same material, are so accurate in outline as to suggest that they could have been cut in this hard material only with a mechanical aid such as the lathe.

MMT-015 AN OLD-WORLD CUBIT IN AMERICA

Anonymous; Nature, 111:647, May 12, 1923.

In Ancient Egypt, Part iv, 1922, Prof. W. M. Flinders Petrie directs attention to excavations made by the School of American Research at Santa Fe, New Mexico, where the measurements of buildings indicate a unit of 20.7 inches. This figure accords exactly to the well-known Egyptian cubit: 20.62 in the best early examples, 20.65 in later cubit rods, 20.76 on the Roman Nilometers. Babylonia had a rather longer type, 20.88 in. for the cubit of Gudea's plotting scales, and this was also the standard of Asia Minor, 20.6 to 20.9, with a mean of all of 20.63 in. "How could this reach New Mexico? It was evidently Asiatic. We have evidence from weights of an Asiatic diffusion of a Babylonian original over India, China, and Etruria. If the cubit similarly passed to China, it might thence reach North America. It has been already pointed out how the cross at Palenque (Southern Mexico) was in its detail of ornament derived from Italian crosses of about the eighth century, probably carried to China by the Nestorian mission. By the same route the Asiatic cubit may have passed over to the New World at some earlier period."

MMT-016 HIGH TECHNOLOGY

MMT-016 PREHISTORIC TIME MEASUREMENT IN BRITAIN

Anonymous; Nature, 89:619-620, August 15, 1912.

The current volume of Transactions of the North Staffordshire Field Club contains a paper by Dr. McAldowie on prehistoric time measurement. It is based on two years' astronomical study of megalithic monuments which have been uncovered in long barrows in Staffordshire and Gloucestershire. It treats first of the orientation of these to sunset at the equinoxes and solstices, and at the early part of November and February, and of May and August, the former being the astronomical, the latter the religious, or agricultural, year of prehistoric times. The chief object of the communication, however, is to direct attention to the shadows cast by these stones on these various dates.

At the south-east corner of the chamber in the Bridestones, in North Staffordshire, which is oriented to sunrise at the equinoxes, the shadow of a tall upright strikes the edge of a recumbent stone at its base when the sun is on the meridian at the summer solstice. At Notgrove, on the Cotteswolds, there is a similar arrangement of megaliths in the middle of a long barrow, the chamber being oriented to the November sunrise. The meridional shadows strike the south and the north edges of the dial stone respectively at the equinoxes and the beginning of November.

The chief portion of the paper deals with a dolmen situated in a long barrow at Camp, near the author's residence, where he had spent many days at all seasons of the year. This dolmen is composed of a north, a south, an east, and a west stone, all firmly embedded in the solid rock, and occupying a somewhat quadrilateral space. A leaning-stone crosses near the middle of this space in a diagonal manner, forming, by its union with the east stone, a sacred "creep-way." The dolmen marks the solstices and equinoxes at sunrise, noon, and sunset, but the most interesting feature is the fact that solar hours for two degrees west longitude are indicated by shadows touching various prominent points or edges of the stones at the beginning of November and February, and at the winter solstice and the equinoxes. The remains of the barrow prevent the sun's rays from striking on the dolmen when the sun is low on the eastern or western sky, but the author has been able to obtain photographic records of the shadows of twenty-two out of twenty-seven possible hours of sunshine at the dates mentioned. The south stone acts only as a style, the north stone only as a dial, while the east and diagonal stones fulfil both purposes. The probability is that the megaliths were sacred gnomon stones worshipped by certain of the ruling races of prehistoric times, and used as a means of registering the passing time chronicled by the sun. The dolmen, therefore, appears to have been a sacred instrument constructed to show mean solar hours, horae equinoctiales (used by the ancients for astronomical purposes), at certain critical periods of the year. It must, moreover, have been in use before the barrow was erected. The author has also found solar hours indicated by shadows on the uncovered stones in the long barrows at Notgrove and BeLas Knap, although he has not been able to obtain a regular series owing to their imperfect condition. Perhaps, ages after time-measuring dolmens had been in use, some change of cult was introduced into this country, either by the pre-barrow race themselves, or, more probably, by alien invaders, and certain of those ancient temple observatories used as foundations for barrows. The practice of taking over sacred places and temples was a universal one amongst ancient races.

MMT-017 THE TRANSPORTATION AND LIFTING OF HEAVY BODIES BY THE ANCIENTS. A PROBABLE METHOD

Watkins, J. Elfreth; Smithsonian Institution Annual Report, 1898, Government Printing Office, Washington, 1899, pp. 615-619.

Many surveys of ancient transportation and construction technology exist. The sourcebooks will reproduce some of the more interesting ones as space permits.

The ability displayed by the ancients in transporting heavy objects from place to place, and in raising them many feet above the surface of the ground in the construction of temples, palaces, and pyramids, has long been a source of wonder. It may, indeed, be truly said that the engineers of the present era would find it difficult to perform similar feats, even when aided by the most improved appliances devised through the ingenuity developed in this inventive age.

So impressed with amazement at the achievements of the ancient architects have trained archaeologists become that not infrequently the opinion is expressed that these men, whose work has withstood the ravages of scores of centuries, must have been aided by well-devised machines, possibly operated by one or more of the generated forces.

Notwithstanding these conjectures, in the many careful and thorough explorations made in late years the remains of no hoisting machine have thus far been discovered, nor has there been found, either in the Assyro-Babylonian cuneiform inscriptions or in the Egyptian hieroglyphics, an account or description of the processes employed by the ancients in lifting heavy masses to extraordinary heights. In fact, no equivalents for the words "derrick," "pulley," "winch," etc., have yet been identified in these ancient records to encourage the belief in a *seaculo sapienti*.

It is the purpose of this paper to explain how many of the edifices now regarded as remarkable could have been constructed by primitive tools and simple methods. Eight years ago, while the writer was making the investigations which led to the publication of a paper entitled "The beginnings of engineering," presented before the American Society of Civil Engineers, access was had to many drawings and photographs of ancient mural paintings and carvings in relief in the collections of the United States National Museum and in the great libraries of Washington and New York City.

While several pictorial remains are in existence, showing how, by the aid of sledges, rollers, and levers, huge images of stone were moved over ground from the quarry to the building under construction, nothing has been found to show how these heavy masses were lifted into position. In examining the photographs referred to, it was noted, especially in the pictorial representation of Assyrian and Egyptian remains, that many figures are represented in various attitudes carrying something in baskets or bags. It occurred to the writer that this "something" was clay or other kind of earth, and a method of lifting heavy bodies into position suggested itself, in which the sledge, the roller, the level, and the inclined plane, made of earth, were the only mechanical powers necessary to be utilized, no pulleys, cranes or other machinery being employed.

From the earliest times the erection of embankments of earth has been carried on by savage nations and primitive peoples. The earth-works left by the mound builders in America and Europe are conspicuous evidence that the digging and carrying of earth was practiced on a large scale in many localities, far distant from one another, centuries ago.

MMT-017 HIGH TECHNOLOGY

Let us see how, by the aid of inclined planes of earth, the huge stones used in the construction of dolmens or cromlechs could be put in position by the use of primitive appliances. The stone posts could be moved to the desired place and erected in a vertical position in the manner indicated by the several accompanying drawings. In the illustration (Pl. I) figure 1 shows the stone post lying flat and supported upon rollers; figure 2 shows two piles of earth dug from the pit in which one of the posts is to stand. The stone slab can be rolled up the inclined plane and tilted into position, and, by the use of levers and pry bars, be made to stand upright; and when the second post was erected by a similar operation, and the space between the posts and around them filled with earth, the top stone or lintel could be placed in position after being elevated to the desired height on another inclined plane, made of earth, as shown in Pl. II. These operations being completed, the earth could be returned to the pits from which it was dug and the surface of the ground leveled.

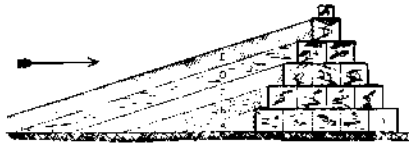


Fig. 1. (MMT-017)

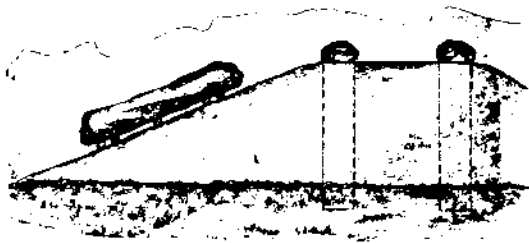


Fig. 2. (MMT-017)

Since these lines were written the author has received the following communication from Dr. William H. Dall, of the United States Geological Survey:

"During a visit to the island of Jersey (Channel Islands) in 1878, while wandering over the hills, I noticed among many dolmens scattered about one which seemed to have never been finished. The sides stood erect, and one enormous roofing slab had been laid in place, covering about half the cavity at the inner end. Behind it and against the erect slab, forming the end of the chamber, was an inclined plane of earth, beaten very hard, and extending from the level of the uprights to the general level of the soil. Here was a clue to a very simple explanation of what had often puzzled me---how the prehistoric people without tools could have raised such heavy weights as the roofing slabs of the dolmens to the positions in which we find them. It was evident that cords and rollers,

with a sufficient number of sturdy savages, would have been amply sufficient for the purpose in the case before me. The thorough manner in which the clay of the inclined plane had been consolidated was evident when it was considered that the denudation of it by the elements during unknown centuries had been insufficient to noticeably reduce its level or conceal its evident purpose."

The construction of the Egyptian pyramids, for centuries a matter of wonder, could have been performed by similar methods. Let us suppose that each of the stone blocks used had a rectangular base, being half as thick as wide, and that they were moved from the quarry to the pyramid in the direction indicated by the arrow in figure 1, block No. 1 being first placed on rollers and moved into position. The stone blocks numbered 2, 3, 4, and 5 could then have been transported along the surface of the ground in the same manner, and so could the other stones in the same tier, which are not shown in this view. An embankment at a 20 or 30 per cent grade (see section A) could then have been constructed by carrying earth from pits beyond the continuation of the boundary lines of the base of the pyramid. Over the surface of this plane, extended toward the quarry, the second tier of stones, of which blocks numbered 6, 7, 8, and 9 are visible, could then have been put in place; embankment B could then have been constructed, blocks numbered 10, 11, 12, and those behind them being put in place; and so on, by the aid of the additions to the embankments, C, D, and E, the remaining stones could have been put in position.

When the pyramid was complete the earth could have been removed from in front of it, the pits filled up, restoring the original condition of the surface of the ground, leaving no hint to gratify the explorer forty centuries after the work was done.

Let us see what labor this method would have involved in the construction of the pyramid of Gizeh, the largest of its kind, which is approximately 150 yards high and 250 yards square at the base. As is well known, in building this pyramid, which is located 3 miles south of Cairo, two kinds of stone were used---limestone and red granite. The limestone was quarried at El Massarah, 45 or 50 miles from Gizeh, while the red granite was brought from Assouan, near the first Cataract, over 500 miles. Both of these quarries were located on the River Nile.

In the foreground of the illustration (Pl. III) are to be seen rafts laden with stone blocks, brought from the quarries. Upon the sloping embankment blocks are being drawn on sledges, perhaps equipped with rollers, to the highest point to which the structure has been built, the inclined plane being gradually made longer and higher with earth brought from the pits on the right and left. The highest embankment necessary when the workmen reached the top course, assuming that a 20 per cent grade was adopted, would have been 750 yards long, containing about 7,500,000 cubic yards, if the sides of the earth embankment would stand at an angle of 30 degrees, which is not at all improbable.

Assuming that one laborer could have placed 2-1/2 yards (about 20 barrow loads) of earth on an average each day on this embankment, 10,000 men could have built it in twelve months of twenty-five working days. It is stated that 100,000 men were employed for twenty years in the whole work, so that, according to this calculation, the construction of this embankment would have occupied only a small portion of the total time consumed.

The false work to support the walls of the interior chambers of the pyramids could also have been made of earth rather than of timber. It should be remembered that heavy lumber for scaffolding must have been brought over long distances and that the framing and erection of any structure of sufficient strength to bear heavy weights would have required more skill and knowledge than the building of the pyramid itself by the method above described.

In the great temple of Rameses II is to be found a colossal statue of that king, which equals in dimensions and exceeds in weight any other Egyptian monolith, being 60 feet high and weighing 887 tons 5-1/2 hundredweight. It was made from a single block of red granite brought from the quarries at Assouan, 135 miles distant, by the River Nile.

At Baalbec, Syria, are to be found the ruins of three temples, one of which has been given the name of Trilithon, "Three-stone temple," from the extraordinary proportions of three of the stone blocks found in it, each being over 63 feet in length, 13 feet in height, and proportionately thick. These stones now rest in a wall over 20 feet above the present surface of the ground.

In the solution of the problem of putting similar huge blocks in place at the present day the utilization of inclined planes of earth in the manner just described might well be considered by the modern engineer before adopting a more complex method. In fact, since the various details of this method of construction have suggested themselves, the writer has examined photographs of many ancient structures and has yet to find one that could not have been constructed to a great extent according to the practices just described. Until the principles of the true arch were understood it was less difficult to move and erect long blocks of stone by these primitive methods than to place smaller units over the openings of structures designed in accordance with the types of ancient architecture, in which the arch, with a keystone, was lacking.

Especially was this true in an era when the value of time was not considered, and slaves were to be obtained by thousands, at small cost, to toil and sweat to gratify the ambition and perpetuate the fame of kings.

Happily for our race and time, the crack of the Egyptian slave master's whip and the weird cries in cadence of the battalions of swarthy laborers, while tugging in unison to draw or hoist the monolith, has given place to the puffing engine and the rumble of revolving wheels; but, mayhap, in the years to come, the engineering methods in vogue at the end of this eventful century will seem almost as crude to those who will practice in the new fields of applied science on the borders of which we seem to stand as these primitive methods of the ancients now appear to us. Whether the anticipations for the future shall be realized or not, and proud as we may be of the advances made by discovery and invention in our age, we must not forget that the patient perseverance of the engineers of antiquity, who, by brawn and muscle, and unaided by mechanism, built wiser than they knew, have been rewarded by the preservation of an undelible record of their achievements in the material remains of their edifices that have withstood the ravages of centuries. Will fate so favor the engineer of the nineteenth century, versed in the laws of modern science, and skilled in the practice of the mechanic arts?

Postscript. ---Since this paper was published in Cassier's Magazine, there appeared in L'Illustration, Paris, for the first time, an illustrated account of the restoration in 1895-1898 of the Temple of Karnak, the original construction of which was begun by Usertsen I in the twenty-fifth century B. C., being added to by Thothmes III, 1600 B. C., and again by Rameses III, 1200 B. C.

In the work connected with this valuable archaeological undertaking, a Frenchman, M. M. G. Legrain, under whose direction the restoration was carried on, employed at one time over 700 Fellahs. The methods adopted to replace the huge carved blocks of stone are thus described in L'Illustration, January, 1899:

By means of filling in and an inclined plane M. Legrain succeeded in lowering, piece by piece, its architraves of a weight of 57,200 pounds, and its capital and its tambours of 22,000 and 9,900 pounds.

It is a curious fact that the Fellahs merely began again exactly what their

fathers had done in order to crown with success the work to be accomplished. In looking at these inclined planes and at the laborers bent under baskets of earth, we find ourselves carried back several thousand years, since we have seen the same picture sculptured upon the walls of the edifices in commemoration of their construction. There is but one thing wanting in the modern picture, and we have not to regret it, and that is the man with the lash, the taskmaster of the force of laborers of what was, of old, the land of the Pharaohs.

MMT-018 SUPPOSED DISCOVERY OF A SHIP NEAR THE CAPE OF GOOD HOPE

Anonymous; Blackwood's Magazine, 3:339, June 1818.

A discovery has been lately made of a quantity of wood in a carbonized state, buried at some depth under the sand, about 10 miles from Cape Town. From the appearance and position of pieces of timber, it has been supposed to consist of the frame-work of a large vessel; and as it is at a considerable distance from the sea, and bears every mark of having been in its present position for a very long period, many speculations have been formed concerning it. The evidence on this point appears, however, to be extremely vague and uncertain; and from the specimens of the wood which have been exhibited in this country, which appear to be in the state of brown coal, as well as from all the circumstances of the case, it is probable that it does not differ from the forests or collections of trees which have been found buried in different situations, in consequence of some of the great revolutions which have formerly occurred on the surface of our globe.

There is a resemblance between this tale and the ship skeletons supposedly found in the California desert. If such are true, the implications include: (1) higher sea levels in the past; and (2) wide-ranging seafarers from somewhere.

MMT-019 [PREHISTORICAL MASS OF METAL]

Anonymous; Nature, 73:180-181, December 21, 1905.

In the current issue of the Bulletin de la Societe d'Encouragement Messrs. G. Arth and P. Lejeune give some interesting particulars of a prehistoric mass of metal found near Nancy at a depth of 4-1/2 metres below the surface. The mass weighs about 300 kilograms, and is accompanied by fragments of charcoal and slag. It appears to have been the base of an ancient hearth in which the metal had been subjected to repeated and prolonged heatings. The metal contains, in addition to iron, 1.212 per cent. of combined carbon, 0.038 per cent. of graphite, 1.670 per cent. of silicon, 0.026 per cent. of sulphur, 0.013 per cent. of phosphorus, and 0.180 per cent. of manganese. It is thus a steel containing a higher percentage of silicon than is now usual. The microscopic examination shows that it belongs to Guillet's first group of silicon steels, pearlite steels consisting of a solid solution of Fe_2S in iron.

MMT-020 HIGH TECHNOLOGY

MMT-020 SINHALESE IRON AND STEEL OF ANCIENT ORIGIN

Hadfield, Robert; Nature, 89:360-361, June 6, 1912.

One of the most notable ancient specimens of iron is the famous Pillar of Delhi, which is not the less interesting in view of the fact that the city of Delhi itself, now the capital of our Indian Empire, owed its name to this pillar. It is a solid shaft of wrought iron welded together, the total length being 23 ft. 8 in., the total weight about six tons---a very creditable piece of work for a metallurgist of at least 1600 years ago. There are several important inscriptions on the pillar, which, notwithstanding the long exposure to wind and rain, are still quite clearly cut, showing that very little alteration has taken place in them since they were added on to the pillar. There is also a still longer iron pillar at Dhar, or Dhara, having a total length of no less than 42 ft. (p. 361)

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MMT-021 [ANCIENT IRON BEAMS IN INDIA]

Anonymous; Nature, 90:140, October 3, 1912.

The Builder for September 27 gives some interesting particulars of ancient iron beams in India. At the Black Padoga of Orissa, Kanarak, there are some very large forged iron beams; the two largest members, as described by Mr. H. G. Graves, of Calcutta, are 35 ft. long by 8 in. square, and 25.5 ft. long by 11 in. square. The broken end of one of them indicates that the method of construction was by the welding up of billets. The age of the temple has been placed by some as early as the ninth, and by others as late as the thirteenth, century. Examination indicates that the small blooms were of 3 to 4 lb. in weight; in some places the blooms appear to have been welded together in strings to form short bars, which in turn were welded into place. No special care seems to have been taken to make the blooms break joint. The beams are nearly all of uniform size, and square in section from end to end. The designers do not appear to have understood the advantage of making the depth of the beam greater than the width. The beams could have been of but little structural value, although they constitute interesting examples of smiths' work.

MMT-022 THE IRON AGE

Anonymous; Nature, 113:24, January 5, 1924.

Dr. J. Newton Friend, in a paper entitled "Iron in Antiquity" which has been published in the Carnegie Scholarship Memoirs, volume xii., has brought together a great deal of information relating to the early use of iron. He agrees with Sir Flinders Petrie in regarding the iron which occurs in Egypt between the find of the pre-dynastic beads at El Gerzeh and the 18th Dynasty as belonging to the "Sporadic Iron Age of Egypt," and inclines to the view that the earliest iron used there was meteoric in origin, notwithstanding the fact that the earliest known larger piece of iron---that found in the pyramid of Khufu---was telluric. In support of the likelihood of the use of meteoric iron by primitive

man, he cites the cases of the Eskimo of the Coppermine River and Cape York quoted by Zimmer. Dr. Friend has some interesting notes on the use of iron in India. These include an account of the remarkable pillars of wrought iron at Delhi, dating from 300 A. D., and at Mandu near Dhar. Of these, the former is 23 ft. 8 in. in height, and the latter, now in three pieces, was originally 43 ft. 4 in. or possibly 50 ft. in length. Discussing the peculiar freedom from rust of early Indian iron, Dr. Friend states that he has found by experiment that after one year's exposure to the corrosive influence of alternating wet and dry, the relative corrodibility of modern mild steel is 100.0 as compared with iron from the Black Pagoda at Konarak, Madras, 89.3.

MMT-023 THE DELHI PILLAR

Hudson, J. C.; Nature, 172:499-500, September 12, 1953.

Much has been written about the Delhi Pillar, but the mystery does not seem very deep.

The freedom from rusting of the famous iron pillar at Delhi has long been a subject of comment and has been attributed by some writers to the peculiar properties of the ancient iron from which it is forged. Although some particulars of its history are obscure, it seems certain that the pillar dates from about the fifth century A. D. and is roughly 1,500 years old. The immunity of iron from rusting over such a long period is a striking phenomenon and it may therefore be of interest to report the results of some experiments that were made to ascertain the reason for this.

Table 1. Atmospheric Corrosion of Steel and Zinc

<u>Exposure station</u>		Corrosion rate. Mills (0.001 in.) per year	
		<u>Steel*</u>	<u>Zinc</u>
Delhi	1950-1951	0.23	--
	1951-1952	0.17	0.006
Godalming	1951-1952	1.7	0.042
Sheffield	1951-1952	4.2	0.51
Khartoum	Average, 9 yr.	0.1	0.02
Basrah	" 8 "	0.6	0.04
Singapore	" 10 "	0.6	0.04

* The specimens exposed at Delhi, Godalming and Sheffield were of steel containing 0.3 per cent of copper. This material is roughly one-quarter less corrodible than ingot iron, of which the Khartoum, Basrah and Singapore specimens were made.

MMT-023 HIGH TECHNOLOGY

Table 2. Meteorological Observations at New Delhi (1951)

	Jan.	Feb.	Mar.	Apr.	May	June
Relative humidity, per cent, 0830h.	74	52	53	42	35	41
Relative humidity, per cent, 1730h.	46	24	33	21	21	26
Rainfall (in.)	0.9	0.0	2.1	0.9	0.1	0.5
	July	Aug.	Sept.	Oct.	Nov.	Dec.
Relative humidity, per cent, 0830h.	63	74	63	50	50	59
Relative humidity, per cent, 1730h.	48	60	52	37	42	47
Rainfall (in.)	4.8	3.1	4.1	0.3	0.6	Nil

Small specimens, 4 in. x 2 in., of steel (1/8 in. thick) and zinc (1/20 in. thick) were exposed in the open air near the pillar for one year and their losses in weight were then determined after the corrosion products had been removed. Their corrosion-rates found in this way are compared in Table 1 with the results of similar tests made at other stations, both at home and overseas.

It is clear that the corrosive conditions at Delhi are very mild. Indeed, the zinc specimens were so little corroded that they retained much of their original polish after a year's exposure there. In my view, therefore, the lack of serious rusting of the pillar is to be attributed to the mildness of the local climate rather than to any intrinsic superiority in the corrosion resistance of the iron itself.

This conclusion is supported by a study of the meteorological data for Delhi, for which I am indebted to the Indian Meteorological Office. The figures for 1951, which fell within the experimental period, are given in Table 2.

It is known from the classical researches of W. H. J. Vernon that the relative humidity of the air is the primary controlling factor for the atmospheric corrosion of iron and that little or no rusting occurs unless the humidity exceeds 70 per cent. The records show that this critical value would only be reached at Delhi for a short time during the whole year. Presumably, too, the sulphur pollution of the atmosphere, which, as Vernon demonstrated, controls the corrosion rate when the humidity reaches the critical value for rusting, is but slight in the neighbourhood of the iron pillar.

The late Sir Robert Hadfield, who was very interested in the Delhi pillar and published an analysis of its iron, seems to have been of a similar opinion, for in one of his papers he prefaces his remarks about this and other specimens of historical interest by observing that "in dry air the action of corrosion may be very slight."

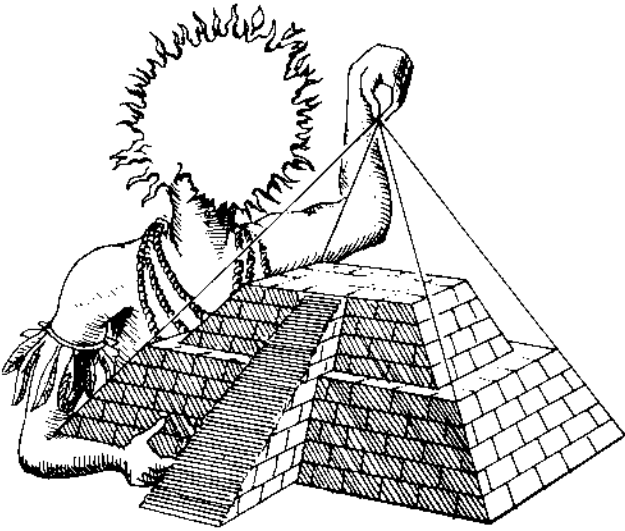
SECTION MS: STRUCTURAL ARTIFACTS

The most obvious remains of ancient civilizations are made of stone---the only construction material capable of surviving thousands of years of neglect. The stone artifacts bequeathed us are worldwide and span the spectrum from rough, undressed standing stones to the meticulously shaped stone spheres of Central America. These lithic remains pose several problems, such as (1) how did the ancients quarry and transport such immense objects over great distances, (2) how did they work the stones and fit them with such great accuracy, (3) what was the geographical extent and character of the so-called "megalithic culture," and (4) how and why did the ancients accurately align and orient structures and systems of structures in geometric and astronomical patterns?

- MSB Buildings. Temples, towers, houses.
- MSC Canals and waterworks. Aqueducts, irrigation systems, drained fields.
- MSD Dolmens and standing stones. Menhirs, rocking stones, and similar solitary plain stones.
- MSF Forts. Stone and earthen types, including vitrified works, apparently defensive in nature.
- MSG Graves and mounds. Chamber tombs, barrows, tumuli.
- MSH Henges, organized structures. Stone and wooden circles, alignments, and other purposeful arrangements, including Central American stone spheres.
- *MSO Obelisks and stellae. Columns and other solitary well-worked stones, usually engraved or carved.
- MSP Pyramids. Including pyramidal mounds and stepped pyramids.
- MSR Roads.
- MSS Systems of structures. Cities and geometrically arranged groups of structures. In essence, large-scale groupings or macroforms.
- MST Tunnels, mines. Includes den holes and catacombs, all underground construction.
- MSW Walls, ditches. Earthen banks included.

*This subsection not represented in Volume M2.

STRUCTURAL ARTIFACTS



The pyramidal urge. (Drawing by John Holden)

MSB-006 PREHISTORIC RUINS IN NEW MEXICO

ones, Elisha; American Antiquarian, 15:150-151, 1893.

There is no field at present attracting more attention or better rewarding the labors of the antiquarian than Southwestern New Mexico. Within a radius of five miles from a certain point in Socorro County, New Mexico, has been discovered several hundred ruins of the habitations of prehistoric man. The walls of these ruins are built of undressed stone laid in cement. Remains of huge cisterns, walls of fortifications, queer implements of bone and stone, beautifully designed and carved, also painted pottery; together with odd and artistic pictures, characters and symbols cut upon rocks in neighboring canons, all excite in the beholder wonder and admiration.

These ruins are found generally on high ground, and are composed of ancient buildings, containing from a few to several hundred rooms, averaging about eight by ten feet, and six feet in height. In some cases the buildings have been two stories high. There has been a side entrance to all of these rooms, but these openings, from some unknown cause, have been walled up. On the surface the walls of some of these ruins are well defined and can be easily traced, while others show only irregular piles of stone, as the crumbling ages have left them. They buried their dead in the ground floors of their rooms, with the heads toward the east, and, as a rule, their pottery, trinkets and personal ornaments with them.

In excavating these ruins one is constantly impressed with one paramount wonder, their great age. Huge pine trees, three or four feet in diameter, and one hundred feet in height, flourish upon the walls and in the rooms of these habitations of forgotten man. The infilling of earth and the increase of soil caused by vegetable growth and decay are naturally very slow. It has been estimated by geologists to average about one foot in eighty years. Admitting this to be true, our surprise knows no bounds when, on digging down beneath these giant trees, we pass through from six to ten feet of vegetable mold, then encounter from one to three feet of clean mashed sand and gravel, then a solid earthen floor covered with ashes, charcoal, bones and fragments of broken pottery. Yet still below this are skeletons of human beings, surrounded by their war weapons and ornaments of stone, copper and bone. No satisfactory account is given of this beautiful and wonderful ancient pottery. Many of the finest pieces are crushed by the weight of earth above them, yet many beautiful specimens are saved whole and perfect.

We can only conjecture what race of people inhabited this country so many centuries ago. Their religion, language and habits, the cause of their extermination, in fact nearly all concerning them is wrapped in profound mystery. They were sun worshipers and well advanced in the arts of carving, painting and building, and in agriculture. They flourished many centuries in Colorado, Arizona, New Mexico, Central and South America. They were exterminated either by famine, flood, disease or volcanic action at least a thousand years ago. In the eastern part of Socorro County are the ruins of an immense city known as Quivira, covering an area two miles square. Its walls, in some places, are eight feet thick, forty feet high, and several hundred feet long. A great aqueduct conveyed water to the city, but to-day there is no running water within forty miles of this ancient wonder. It stands silent and alone in the sunlight and moonlight. Where once the love, industry and skill of an unknown race made thousands of beautiful and happy homes, the coyote, bat and creeping reptile hold sway. This city was in ruins at the time of the conquest. When and by whom it was built was a mystery to the Mexican people more than three hundred years ago.

MSB-007 BUILDINGS

MSB-007 THE HOVENWEEP NATIONAL MONUMENT

Fewkes, J. Walter; Smithsonian Institution Annual Report, 1923, Government Printing Office, Washington, 1925, pp. 465-480.

These three paragraphs are quoted from the conclusions of this lengthy article.

It is almost impossible to traverse the country surrounding the Hovenweep Monument without observing mounds and other remnants of the former house-builders. The remarkable similarity of these remains is everywhere apparent. It is unnecessary to excavate any considerable number of these mounds to prove the identity of the builders. Neither is it desirable or necessary to reserve the extensive tracts of land upon which they stand to preserve the type of buildings characteristic of the extensive culture area to which they belong. The Hovenweep National Monument contains buildings typical of an extended area in southwestern Colorado, southeastern Utah, New Mexico, and Arizona. Similar buildings of the same type are found as far north as the Dinosaur beds of Utah and follow down the San Juan to an indefinite horizon. In the south the culture they represent merges into the Chaco Canyon region and that of the pueblos on the Rio Grande.

The relationship of Hovenweep buildings to those on the Mesa Verde is practically identical, but there are forms of buildings in the Hovenweep country which have not yet been found on the Mesa Verde. The massive character of the walls of several typical buildings of the Hovenweep suggests solidity and construction necessary for defense, and these buildings are ordinarily situated on the edges of great canyons and may have been so placed to secure distance views down the canyons or extensive vistas over the waterless plains. Plate 10 shows a tower on a projecting rock which has fallen and probably buried a cave dwelling. The masonry of the great houses is the most massive of all those made by the inhabitants of the San Juan drainage. In addition to this feature, attention may be called to the predominance of the tower element, which is likewise a Mesa Verde characteristic. They are condensed in form, not spread over a large area. The closest of the Hovenweep likenesses to the Mesa Verde buildings is the ceremonial rooms known as kivas, which are seen in Unit Type House, wherein we have a single central circular room surrounded by square rooms, very similar to the One Clan House near the road from Mancos to Sprucetree House. The terraced form of building so common among modern pueblos and so well illustrated in Far View House on the Mesa Verde has not thus far been made out clearly in pueblos of the Hovenweep Monument, nor do we find clusters of disjointed small buildings indicating a pueblo in process of formation so common in Hovenweep Monument as at Mesa Verde. This indicates to the writer's mind that the unconsolidated units of the Mesa Verde pueblos are older than the more closely amalgamated pueblos of the Hovenweep or the still more compact Chaco pueblos. It is apparent, as no evidence of white habitation has been found, that all are strictly pre-Columbian buildings; and their fine preservation would indicate that they are more modern than the mounds which conceal similar buildings on the Mesa Verde.

As we go west from Hovenweep there is a gradual change in architectural types and a corresponding change in relative age of the monumental remains. While stone houses whose walls are not very unlike those of the Hovenweep occur in this far western region, there is an older appearance to the ruins and a closer affinity to a prepuuebloan type which on the Mesa Verde underlies the puebloan. In the Hovenweep Monument there are evidences of two epochs of culture, an early earth lodge or pit dwelling culture and a later epoch, the buildings of which were constructed upon the more ancient. This underlying

prepuuebloan culture, generally extinct or submerged by a new influx of pueblo buildings, may have been an early stage in the evolution or a local development. The later or pueblo form, being more complex, varies more in different regions, although derived from an almost identical prepuuebloan type. It is not possible from our limited knowledge to make any final statement regarding the age of these two types of culture or the causes that led to the final abandonment of these buildings. The same reasons that have been advanced for the desertion of the Mesa Verde habitations are no doubt valid for those of the Hovenweep; migrations due to pressure produced by inroads of hostiles; desire for better farms and more water; changes of climate, perhaps; even growth of local feuds among different settlements, due to congestion of population, may have contributed to the migration of the Hovenweep people. The traces of direction of migration shown by the distribution of buildings suggest a southern migration or toward the sun, where farming conditions were more favorable and inroads of hostile people less frequent. Legends current among the pueblos support this conclusion. The population of this region was fairly large, or at any rate the size of the houses, with a few notable exceptions, indicate this. The people could not have had very extensive knowledge of where they were going, and there is no evidence of their possessing beasts of burden or other modes of transportation over long distances. Their struggle for physical existence was fierce, their migratory movement slow, and the evidences are that they harvested fairly good crops for a limited time as they spread over the country. The desire to improve their condition was intensified by the growth of population. Of necessity they sought the river valleys where water was constant and always available, and those unoccupied fields that were fertile were more extensive than any that could be found in a rocky environment. (pp. 477-479)

MSB-008 ATLANTIS UNDISCOVERED - - - BIMINI, BAHAMAS

Harrison, W.; Nature, 230:287-289, April 2, 1971.

In 1969, J. M. Valentine described what he called an "archaeological enigma" consisting of "pavement-like stones at 15 feet off North Bimini". Since then, newspaper reports, at least one magazine article and two books have suggested, first, that there is a seawall or roadbed submerged at about 7 m off the northwest coast of North Bimini (Fig. 1) and, second, that sections of pillars which seem "to have been carved from natural stone" lie at shallow depths off Entrance Point. Last October an advertisement for one of the books, Atlantis, by R. Ferro and M. Grumley, appeared in the New York Times, confidently reporting that although ultimately it may turn out that Atlantis is no more than a legendary pot of gold . . . Ferro and Grumley discovered unmistakable traces of an ancient civilization---exactly where and when Edgar Cayce prophesied the re-emergence of Atlantis.

These occurrences have now been carefully investigated, using SCUBA gear, underwater cameras and hand tools. Most of the underwater work was done by Dr. R. J. Byrne and Mr. M. P. Lynch, who also helped in the interpretation of the data. We were guided to the sites by Mr. Pino G. Turolla, said to have been the original discoverer.

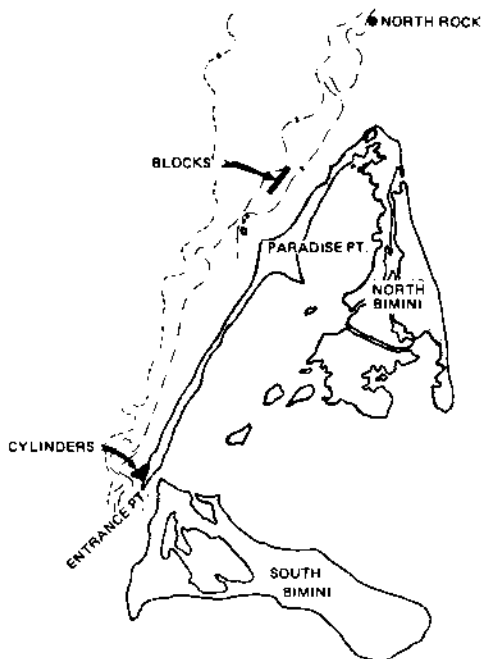


Fig. 1 Map of the Bimini Islands, showing locations of materials referred to in text. Bathymetric contours are in fathoms.

The most obvious "pavement-like stones" or blocks form single or double lines roughly parallel to the present shoreline. The blocks here are between 60 and 90 cm thick, somewhat pillow-shaped in cross section, their originally right-angled corners having been trimmed back, chiefly by boring molluscs and sea urchins. All of the blocks are of coarse-grained limestone lying on a stratum of denser limestone of finer grain. Shifting sands cover this underlying formation in most places, giving the impression that the blocks have been placed there. Erosion at the interface of the two rock types has caused many of the largest blocks to fracture, either under their own weight or when storm swells have caused heaving and fracturing.

Although casual inspection of structures such as the fractured rock of Fig.2B might suggest small slabs that have been cut and fitted, closer examination of the opposing faces of the lifted and the unmoved pieces indicates an exact correspondence of bedding planes and surface morphology, so that all pieces are from the same original block. Similarly, the margins of adjacent large blocks correspond to one another, indicating that all blocks have developed by fracturing of an originally coherent formation. At no place are blocks found to rest on a similar set beneath. Samples of several blocks indicate that all are composed of shell-hash cemented by a blocky calcite, a type that originates only in the fresh water vadose or phreatic zones. The rock was thus almost certainly lithified during the lower relative sea level of the Pleistocene.

The geological setting of the blocks is important. The three small islands off Paradise Point are composed of a cemented wind-blown sand (eolianite) above a cemented shell-hash, with an interface roughly 1 m below low water. The beds of cemented shell-hash gravels and marine sands extend to at least 2 m below MLW, so that the sequence of blocks of coquina limestone overlying marine sand limestones to the north-east of the islands is not surprising.

The blocks are believed to have originated as follows. A shell-hash gravel was deposited in shallow water as relative sea level fell during the most recent emergence of the Bahama Banks, and later brought into the fresh water environment. The materials were cemented and joints formed in the material, as is usually the case with limestones. After two sets of practically right angle joints

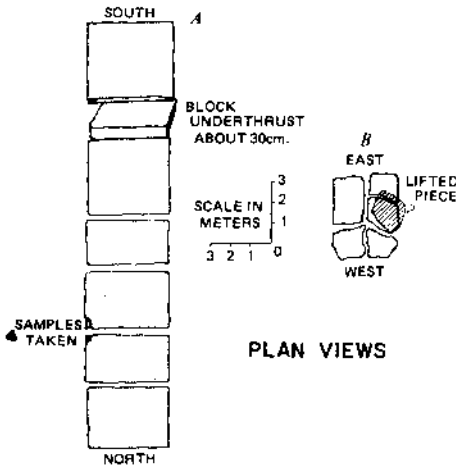


Fig. 2. Dimensions and arrangements of blocks (A) and fragments of a single fractured block (B).

had developed, submergence of the area brought the jointed coquina limestone first into the breaking zone of waves and then the offshore zones. Wave action probably caused much of the initial separation into blocks, but when the formation was farther offshore the destructive activity of marine life would have become dominant.

The overall result is a field of blocks that at first sight appear to have been fitted together, and this has led to statements such as, (some) "human agency must have been involved". The blocky remains of the limestone outcrop are, however, no more enigmatic than other subaerial or subaqueous outcrops of jointed limestone found in various stages of fracture and decay in the north-western Bahamas.

The cylinders (Fig. 1), previously called "pillars", raise different considerations. They were found (Fig. 3) in grooves in the limestone country rock running roughly perpendicular to the present shoreline. Such grooves are common at Bimini and other Bahamian islands. Two of the cylinders are composed of marble and have flute-like marks parallel to the long axis. The wavelength of the crests is about 15 cm and their height about 1.5 cm. The remaining cylinders consist of what is most probably an early natural cement. All of the

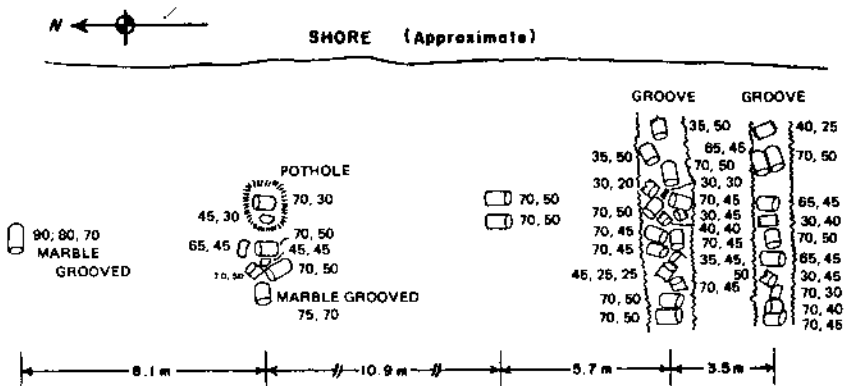


Fig. 3 Distribution of marble and cement cylinders off Entrance Point (April 17, 1970). Cylinders closest inshore were about 12 m from the shoreline. (First dimension is cylinder length in cm; the second is the diameter.)

cylinders are encrusted with a layer of whitish CaCO₃, a few mm thick. Although several of them have been attacked by boring molluscs and sea urchins, destruction has been hindered by periods of burial by sand.

Table 1. Eight Measurements of the Circumference of a 68.5 cm Long Cylinder, by 10 cm Intervals

Incremental distance (cm)	Circumference (cm)
0.0	135 (end)
10.0	152
10.0	160
10.0	165
10.0	163
10.0	157
10.0	147
8.5	142 (end)

Thin section examination of one of the marble samples indicates that it consists of calcite (90%) and quartz (8%) together with muscovite, pyrite and sphene. It is the metamorphosed equivalent of a calcite-rich limestone containing a small amount of clay. The marble is not native to the Bahamas, so that it would have had to be transported at least a few hundred miles to Bimini. Georgia is probably not the source and there is only a small chance that it could have come from Vermont (unpublished communication from J. B. Lyons). A possible clue to its origin is the pyrite content.

The cement cylinders are also composed of material which is not indigenous to the Bahamas (unpublished communication from R. Perkins). On balance, the material seems to be a hydrated natural cement.

Mr. P. Klieger of the Portland Cement Association, Skokie, Illinois, has supported this opinion on the basis of X-ray and petrographic analysis, as has Dr. R. C. Mielenz (Master Builders, Cleveland, Ohio) on the basis of petrographic analysis. Dr. R. Nurse of the Building Research Station (England) has examined a thin section and concludes that it is a high temperature product and not an oxychloride cement and that "it resembles the 'grappier' made from the overburnt product of lime kilns".

Mrs. Bryant Mather, U. S. Army Corps of Engineers (unpublished communication), says that the material consists of "calcite, brucite, a complex calcium aluminum hydrate, quartz, hydrogarnet, a little ettringite and some sort of calcium aluminoferrite", suggesting that the material is a hydrated natural cement manufactured after about 1800. The material also contains widely separated particles of partially carbonized coal, supporting the belief that it is a simple natural cement from lime kilns in the United States, England, France or Belgium. Long-term action of seawater on the set material would account for sulphate, chloride, and perhaps part of the magnesium, but an important proportion of the magnesium is an original constituent of the cement.

The most striking aspect of the cylinders is the constancy in size and shape of the whole ones. They are all barrel-shaped, about 70 cm long and 50 cm in diameter (Table 1). It seems most likely that the objects were formed by cement hardening in barrels or casks. The wooden containers would have by now been broken up and lost. The most likely explanation of the marble and cement cylinders is therefore that they are construction materials that were being transported by ship when, either by shipwreck or design, they came to rest on the seafloor off Entrance Point.

MSB-009 PREHISTORIC RUINS OF HONDURAS AND YUCATAN

Maudslay, Alfred P.; Nature, 57:568-571, April 14, 1898.

Only the portion of the article dealing with the strange chaltunes is reproduced.

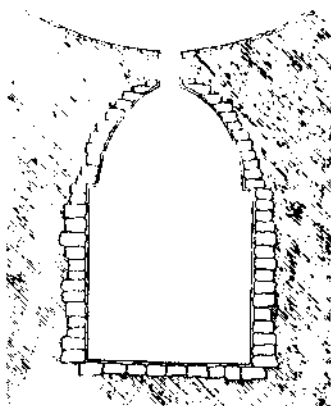
In a country where water is so scarce, it is only reasonable to suppose that the inhabitants would have devised some means of storing the precious fluid; and in the existence of numerous "chaltunes" we have almost certain evidence of the means of storage most commonly employed. These chaltunes are "single chambers of a vault-like appearance, built from ten to fifteen feet beneath the surface of the ground, and communicating with the outer world by means of a narrow well-like opening placed near the apex of the vaulted roof." They are somewhat irregular in shape, but the prevailing form is shown in the following section.

Mr. Thompson paid particular attention to the chaltunes amongst the ruins of Labna, a neighbourhood where---if the opinion that they were used for the storage of water be correct---it is likely that they would be found in considerable numbers, as the nearest permanent water supply is found at the Cave of Loltun, twelve miles distant. Mr. Thompson is of opinion that many of the rougher class of chaltunes were formed in the cavities or pockets from which the white earth, called by the natives "zahcab," had been taken. "This earth is of a peculiar character, and served the ancient builders, as it does those of the present day, as a building material to mix with lime in place of siliceous sand, which is practically unknown in Yucatan." The other chaltunes are well-built chambers, having their walls, roof, and floor of dressed stones, and finished with a coating of fine, hard stucco. In the ruins of Labna, each edifice and each

MSB-009 BUILDINGS

terrace was found to be provided with one or more of these subterranean chambers, the largest of which, however, would not hold more than 10,000 gallons.

Many of the chaltunes had become hopelessly ruined, and many were filled up with earth and rubbish; but some of them had been purposely sealed up by the ancient inhabitants, and these presented a new and interesting field for investigation. Human bones and various objects of human workmanship were found among the deposits at the bottom of the chambers; and Mr. Thompson is led to the conclusion that many of these singular structures, after having been first used as reservoirs, were finally used as depositories for human remains, probably secondary burials, in connection with some special rite, after which the entrance of the chaltune was closed and cemented.



Section of chaltune.

MSB-010 THE PRIMEVAL MONUMENTS OF PERU COMPARED WITH THOSE
IN OTHER PARTS OF THE WORLD

Squier, E. G.; *American Naturalist*, 4:1-17, 1870.

There is a class of stone structures in Peru belonging to what is regarded through the world as the earliest monumental period, coincident in style and character with the cromlechs, dolmens, and "Sun" or "Druidical" circles, so called, of Scandinavia, the British Islands, France, and Northern and Central Asia. The existence of such remains in Peru has not, I believe, been hitherto mentioned by any traveller in that country. They are not very numerous, at least not in the parts of Peru traversed by me, but their scarcity is probably in great part due to circumstances and causes to which I shall refer further on, and is by no means inconsistent with the supposition that they formerly existed in considerable, if not very great numbers.

I think students will attach importance to these remains as indicating the existence at one time or another in Peru of a population identical in degree and stage of development with the people who raised corresponding lithic and megalithic monuments in other parts of the world, and who, if not the progenitors of the semi-civilized nations found in Peru at the time of the conquest, certainly preceded them in the occupation of the country. If it should be found, nevertheless, that there has been a gradual development of any of these rude remains into elaborate and imposing monuments, corresponding with them in their purpose or design, or a gradual change from the rough burial chamber of uncut stones into the symmetrical sepulchral tower built of hewn blocks accurately fitted together, and in general workmanship coinciding with the other and most advanced and admirable structures of the country, then we may reasonably infer that the latter were constructed by the same people that built the first, and that, monumentally, at least, the civilization of Peru was indigenous, gradually developed and not intruded. Leaving, however, the very few and obvious deductions I may feel justified in making, for the close of this brief paper, I wish to call attention to three groups of monuments, the chulpas and other remains of Acora, Queillenata, and Sillustani, all in the great terrestrial basin of Lake Titicaca, near that lake, in that political subdivision of the ancient Peruvian Empire called the Collao, and now Department of Puno.

The arable portions of Peru, circumscribed by mountains, cold and sterile punos or table-lands, and bare deserts, early forced the population of the country to a close economy of their cultivable lands, and led them to bury their dead and build their towns in waste places, on arid hillsides above the reach of irrigation, or on rocky eminences and promontories, which even their patient industry could not make productive. In such positions throughout the ancient Collao, we find numberless cemeteries, often in proximity to the ruins of towns and villages. Some of these cemeteries are marked by really imposing monuments, and form conspicuous features in the landscape.

The first and simplest form of the burial monument, and which I shall assume, for the present, to be the oldest, consists of flat, unhewn stones of varying lengths set firmly in the ground, projecting above it from one to two feet, so as to form a circle, more or less regular, about three feet in diameter. The body was buried within this circle, in a sitting or crouching posture, and with a vase of pottery or some other utensil or implement at its feet. Sometimes a few flat stones were laid across the upright ones, so as to form a kind of roof, and in a few instances these rude tombs were placed side by side in long rows, and stones afterwards heaped over them, so as to give them the appearance of lines of ruined walls.

Another rude but more advanced and impressive form of the tomb consists of large slabs of stone, projecting from four to six feet above the ground, and also set in the form of a circle or square of from six to sixteen feet in diameter. These uprights support blocks of stone, which lap over each other inwardly, until they touch and brace against each other, thus forming a kind of rude arch. A doorway or opening is often found leading into the vault, formed by omitting one of the upright stones.

The arid plain to the south of the town of Acora, near the shores of Lake Titicaca, and twelve miles distant from the ancient town of Chucuito, is covered with remains of this kind, of which Fig. 1 is an example; and on the western border of the plain, at the base of the mountains which bound it in that direction, are some of the better class of chulpas, round and square, built of worked stones, to which I shall have occasion to allude in another place.



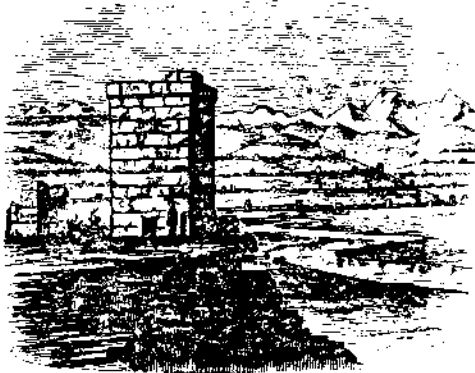
Primitive Tomb, Acora.

A modification of the second class of chulpas, which I have described, or rather an improvement on them, is to be found among the ruins, so called, of Quellenata to the northeast of Lake Titicaca, in Bolivia, and at many other places in the ancient Collao. Here the inner chamber or vault is formed, as in the case of those already noticed, by a circle of upright stones, across the tops of which flat stones are laid, forming a chamber, which often has its floor below the general level of the earth. Around this chamber a wall is built, which is carried up to varying heights of from ten to thirty feet. The exterior stones are usually broken to conform to the outer curve of the tower, and the whole is more or less cemented together with a very tenacious clay. Nearly all are built with flaring or diverging walls; that is to say, they are narrower at their bases than at their tops. Sometimes this divergence is on a curved instead of a right line, and gives to the monument a graceful shape. In Quellenata I found only one skeleton in each of the chulpas I examined; and none of the chulpas had open entrances. Similar structures in shape and construction occur in great numbers among what are called the ruins of Ullulloma, three leagues from the town of Sta. Rosa in the valley of the river Pucura. But here the chulpas have openings into which a man may creep, and all of them contained originally two or more skeletons.

Returning now to Acora. As I have intimated, within sight of the rude burial monuments already noticed as existing there, ---and which so closely resemble the Cromlechs of Europe, ---are other sepulchral monuments, showing a great advance on those of Quellenata and Ullulloma. They are both round and square, standing on platforms of stones regularly and artificially shaped, and are themselves built of squared blocks of limestone. In common with the primitive and typical forms of the same class of monuments already described, these also have an inner chamber, vaulted by overlapping stones, after the fashion of the earlier approximations towards the arch. They differ, however, in having each

four niches in the chamber or vault, placed at right angles in respect to each other. The sides of these niches converge a little towards their tops, as do most of the Inca niches, windows and doorways. In these niches were fastened the bodies of the dead, in squatting or crouching postures.

Figure 4 is a view of a double-storied, square chulpa, with a pucura or hill fort in the distance, occurring near the Bolivian town of Escoma, on the eastern shore of Lake Titicaca. I introduce these cuts to show some of the variations in this class of monuments. Escoma is on the same side of Lake Titicaca with Quellenata, but sixty miles to the southward; and it is a curious fact, that while at the latter place all the chulpas are round, at the former they are all square.



Square Chulpa, Escoma, Bolivia.

The sides of all the square chulpas appear to be perfectly vertical, and near their summits we find a projecting band or cornice. Their tops seem to have been flat. On the other hand the round chulpas here swell out regularly up to the ornamental band or cornice, and terminate in a dome.

These features, however, are still better marked in the ruins of Sillustani, where the chulpas, in respect of size, elaboration of design and workmanship, take their highest form. Here we find them built of great blocks of trachyte and other hard stones, fitted together with unsurpassable accuracy, the structure nevertheless preserving some of the characteristic features of the first and rudest form of the chulpa. The lower course of stones is almost invariably composed of great blocks of which the unhewn portions are set in the ground, and these support a series of layers, not always regular in respect of thickness, nor uniform in respect of size, but which have their sides cut on exact radii of the circle, and their faces cut with an accurate bevel upward to correspond with the swell of the tower. The stones forming the dome are not only cut on accurate radii, but the curve of the dome is preserved in each, and they are furthermore so cut that their push or plunge is inward towards the centre of the structure, thereby tending to give it compactness and consequent strength. There are many other interesting architectural features connected with these remains of Sillustani, the enumeration of which is not necessary in order to illustrate the particu-

lar question before us. *

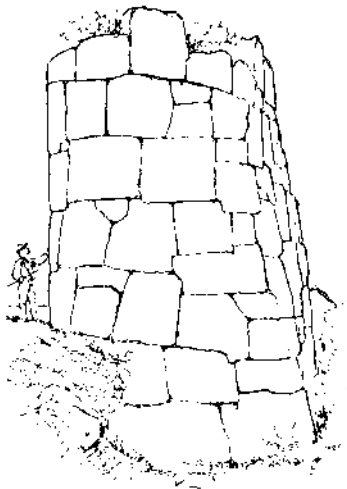
Some of the chulpas of Sillustani have double vaults or chambers, one above the other, and others have a double row of niches, in a single chamber, with a cist, carefully walled up, sunk in the earth below. There are a few built of rough stones plastered and stuccoed over, and painted, with inner chambers also stuccoed.

Now, in all these varieties of the burial monument called the chulpa, from the rude pile of rough stones at Acora, so much resembling the European cromlech, through every variety of form and phase of skill to the fine towers of Sillustani we discover common features, a common design, and many evidences that all were equally the work of the same people. If so, do the ruder monuments mark an earlier and possibly very remote period in the history of that people? And do the various stages of development which we observe in this class of monuments, correspond with like stages in the development of their builders? Or did they build the rough tomb for the poor and insignificant, and the grander and more elaborate monument for the rich and the powerful, as we do today?

I incline, for reasons not altogether drawn from an investigation of this single class of monuments, to the opinion that the various forms of the chulpa are indices of different eras. I doubt if monuments were ever raised, whether rude or imposing, except over important persons. I believe that anciently as now, the common Indian, the patient servant of the chief or curaca of old, as as of the gobernador of our age, received few burial honors. His grave was

* For purposes of comparison, I introduce a reduction from a photograph, of a view of a so-called Pelasgic round tower, among the ruins of Alatri, Italy. The resemblance between the style and workmanship of the Sillustani monuments and those of Alatri is strong, except that the stones of the former are much the largest, and are cut and fitted with much greater accuracy. In no part of the world have I seen the art of stone-cutting and fitting carried to the point of perfection it was by the ancients of Peru.

"Pelasgic" tower, Alatri, Italy.



unmarked by stone or symbol. The chulpas probably signalize the graves of individuals distinguished in their periods, upon which contemporaneous skill and effort were expended. If the monument was rude, it was because the people who raised it were also rude. At the time it was erected the cromlech or chulpa of Acora cost, it may be, an effort as great or greater than was exhausted, at a later period, on the elaborate and imposing towers of Sillustani. And, altogether, I am convinced, speaking for the present only in view of sepulchral monuments, that their development in Peru may be traced from their first and rudest form up to that which prevailed at the time of the Conquest, preserving throughout the same essential features.

But it is not in the early sepulchral monuments of Peru, that we have absolute coincidences with the remains which are now accepted as among the primitive monuments of mankind. As we find in both Europe and Asia the rude monuments of religion existing side by side with those of sepulture, so we find in Peru the Sun-circle, or primitive, open, symbolical temple, side by side with the Peruvian chulpa. In many places we discover circles defined by rude upright stones, and surrounding one or more larger upright stones placed sometimes in the centre of the circle, but oftener at one-third of the diameter of the circle apart, and on a line at right angles to another line that might be drawn through the centre of the gateway or entrance on the east.

In connection with the group of chulpas at Sillustani, or rather on the same promontory on which these occur, are found a number of such Sun-circles, which seem strangely to have escaped the notice of travellers. The tradition of their original purpose is preserved in the Quichua name they still bear of Intihuatana, "where the sun is tied up."

Some of these circles are more elaborate than others, as shown in the engraving, from which it will be seen that while the one nearest the spectator is constructed of simple upright stones, set in the ground; the second one is surrounded by a platform of stones more or less hewn and fitted together. The first circle is about ninety feet in diameter; the second about one hundred and fifty feet, and has a single erect stone standing in the relative position I have already indicated. A remarkable feature in the larger circle is a groove cut in the platform around it, deep enough to receive a ship's cable.

I am well aware that many of the smaller so called Sun-circles of the old world are rather grave-circles, or places of sepulture; but that in no way bears on the point I am at present illustrating, namely: the close resemblance if not absolute identity of the primitive monuments of the great Andean plateau, elevated thirteen thousand feet above the sea, and fenced in with high mountains and frigid deserts, with those of the other continent.

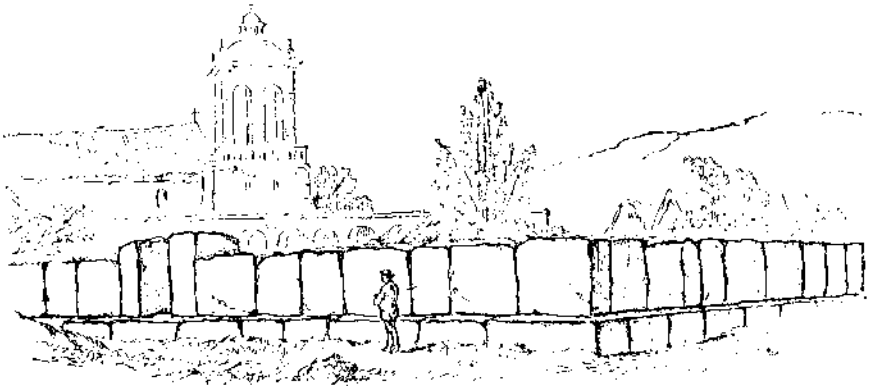
Peru has many examples of that kind of stone structures called Cyclopean, in which stones of all shapes and sizes are fitted accurately together, without cement, so as to form a solid whole. The great Inca fortress of the Sacsahuaman, dominating the city of Cuzco, the old Inca capital, is one of the most imposing monuments of this kind in America or the world, and claims to rank with the pyramids themselves as an illustration of human power. But apart from remains of this kind, which characterize comparatively late eras, we find remains of similar design, often imposing, but rude, and on the stones of which we look in vain for the traces of tools of any kind. In construction they somewhat resemble the works uncritically known as Pelagic. A notable example may be named in the ruins of Quellenata, already mentioned, situated on a mountain dominating the town of Vilcachico, and overlooking Lake Titicaca. Still another, but less rude, is the great fortress of Chancayillo or Calaveras, in the upper part of the valley of Casma.

Tradition affirms that these pucuras, or strongholds, were reared long ago, when the inhabitants of Peru were divided up into savage and warlike tribes, "before the sun shone," or the Incas had established their benignant rule. They are held in a certain veneration as the works of giants, whose spirits still haunt them, and require to be propitiated with offerings of chicha and coca. Hundreds of these remains, often of great extent, crown the bare mountain tops of Central and Southern Peru and Bolivia, and are scattered all through the grand Andean Plateau. Looking upon them in their obvious character, expressed also in their name of pucuras, as strongholds or fortresses, we find them to be but rude types of the extensive and elaborate defensive works constructed by the Incas, and in which were introduced parapets, salient and reentering angles, and many of the most important features of modern fortifications. In short, as we find in the rude chulpas of Acora, the essential features of the imposing and skilfully constructed burial towers of Sillustani, so we find in these primitive defenses the fundamental ideas subsequently elaborated in the gigantic fortresses of Sacsahuaman, Pisac, and Ollantaytambo. Some instances fell under my notice in Peru, of single rough upright stones, occasionally of great size, which were huaca or sacred, and to which great reverence is still paid by the Indians. A notable instance is to be observed on the summit of a high, bare hill, on the road between the port of Simanco and the town of Nepena, and which overlooks the interesting ruins of Huaca-Tambo. No doubt some of these stones were set up by hand of man, but most of them occupy natural positions.*

The celebrated ruins of Tiahuanaco in Bolivia, which may be called the Stonehenge or Carnac of the new world, afford a striking example of the artificial arrangement of rough as well as upright stones, in the form of squares and rectangles, and on parallel lines. Here we find quadrangles defined by huge, unheven stones, worn and frayed by time, and having every evidence of highest antiquity, by the side of other squares of similar plan, but defined by massive stones cut with much elaboration, as if they were the work of later generations, better acquainted with the use of tools fit for cutting stones, who nevertheless retained the notions of their ancestors, bringing only greater skill to the construction of their monuments. The megalithic remains of Tiahuanaco rank second in interest to none in the world.

Fig. 9 is of a singular monument, in the ancient town of Chicuito, once the most important in the Collao. It is in the form of a rectangle, sixty-five feet on each side, and consists of a series of large, roughly worked blocks of stone, placed closely side by side on a platform, or rather on a foundation of stones, sunk in the ground, and projecting fourteen inches outward all around. The entrance is from the east, between two blocks of stones, higher than the rest. This may be taken as a type of an advanced class of megalithic monuments by no means uncommon in the highlands of Peru. The features I seek to illustrate would be made more apparent by a greater number of views, plans, and sections than I am now able to present, as may be inferred from the few accompanying this paper. When they shall come to be fully illustrated, I think all students will coincide with me in my already matured opinion that there exist in Peru and Bolivia, high up among the snowy Andes, the oldest forms of monuments, sepulchral and otherwise, known to mankind, exact counterparts in character of those of the "old world," having a common design, illustrating similar conceptions, and all of them the work of the same peoples found in occupation of

* The Indians of the coast of Peru raised large stones in their chacras, gardens and cultivated fields, which they called chichoe or Truanca, also chacrayoe, or Lord of the chacra. This stone received especial reverence at seed time.



Ancient Monument, Chicuito.

the country at the time of the Conquest, and whose later monuments are mainly if not wholly the developed forms of those raised by their ancestors, and which seem to have been the spontaneous productions of the primitive man in all parts of the world, and not necessarily nor even probably derivative.

I have only to add one word in respect to caverns. There are many of these in the sierras of Peru, in which the modern traveller is often glad to find refuge, as was the Indian voyager before him. But few of these however, seem to have been inhabited. Generally they appear to have been used as burial places, and abound in desiccated human bodies, human bones, objects of human art, and the bones of indigenous animals, often cemented together with calcareous deposits. Some of the many Peruvian traditions affirm that the ancient inhabitants of the country emerged from the limestone caverns in the frontier Amazonian valley of Paucartambo. The best accepted perhaps of the Peruvian traditions assigns to the Sun-born Manco Capac, his birth-place and early residence in a shallow cavern on the island of Titicaca, out of which the sun rose to illuminate the earth, and which was regarded as the most sacred spot in the Inca Empire. That man should first seek shelter in caverns, in a cold and arid region like the plateau of Peru, where wood is scarce or unknown, is equally natural and probable; but the evidences of such a practice do not exist, or rather have not yet been discovered.

That considerable aboriginal Peruvian tribes once lived in houses built on piles, or on floats, in the shallow waters of the Andean lakes, is not only probable but certain. The remnants of such a tribe, bearing the name of Antis, still live in this manner in the reedy lakes formed by the spreading out or overflow of the Rio Desaguadero, the outlet of Lake Titicaca. These people spoke and still speak a language differing equally from the Aymara and Quechua, called Puquina, and the early chroniclers speak of them as extremely savage, so much so that when asked who they were, they answered, they were not men but Uros, as if they did not belong to the human family. Whole towns of them, it is said, lived on floats of totorá or reeds, which they moved from place to place according to their convenience or necessities.

MSB-011 BUILDINGS

MSB-011 ON SOME POINTS IN THE EARLY HISTORY OF ASTRONOMY. II.

Lockyer, J. Norman; *Nature*, 44:8-11, May 7, 1871.

In this article (derived from one in a series of lectures), Lockyer first explains the motions of the stars and then the "optics" of Egyptian temples. Only the latter portion of the lecture is quoted here.

First a word as to the general plan of a temple such as we find it in Egypt. They may be arranged architecturally into two main groups. Edfou is the most perfect example of one of the first group, characterized by having a pylon consisting of two massive structures right and left of the entrance, which are somewhat like the two towers that one sometimes sees on the west front of some of our English cathedrals. The Temple of Ramses II, in the Memnonia at Thebes is another example.

From the entrance-*pylon* the temple goes stretching along through various halls of different sizes and details until at last at the extreme end of the temple what is called the Sanctuary, Naos, or Holy of Holies, is reached. The end of the temple at which the pylons are situated is open, the other is closed. These lofty towers, and indeed the walls, are sometimes covered with the most wonderful drawings and hieroglyphic figures and records. Stretching in front of the pylons, extending sometimes very far in front, are rows of sphinxes. This principle is carried to such an extent that in some cases separate isolated gates have been built right in front and exactly in the alignment of the temple. At Karnak there really are two such temples back to back, and the distance which separates the outside entrances of both is greater than the distance from Pall Mall to Piccadilly; the great temple covers about twice the area covered by St. Peter's at Rome, so that these were temples of a vastness absolutely unapproached in the modern world.

In Denderah we have an example of the second group, in which the massive pylon is omitted. In these the front is entirely changed; instead of the pylon we have now an open front to the temple with columns---the Greek form of temple is approached.

I shall not have time to get to the astronomical side of the Greek temples in this course of lectures, but I am anxious to take this opportunity to refer to the transition from the Egyptian form of temple to the Greek one. The east front of the Parthenon at Athens very much more resembles the temple of Denderah than it does the early Egyptian temple---that is to say, the eastern front is open; it is not closed by pylons.

In many Egyptian temples, in the progress from one end to the other, one goes through various halls of different styles of architecture and different stages of magnificence. But in the Greek temple this is entirely changed; the approach to the temple was outside, the temple representing, so to speak, the core, almost the Holy of Holies, of the Egyptian temple, and any magnificent approach to it which could be given, was given from the outside. But although they were quite different in their aspects, they were quite similar in their objects. Some Egyptian temples took hundreds of years to build; the obelisks were all in single blocks like that on the Embankment, and all were brought for hundreds of miles down the Nile. A temple meant to the Egyptians a very serious thing indeed.

So much, then, for a general idea of an ancient temple.

Another point is very striking in these temples, notably in the chief one at Karnak.

From one end of the temple to the other we find the axis marked out by narrow apertures in the various pylons, and many walls with doors crossing the axis. There are 17 or 18 of these limiting apertures, and in the other temple

which is back to back to this one we have pylons in exactly the same way limiting the light which falls into the Holy of Holies or the Sanctuary. This construction gives one a very definite impression that every part of the temple was built to subserve a special object, viz. to limit the sunlight which fell on its front into a narrow beam, and to carry it to the other extremity of the temple---into the sanctuary---which extremity was always blocked. There is no case in which the beam of light can pass absolutely through the temple.

The idea is strengthened by considering the construction of the astronomical telescope. Although the Egyptians knew nothing about telescopes, it would seem that they had the same problem before them which we solve by a special arrangement in the modern telescope---they wanted to keep the light pure, and to lead it into their sanctuary, as we lead it to the eyepiece. To keep the light that passes into the eyepiece of a modern telescope pure, we have between the object-glass and the eyepiece a series of what are called diaphragms; that is a series of rings right along the tube, the inner diameters of the rings being greatest close to the object-glass, and smallest close to the eyepiece; these diaphragms must so be made, that all the light from the object-glass shall fall upon the eyepiece, without loss, or reflection by the tube.

These apertures in the pylons and separating walls of Egyptian temples exactly represent the diaphragms in the modern telescope.

Lockyer asserts that the Egyptians "knew nothing about telescopes." This is a dangerous statement, especially in light of the "Carthaginian lenses" of MMT.

MSB-012 ON SOME POINTS IN THE EARLY HISTORY OF ASTRONOMY. IV.

Lockyer, J. Norman; Nature, 44:107-110, June 4, 1891.

The bulk of Lockyer's fourth lecture is devoted to the astronomy of the precession of the equinoxes. We skip over this and go directly to the question of Egyptian temple alignment.

Now that we are familiar with the effect of the precession of the equinoxes in changing the amplitudes of the rising and setting places of stars, we can return to the consideration of the temples. So far, we have considered those built in relation to the sun, in the case of which body there is, of course, no precessional movement, so that a temple once oriented to the sun would remain so for a long time. After some thousands of years, however, the change in the obliquity of the ecliptic would produce a small change in the amplitude of a solstice.

Suppose we take, as before, that region of the earth's surface in the Nile valley with a latitude of about 26° N. The temples there built to observe the sun will have an east and west aspect true if they have anything to do with the sun at the equinoxes, and will have an amplitude of about 26° N. or S. if they have anything to do with the sun at the solstices.

The archaeologists who have endeavoured to investigate the orientations of these buildings have found that they practically face in all directions; the statement is that their arrangement is principally characterized by the want of it; they have been put down higgledy-piggledy; there has been a symmetrophobia, mitigated by a general desire that the temple should face the Nile. This view may be the true one, if stars were not observed as well as the sun; for at Thebes, if any temple have an amplitude more than 26° N. or S. of E. or W., it cannot by

any possibility have been used, as we have seen the temples at Karnak might have been used, for observations of the sun; for since the maximum declination of the sun is almost $24-1/2^{\circ}$ (it is at present only $23-1/2^{\circ}$), represented by an amplitude of 27° , no temple oriented in a direction more northerly or more southerly could get the light of the sun along its axis.

Let us see, then, if the builders of them had any idea in their minds connected with astronomy. If they had, we may conclude that there was some purpose of utility to be served, as the solar temples were used undoubtedly, among other things, for determining the exact length of the solar year. When we come to examine these non-solar temples, the first question is, Do they resemble in construction the solar ones? Are the horizontal telescope conditions retained? The evidence on this point is overwhelming. Take the temple of Denderah. It points very far away from the sun: the sun's light could never have enfiladed it. In many others pointing well to the north or south, the axis extends from the exterior pylon to the Sanctuary or Naos which is found always at the closed end of the temple. We have the same number of pylons, gradually getting narrower and narrower as we get to the Naos, and in some there is a gradual rise from the first exterior pylon to the part which represents the section of the Naos, so that a beam of horizontal light coming through the central door might enter it over the heads of the people flocking into the temple, and pass uninterruptedly into the Sanctuary.

In these, as at Karnak, you see we have this collimating axis. We have the other end of the temple blocked; we have these various diaphragms or pylons, so that, practically, there is absolutely no question of principle of construction involved in this temple that was not involved in the great solar temple at Karnak itself.

We made out that in the case of the temples devoted to sun-worship, and to the determination of the length of the year, there was very good reason why all these attempts should be made to cut off the light, by all these diaphragms and stone ceilings, because, among other things, one wanted to find the precise point occupied by the sunbeam on the two or three days near the winter and summer solstices in order to determine the exact moment of the solstice.

But if a temple is not intended to observe the sun, why these diaphragms? Why keep the astronomer, or the priest, so much in the dark? There is a very good reason indeed: because the truer the orientation of the temple to the star, and the greater the darkness he was kept in, the sooner would he catch the rising star. In the first place, the diaphragms would indicate the true line that he had to watch; he would not have to search for the star which he expected; and obviously the more he was kept in the dark the sooner could he see the star.

The next point that I have to make is that in the case of some of these temples which are not directed to the sun we get exactly the same amplitudes in different localities. To show this clearly it will be convenient to bring together the chief temples near Karnak and those having the same amplitudes elsewhere.

We can do this by laying down along a circle the different amplitudes to which these various temples point. To begin with, I will draw your attention to those temples which we have already discussed with an amplitude of 27° or 26° , at Abydos, Thebes, and Karnak. Next we have non-solar temples removed just as far as they can be in amplitude from the solar ones, for the reason that they are as nearly as possible at right angles to them. We have temples with the same amplitudes high north and high south, in different places---temples, therefore, which could not have been built with reference to the sun: just as we have at different places temples with the same amplitudes which could have been used for solar purposes.

In connection with the possible astronomical uses of these temples, I find that when one of these temples has been built, the horizon has always been very

carefully left open; there has always been a possibility of vision along the collimating axis prolonged. Lines of sphinxes have been broken to ensure this; at Medinet Abou, on the opposite side of the river to Karnak, we have outside this great temple a model of a Syrian fort. If we prolong the line of the temple from the middle of the Naos through the systems of pylons, we find that in the model of the fort an opening was left, so that the vision from the Sanctuary of the temple was left absolutely free to command the horizon.

It may be said that that cannot be true of Karnak, because we see on the general plan that one of the temples, with an azimuth of 71°N , had its collimating axis blocked by numerous buildings. That is true; but when one comes to examine into the date of these buildings, it is found that they are all very late; whereas there is evidence that the temple was one of the first, if not the very first, of the temples built at Thebes.

Mariette spent a long time in examining the temple of Karnak. His idea is that the part of the temple near the Sanctuary represents the first part of the building; and at that time the great temple of Karnak---enormous though it is now---was so small and entirely out of the way of the line of the axis of the temple of Maut that its existence might have been entirely neglected. There was first a square court like the court of the Tabernacle, and very shortly after that a very laboured system of pylons was introduced to restrict the light. The next stage shows the Sanctuary thrown back away from the court; then, after that, more complication is introduced by the addition of pylons, until finally, after two or three extensions, the length of the temple was quadrupled. So that the proof is positive that at first the horizon of the temple of Maut was left perfectly clear. Why it was subsequently blocked I shall suggest afterwards.

The next point to be noticed is that there is in very many cases a rectangular arrangement, so that if the sun were observed in one temple and a star in the other, there would be a difference of 90° between the position of the sun and the position of the star at that moment. This would, of course, apply also to two stars. Sometimes this rectangular arrangement is in the same temple, as at Karnak, sometimes in an adjacent one, as at Denderah.

If we look at Denderah we find that we have there a large temple inclosed in a square temenos wall, the sides of which are parallel to the sides of the temple; and also a little temple at right angles to the principal one.

It is hardly fair to say that a rectangular arrangement, repeated in different localities, is accidental; it is one which is used to some extent in our modern observatories.

The perpetual recurrence of these rectangular temples shows, I think, that in all the pairs of temples which are thus represented, there was some definite view in the minds of those who built them.

Another point is that, when we get some temples pointing a certain number of degrees south of east, we get other temples pointing the same number of degrees south of west, so that some temples may have been used to observe risings and others settings of stars in the same declination. It is then natural of course to conclude that these temples were arranged to observe the rising and setting of the same stars.

The Egyptians obviously invested an incredible amount of effort in building solar and stellar observatories. The custom is to say they did this for religious and calendar-keeping purposes, but possibly they were gauging cycles of natural phenomena. Astrology, of course, could be a debased version of an ancient science of cycles.

MSB-013 BUILDINGS

MSB-013 THE TALAYOTS OF MAJORCA

Anonymous; Antiquity, 1:96-97, 1927.

The pre-historic inhabitants of the Balearic Islands built small stone forts or towers, called 'talayots.' These are either rectangular or round, and occur either singly or in groups. The stones of which they are constructed are sometimes very large---two of these in a tower at LaCanova, near Arta, are twelve feet long and three feet wide; and the walls are fourteen feet thick. The surface around it is thickly strewn with potsherds, including fragments of red glazed ware, ---like the Samian pottery found on Romano-British sites, ---and fragments of amphorae, proving that it was occupied during the early part of the Christian era. On the other hand, bronze objects of the Bronze Age have also been found in talayot settlements, and some of these objects can hardly be later than 1000 B. C. This implies a long period, during which one might expect to find evidence of development in the methods of construction of the talayots. It seems possible that the earliest forms of settlement may have been normal hill-forts with stone walls, such as occur on the tops of several of the hills of the island; and that the talayot settlements with their towers may be a later type of fortified village adapted to the lower ground. Several of the smaller hills around Arta are crowned by small round forts, consisting simply of a wall of big stones roughly squared, set round the top of the hill. This seems to represent a primitive type such as one might suppose to be earlier than the more elaborate villages. Some of the forts contain citadels in the centre, the best example being that of Encinar des Payeses. The main entrance is four feet wide and covered by a single lintel-stone, six feet long and two and a half feet thick; it rests on two uprights, one of which is seven and a half feet high, and has been dressed to receive the lintel. There is a similar, but smaller 'trilitho entrance in the opposite side, now blocked up. In the centre is a citadel with a sloping ramp. There are remains of walls everywhere inside. There is much pottery lying about, some of it plainly of Roman date---Roman coins have been found here---but some of it probably earlier.

The main entrance is familiar to all archaeologists, it is illustrated in Cartailhac's Monuments primitifs des Iles baleares, and in many textbooks. It is regrettable that the whole fort should be threatened with destruction, for building purposes; and it is to be hoped that the endeavours to preserve it will succeed. To many, this fort and its gateway are typical of Balearic archaeology. It may be suggested that the free-standing towers represent the central citadel of forts such as Encinar, adapted to the needs of a settlement on lower ground.

MSB-014 [GREAT BUILDING UNDER LAKE]

Anonymous; Antiquity, 8:224, 1934.

'When flying over the centre of Lake Daiet-or-Roumi an airman saw the ruins of a great quadrilateral building beneath the clear blue waters. Each side measured about 200 feet. At each angle was a square construction, and at one end there was a tower and a separate round structure'. (Evening Standard, 6 February).

We quote this for what it may be worth, without any guarantee. If the ruins can be seen they can also be photographed. No such photograph of submarine antiquities has ever appeared, though many claims to have seen them have been made. If this claim is well founded it would be well worth the while of an enterprising newspaper to send an aeroplane to photograph the remains.

MSB-015 THE PROBLEM OF THE RHODESIAN RUINS

onymous; Nature, 75:369-371, February 14, 1907.

The recent investigation of some of the famous ruins of Rhodesia, conducted in 1905 by Dr. D. Randall-MacIver on behalf of the British Association and the Rhodes trustees, has resulted in an entirely fresh view of their origin and age. The hitherto generally accepted view, that these buildings were erected in very ancient days by a Semitic people, whose search for gold led them thus far afield, has received a serious check. Dr. MacIver's researches, conducted upon the lines of archaeological investigation, point to the buildings in question being of comparatively recent date, not earlier, in fact, than late mediaeval times. This result is the more striking when we remember that his previous researches have been mainly archaeological, conducted chiefly in Egypt, and that, in consequence, we might expect a certain degree of bias in favour of retaining the ruins within the sphere of archaeology. That a trained archaeologist has been unable to find evidence of high antiquity upon the sites investigated is at least a strong point in favour of his argument.

Dr. MacIver made excavations on seven sites in various parts of Rhodesia, these being:---(1) Inyanga, on the Cecil Rhodes estate, sixty miles north of Umtali; (2) the Niekerk ruins to the north-west of Inyanga; (3) a site three miles south of Umtali; (4) Dhlo Dhlo, in the Incisa district; (5) Nanatali, sixteen miles east of Dhlo Dhlo; (6) Kami, fourteen miles west of Bulawayo; and (7) Great Zimbabwe, in the Victoria district, the site which hitherto had received the greatest attention. These sites were well selected as being distributed over a wide area, and, moreover, as differing considerably from one another both in general character and in special features, as also in the greater or less degree of elaborateness in their structure. It may be remarked at once that the distinctive features observable in comparing the different buildings are often no less remarkable than are the points of similarity. No two seem to be alike, and the divergences and specialisation render their individuality very striking.

The principal questions to be determined in regard to these remarkable buildings were: By what people and at what period were they erected? The controversy, which is still active, centres mainly upon these two main points, and the older theory of their Semitic origin and great antiquity, urged by Mauch, Bent, Keane, Hall, and others, is being maintained steadfastly and strenuously by several authorities. Dr. MacIver in the title of his book, "Mediaeval Rhodesia," has hoisted his fighting flag. His contention is that none of these buildings are referable to an earlier period than mediaeval or post-mediaeval times. He argues that none of the objects hitherto discovered in excavating within the area of the ruins would be recognised by an archaeologist as "more than a few centuries old; and that the objects, when not immediately recognisable as mediaeval imports, are of characteristically African type." Inyanga and the Niekerk ruins do not appear to have produced any but native African objects, and at Umtali a fragment of glazed stoneware was the only foreign object found. At the better-known sites, Dhlo Dhlo, Kami, Nanatali, and Zimbabwe, a fair number of imported objects have been found, but here again Dr. MacIver holds that in no case is there evidence of a pre-mediaeval antiquity. As far as possible, he endeavoured in his excavations to reach the lowest strata, and to explore the levels which must be contemporary with the earliest portions of the walls of the buildings, and the objects found therein were naturally considered by him of the highest importance.

It was at Dhlo Dhlo that he discovered his most valuable piece of evidence. The absence of objects of foreign workmanship and of known date at the Inyanga

Niekerk, and Untali sites rendered impossible the assignment of any definite period to the buildings there, although the negative evidence may be held to indicate the lack of foreign influence, which itself may possibly be regarded as pointing to these sites being earlier than the others which were examined, a view which is held by the author on structural grounds. At Dhlo Dhlo, on the other hand, numerous imported objects were found, and in excavating one of the platforms upon which a dwelling had been erected, and which Dr. MacIver asserts most positively is contemporaneous with the earliest portion of the building, he came across a piece of blue and white Nankin china in the unbroken cement floor of the dwelling. This fragment is shown in the illustration reproduced. If this cement floor was, as he maintains, erected at the same time as the oldest walls of the main building, we must certainly admit the validity of his contention that the building cannot antedate the fragment of porcelain, and that the date of erection, therefore, cannot be pushed back beyond late mediaeval times. His critics appear willing to admit the validity of his argument as regards Dhlo Dhlo, but they urge that the buildings on this site are relatively late, and that this dating will not hold good in the case of the buildings at Great Zimbabwe, which they regard as much earlier.

Dr. MacIver regards the principal buildings, such as the so-called "Elliptical Temple" at Zimbabwe, as being fortress-kraals, and urges that the "Elliptical Temple" itself was the fortified residence of the Great Chief, or Monomotapa, whose sway extended over an enormous area and a very extensive population. To understand how architectural feats, such as the finer Rhodesian buildings at Dhlo Dhlo, Nanatali, and Zimbabwe, can have been achieved by the precursors of the modern South African natives, it is necessary to assume that in those days there was organisation of a far higher character than has obtained in recent years, organisation under great chiefs whose power and intelligence were of a relatively high order. This would appear, from the Portuguese and other records to have been the case in the days of the Monomotapan empire of the Middle Ages down to the close of the sixteenth century. The Monomotapa, or paramount chief, may well have resided at Zimbabwe, and he is recorded to have had captains in various fortresses elsewhere. The organisation of labour implied by the elaborate and decorated stone architecture is certainly remarkable, more particularly when we compare these edifices with the results of the constructional efforts of the modern Kafir peoples; but under an intelligent and powerful ruler, and under stable conditions of life, a degree of culture may have been reached far higher than it is possible for smaller communities under lesser chiefs to maintain. It seems well within the bounds of probability that under such conditions even the finer buildings may have been erected by the more progressive and united precursors of the present native inhabitants of Rhodesia.

Even more remarkable, in some respects, than the huge "fortified kraals" are the terrace walls on the Niekerk site described by Dr. MacIver. These stone-built walls form irregular concentric rings round the hills upon which the villages were situated, and although structurally simple, cover an enormous area extending in close formation over a space of upwards of fifty square miles. They do not appear to have been erected as supporting walls for agricultural terraces, nor to have been connected with an irrigation system, and, in the absence of evidence to the contrary, one must assume that their purpose was defence, though one accepts this view somewhat reluctantly, for, when regarded as an elaborate system of defensive girdle walls, one cannot but admit that their practical value is hardly commensurate with the enormous labour expended upon them. They recall to one's mind the sementeras walls of Luzon, in the Philippines which also form long, irregular, though concentric alignments up the slopes of the hills, following their contours, covering, too, a very large extent of country. In the case of the sementeras there are transverse walls dividing up the terraces

into sections. They are purely for agricultural purposes, and are mostly, though not all, connected with a wonderful system of irrigation. It might be of use to compare the sementera system with the Niekerk terrace walls, on the chance of a clue to the latter being found, and it is to be hoped that an accurate survey may eventually be made. The scientific study of the ruins is still in its infancy, and a vast amount of work remains to be done. As has been said, there are two distinct and antagonistic theories of their origin. It is eminently to be desired that the Rhodesian authorities will in every way encourage, nay, promote, further detailed excavations by trained men of science. Such a work would redound greatly to the credit of Rhodesia, and would be followed with the greatest interest throughout the scientific world. It would imply the exploitation of one of the most valuable scientific assets of the country. Dr. MacIver makes out a strong case, but it is desirable to know more precisely to what group of Bantu peoples the buildings are assignable. Whence came they? Many of the native objects found are identical with those in use by the modern Kafir peoples; others, on the other hand, show affinities with a north-western culture, and appear almost out of place where found. Then again, the older gold mines themselves have hardly been examined at all in detail. They should yield material of importance. It is further desirable to explain more fully the individuality of the different settlements and of the arts of their former inhabitants, to diagnose, for instance, the presence of very numerous stone carvings at the Umtali ruin, excavated by Captain E. M. Andrews, in the light of their prevailing absence elsewhere.

It has been urged that the ruins have been shorn by Dr. MacIver of their romance. Taking the term romance in its strict sense, this may be true. For legendary uncertainty he has sought to substitute scientific fact. For ill-defined Semitic invaders he offers a native indigenous people; and King Solomon and the Queen of Sheba he replaces with the Monomotapa. How far he is justified will be shown by future investigations. At least he has presented his case in a straightforward and lucid manner in a very attractive and well-illustrated book, and it does not appear that the problem is in any way less fascinating or less worthy of accurate study for having, perhaps, been transferred from the province of archaeology to that of ethnology.

MSB-016 THE SOUTHERN RHODESIAN RUINS. RECENT ARCHAEOLOGICAL INVESTIGATIONS

Caton-Thompson, G.; Nature, 124:619-621, October 19, 1929.

Since Dr. Randall MacIver investigated in 1905 the problem of the age and origin of the Southern Rhodesian ruins, little evidence on the purely archaeological side has been forthcoming, except that Mr. Douslin, then Minister of Public Works in Southern Rhodesia, partially cleared in 1915 the deep deposits in the so-called Western Temple of the Zimbabwe Acropolis. In 1924, Sir Arthur Keith reported that four ancient skeletons found in various gold-mines, and one from Zimbabwe itself, were of Bantu type, but there is no evidence that these skeletons were those of the original miners.

Dr. MacIver, both in Mashonaland and Matabeleland ruins, found at levels considerably lower than the foundation courses of the containing walls, datable Oriental and European imports of medieval age, consisting of Chinese porcelain, Persian faience, Indian and Venetian beads, and Arab glass. These facts argued conclusively to his mind the general contemporaneity of the buildings with medieval times. With these dated imports was a quantity of native African pottery, metal work and other objects, differing little from those still made by local

Bantu tribes to-day. No object datable as earlier than early medieval was found by him, or had indeed ever been found by the too active amateurs who had preceded him, who had had the pick of the untouched ground, but clung without concrete evidence to the idea of a Phoenician or even older South Arabian origin.

MacIver's argument was immensely strengthened by a structural peculiarity of the Rhodesian buildings, namely, the presence of very hard artificial floors of crushed granite (certainly contemporary with the walls), with which the builders furnished their enclosures and which, when intact, offer an absolutely impenetrable barrier against the infiltration of later objects to a lower level. In Aimbabwe's Elliptical Temple alone, MacIver put down seven test trenches through these floors to see what objects lay beneath. The results of six of these tests were as follows: In one case there was nothing; in four cases native objects identical with those found above the cement floor with dated medieval imports, were discovered; in one case two pieces of imported white porcelain, in company with an iron spear-head and native pottery, were found. MacIver does not specifically date these porcelain fragments, but classes them in his generalisation as medieval.

The seventh test, which was made in Enclosure 15, has become historic. Mr. R. N. Hall had, in previous years, all but cleared out this enclosure, removing 12 vertical feet of deposits from above the original cement floor, at which level he stopped. His published section shows Nankin china, Arab glass, and native pottery in what he calls his fifth stratum from the top--a stratum immediately overlying the original cement floor; from this fact he inferred its later date. Accidentally or otherwise, Hall left a small section standing. This was found and critically examined by MacIver, who asserts that Hall's stratigraphy was mistaken, and that his fifth layer, containing the medieval china and glass, was, in reality, not a separate stratum, but an integral part of the cement foundations of a hut, forming a stratigraphical unit with the cement floor on which it rested. That being so, the cement would be dated by the objects Hall found in it as medieval. MacIver carried on excavation at this spot through the cement floor down to bed-rock 5 feet or so below. He got no datable objects; but a definite stratum of ash and sand was encountered, its level being some feet below the level of the foundation courses of the Temple walls. This lowest stratum contained coiled bronze wire bangles, native pottery, and spindle whorls, similar to the same objects found associated with the mediievally dated products at higher levels.

On inference, therefore, and in conjunction with his positive evidence, MacIver urges the approximate synchronism of the two within a century or two. The evidence bound up in that earliest stratum is obviously extremely important to the whole dating question, and I have concentrated our researches upon it.

At Dhlo-Dhlo, in Malabeleland, MacIver got more evidence of a corroborative nature. Beneath the unbroken cement floor of a platform in the heart of the little stronghold, he obtained Nankin china and Arab glass, lying side by side, with typical African native iron and other objects. The midden and other places produced the same result.

My plan of work was as follows: First we tested the stratification over a wide, continuous area, not only down to bottom, but also with particular reference to its behaviour in relation to main walls in order to see if evidence could be collected proving the walls contemporary with a pre-medieval level. Secondly we checked the results by means of excavations in the deepest undisturbed sections available in other areas, both at Zimbabwe and far afield in distant ruins, as well as by excavations vertically beneath some structure of unquestionable antiquity.

To fulfil the first part of this programme, a site had to be found providing two essentials not easy to come by:

(1) A site unquestionably as old as Zimbabwe's Elliptical Temple.

(2) A site showing an intact cement floor, and yet a site of sufficiently minor importance to warrant the inevitable destruction of that floor.

Dhlo-Dhlo, which I visited and tested on several occasions, failed under the first heading; the Zimbabwe Temple and Acropolis under the second.

The Maund Ruins. I found the spot which seemed likely to meet the case at the Maund ruins in the Valley of Ruins, Zimbabwe. The walls are ruinous, but show all the features characteristic of the Temple---the rounded, bastioned entrances, the grooved doorways, the peculiar concave or convex swing out of the bottom courses to form stepped approaches.

My test pit on virgin ground outside the Maund walls to prove the character of the natural soil showed 12 ft. 6 in. of yellow granite-sand sub-soil of Quaternary age; this was overlain by a layer of red hill-wash about 2 ft. 6 in. thick. This yellow sandy soil forms the sub-stratum of the whole of the Maund ruins, and excavations were not carried below its surface level. The Maund shows the curiously disconnected conglomeration of arcs of elliptical walls, so characteristic of the Rhodesian ruins. Some of these bound enclosures; others refuse to be connected up on any coherent plan whatever. The walls end abruptly, and our excavations, in only one case, revealed a foundation linking up two separated lengths.

Beneath a thin skin of humus we found 10 in.-1 ft. of a hard, yellow, artificial cement formed of pulverised granite. This had been laid as a floor over practically the whole area, and it covered the bottom three or four courses of the walls. This cement, in turn, overlay 2 ft. 6 in.-3 ft. of a brown-red, silty soil of natural origin---hill-wash---but containing charcoal, sherds, and iron tools and slag. Upon this the walls were actually built, and we found this to be the case, with only one exception, in every one of the twenty-nine segments of walls contained in the Maund ruins. (Substantial sections were left standing for examination by members of the British Association.) The red, silty soil passes vertically beneath the walls, which rest directly on it without any prepared foundation. In only one case does a wall rest upon the granite cement floor already described, and this wall appears structurally to be an after-thought. Above the cement floor there was a layer of humus of variable thickness, containing abundant sherds.

In the absence of any established sequence for ancient Rhodesian pottery, it is impossible to say with confidence what objects in this latter position belonged to the period of the cement flooring (the Zimbabwe period, let us call it) or what had shifted down on to it through the humus---or, inversely, what had shifted up into the humus from the surface of the ancient floor beneath. Though the cement flooring is barely covered in some places, in many others there is a large amount of red clay, locally called dagga, extensively introduced into these and all other ruins for hut building ('pole and dagga' huts). In places the dagga clay is piled over the granite cement floor, and in others there are clean cuts through the cement and these are filled with dagga. This shows that the dagga is later than the cement, but there is little difference in the respective contents, and probably no great length of time separates them.

Beneath the intact granite cement floor 10 in.-12 in. thick, and as hard as stone, we obtained 418 sherds of coarse, gritty, red-brown ware. The rims have a flat lip sometimes decorated with diagonal or other arrangements of shallow, square or round punches in the wet clay. Dr. MacIver figures what appears to be similar ware from the Niekirk ruins near Umtali. It is of interest to remember that he judges the Umtali-Niekirk-Inyanga group of ruins to be rather older than Zimbabwe. With this class of rough pottery was a small quantity of plain black polished ware, indistinguishable from that found all through the higher levels. Iron slag and weapons were found throughout this layer, and

also fragments of bangles of flat bronze wire coiled over grass fibre. These finds are just what MacIver got in his lowest ash stratum in Enclosure 15 of the Temple.

No case can be established for an occupation before the building period, and all objects excavated from a sealed deposit of this period in the Maund are typically Bantu. In the course of the work, interesting paved pathways were uncovered and these will be discussed when the detailed results of the work are published.

The Acropolis Sites. The hill-top fortress shows evidence of many successive additions, of terraces faced by curving walls, around the original centre: it also contains the enclosure called the Western Temple. Two test-diggings revealed the middens of the early inhabitants. One of them reached granite boulders at 18 ft. Here the top 12 ft. 6 in. was dagga clay artificially laid down. It yielded good iron implements and fragments of a soapstone bowl in the top 5 ft. Below the dagga was a black midden with ox and other bones, sherds, also two undecorated native pots, six pottery phalli and fragments of bronze wire bangles. On rock-bottom there were two more pots, apparently Bantu, and another phallus.

The other pit, which was dug through a terrace, showed a paving of thin granite slabs 15 ft. -17 ft. below the surface, surrounding a curious stone structure; the objects found in the underlying 5 ft. -6 ft. of black midden are therefore are definitely from a sealed deposit as those from the Maund. This midden, at 18 ft. -25 ft. beneath the present surface, obviously comparable with the other, yielded further types of objects such as three fragments of iron tools, iron slag, a whole porcelain bead threaded on thin bronze wire, and eighty other imported heads in opaque glass. Sherds included the usual black or grey ware, but also fragments similar to those in the lower stratum in the Maund. Here, therefore, there were inhabitants when the building of pavements such as those of the Maund came into use; whilst at some still later period, the area was levelled up to form a terrace, with high retaining wall, by the introduction of dagga and rubble, completely burying thereby the earlier building. This evidence is in harmony with that obtained in 1915 by Mr. Douslin (*Proc. Rhodesia Sc. Assoc.*, 1921-22).

The Elliptical Temple. Trenches totalling 260 ft. in length and averaging 5 ft. 6 in. in depth have been made near the Temple, in every case reaching down to the granite rock. The results have been the same everywhere, the finds from bed-rock level being analogous to those from the midden on the Acropolis. These finds give confirmatory evidence but are not of primary value because they do not come from sealed deposits. In one place, adjoining the Mauch ruins, rock bottom is reached at 9 ft., or about 4 ft. 6 in. below the bottom course of poorly built walls. Here there are two superposed stone pavements, and here again the oldest layer, a bed of grey ash and sand 1 ft. 3 in. -1 ft. 6 in. thick, resting on bed-rock, yielded imported glass beads. As this layer passes under the walls, it may be older than they, or it may belong to the period of construction.

Around the Conical Tower have rallied the theories of foreign origins and, with the consent of the Rhodesian Government and the help of a mining engineer, a tunnel was driven under the Tower from side to side, exposing the underlying deposits down to bed-rock. The tower rests, without any prepared foundation, on 5 ft. 6 in. or so of granite-sand. This sand yielded two palaeoliths. Above this came a thin layer of reddish silt similar to that in the Maund ruins; this was sieved and washed. The objects recovered are a small iron band or clamp, a tiny gold bead, traces of a coiled bronze bangle, and a sherd of black pottery with metallic polish, similar to the ware found so abundantly in all our other excavations.

The purpose of the Tower remains obscure; no evidence has been found to suggest it was a grave; its workmanship is so haphazard that in a diameter of

18 ft. 4 in. there is a fall of 1.19 ft. That this is not due to later subsidence is shown by the fact that thicker courses to correct the error in the ground courses have been introduced higher up the Tower. This is scarcely the work of high civilization, and this opinion has been confirmed by numerous archaeologists and engineers who visited the ruins with the British Association.

Sites in the Sabi Reserve. This reserve, of about 9,000,000 acres, lies on the watershed of the Sabi and Inyazitza Rivers. Matindere, the best known of the ruins here, has a rare dentelle pattern in its crescentic girdle wall. We made 160 ft. of trenches, reaching granite under about 2 ft. of veldt soil and rubble artificially introduced. The finds were the usual ones, and, in the adjacent midden, more than a thousand glass and shell-disc beads were obtained, as well as nineteen others of metal, bronze, and copper.

Chiwona ruins, unknown to all but four white people, yielded rough pottery phalli, hollow perforated bones such as are known from Khami, imported beads, bronze wire bangles and spindle whorls from the midden outside the walls. The site showed signs of recent occupation. A variety in the rather stale list of finds is a fragment of black polished pottery with a frog modelled in low relief climbing up to the brim.

Mshosho ruins, with relics of massive walls and a true Zimbabwe style of entrance, yielded, both from the midden and from the bottom of a fine rock-passage, recalling that of the Zimbabwe Acropolis, more beads, establishing its age as contemporary with that of the other ruins. Mshosho also had stone foundations for grain bins on its terrace-walls and contemporary with them.

Chibrumani ruins in the Sabi-Deruli district were also examined, and yielded similar results.

Beads have been classified from sites ranging from Dho-Dho in Matabeleland to the eastern regions of Mashonaland; these beads link up the dating evidence over this wide area.

Dating. Two fragments of Celadon glaze were obtained from the foundations of a hut of no stratigraphical importance, and these are said by the British Museum to be of the Sung period, tenth to thirteenth century A. D., but they probably reached this remote spot later on. As to beads, Mr. Horace Beck makes a preliminary statement that some are of south Indian types, not later there than 900 A. D. Other beads are of types found in remains of villages in Malaya, and also in similar sites in Borneo, the earliest dating for which seems to lie between 600 and 1100 A. D. We thus have imports the extreme dating limits of which in their homelands lie between 600 and 1300 A. D.: this evidence is supplementary, therefore, to that of Dr. MacIver. I should like to take this opportunity of expressing my admiration for his sound pioneer work.

It is inconceivable to me, as it was to Dr. MacIver, how a theory of Semitic origin could ever have been started. Every detail in plan, building, and contents seems African Bantu. Further, the construction is such that, apart from repairs, not one stone would be standing on another in a period reckoned in millenia and not in centuries. My respect for, and interest in, the Rhodesian ruins is enormously strengthened by these conclusions. Instead of a degenerate offshoot of a higher Oriental civilisation, we have a vigorous native culture showing high organisation, originality, and industry. It is a subject worthy of all the research South Africa can give to it; South African students must be bred to pursue it.

MSB-017 BUILDINGS

MSB-017 RECENTLY DISCOVERED RUINS IN RHODESIA

Geare, Randolph I.; Scientific American, 94:231-232, March 17, 1906.

Spreading over an area between 18 deg. and 22 deg. south latitude and about 27 deg. to 33 deg. east longitude some puzzling ruins have lately been discovered, concerning which very little has so far been published. More than one hundred and twenty separate localities show evidences of the same character of remains, while minor ruins of forts and what were probably guardhouses are scattered for a considerable distance beyond the limits above indicated. Most of the ruins are in or near a region liberally supplied with granite, whose huge boulders form parts of the walls, which it would seem were erected for defensive purposes. Most of the blocks of granite measure from seven to eleven inches in length, and from 2-1/2 to 5 inches thick, roughly worked into a rectangular shape, while larger ones were often used in building the lower courses. The blocks were carefully laid in the walls, many faced on both sides, the interior being filled up with loose rubble. No cement or mortar was used, but the excellent and solid character of the masonry is proved by the fact that some of the walls, 30 feet high and 16 feet thick at the base, stand as firmly to-day as when they were built---probably as far back as 1,000 to 2,000 years before the Christian era.

The extent of some of the ruins, such as Zimbabwe, Mundie, M'Popoti, Chum, Dhlo-Dhlo, and Khami, would indicate that they were important centers, the first being by far the greatest. The so-called "temple" at Zimbabwe (houses of stone) is perhaps the best example of the architecture employed. It is an elliptical figure of three hundred feet by two hundred and thirty feet. Several ingenious theories have been propounded as to the significance of the curves, of orientation, of the special object of the ornamental work in its walls, and as regards the standard of measurement used, but it is a question how far they can be relied upon. Thus, one explorer states that his measurements of the celebrated cone in the temple differ materially from other that have been made, and on which latter was founded the theory that the unit of measurement was the cubit of 1.717 feet.

It is regarded as strange that none of the buildings is square or rectangular in form. The older ruins are characterized by round ends to the walls and entrances, elaborately ornamented, while those of apparently recent date have square corners and straight walls. Several of the entrances were found to be covered in. At Zimbabwe passages or openings through the walls can be seen, the roof or top being supported by beams or slabs of stone. In the entrances of some of the ruins stout hardwood posts still remain, lying partly in recesses which were left in the wall at the time of their construction, the blocks being laid carefully against the timbers. The theory has been advanced that the entrances to these ruins face the rising or the setting sun, which might indicate some form of sun-worship, but others affirm that these openings point to all parts of the compass, and were evidently placed where best suited to the special locality.

In the older type of ruins the walls generally run in one face from the foundations to the top, while in later ruins the walls are built in two, three, or even four tiers, stepped back, and forming terraces two to ten feet in width, and originally covered with a concrete or cement pavement made of crushed burnt granite.

The most characteristic feature of the buildings is the way in which they were ornamented. Spaces were left in the courses by introducing sloping tiles

or thin slabs of stone of different colors, or by laying some courses of a different colored rock. Explorers report that they have discovered several distinct types of ornamental work, which they have named and classified as (1) dentelle, (2) chevron, (3) herring-bone, or double line of sloping blocks, (4) sloping block, (5) check or chess-board pattern, and (6) courses of different colored rocks. The first of these styles of ornamentation---the least common of them all---is formed by placing blocks with an angle facing outward, as is often seen in modern brickwork. The second is a kind of inverted V (the apex uppermost). In the third the V lies sidewise, one following another. In some instances the slabs or tiles of each "herring-bone" are of granite or ironstone, or occasionally a section of granite tiles is followed by one of ironstone. In others the herring-bone figure extends for a long distance, while in others each pattern is separated by one or more full-sized blocks of granite. The "sloping block" is similarly varied. In the check or chess-board style the pattern is formed by leaving out alternate blocks, the dark cavity which remains forming a marked contrast with the gray face of the wall.

At Zimbabwe is seen a special style of ornamental work, consisting of large beams or posts of granite and soapstone fixed into the top of the walls, generally in an inclined position. The objects found in these ruins embrace a large variety, including iron and brass cannon, silver utensils, crockery, beads, glass, etc. These would indicate the presence of the Portuguese at some time. Articles of iron and copper are supposed to represent comparatively recent Kaffir occupation; while worked gold in plates, bangles, beads, tacks, ferrules, etc., are considered to be typical of the ancient builders who, in search of the precious metal, penetrated into what was to them the uttermost part of the world. Such articles as the beads, gold work, roughly carved stone emblems, etc., are claimed by some to establish the antiquity of the ruins beyond doubt on account of the similarity between them and other like objects found in Egypt and Arabia, although it is of course possible that these articles may have been brought from Northern Africa by Arab traders or by migrating tribes in comparatively recent times. This is a problem which further investigation alone can solve.

Mr. Randall McIver, who largely through the assistance of the Rhodes trustees has made extensive explorations in this region, divides these ruin-sites into two groups, the first including the Rhodes estate, the Niekerek ruins, and Umtali; the second embracing Dhlo Dhlo, Nanateli, Khami, and the celebrated Zimbabwe. Dhlo Dhlo is easily accessible from Bulawayo, being only sixteen miles from the railway station of Insiza. Round the citadel there runs a girdle-walk, built of rough, unworked stones, carelessly piled on one another. Viewed as a whole, with the citadel on high ground in the middle, and this rough wall surrounding it, Dhlo Dhlo strongly resembles the eastern fort at Inyanga, whose antiquities have been described as "hill forts," "slave pits," and "water furrows."

Some explorers believe that these pit dwellings not unfrequently contained a subterranean passage, but others affirm that they were built up, and not excavated. The builders commenced by raising a massive platform, whose exterior platform was composed of large, unhewn rocks, carefully selected and fitted, while the inside was filled with earth and rubble. On continuing the work down hill, the builders did not content themselves with maintaining the same height of platform all the way, but added extra courses in proportion to the increase of the gradient, so as always to maintain a horizontal surface over the top. On the upper side of the incline the artificial structure might only be a meter high, but on the lower side it was often two or three meters high. So it was possible, by leaving a space within the platform itself on the lower side, to make a pit

without excavating at all, and this the ancient builders appear to have continually done. Thus the floor of the circular or elliptical pit is always found on the actual level of the ground outside, though its sides may be as much as eight feet in height.

The cement walls of Dhlo Dhlo are still partially intact, and the circular ones were foundations and floors of huts, but where the circumference of one circle abutted on another, a horseshoe or wedge shaped piece was often inserted to fill the space which otherwise would have been left vacant. Excavations showed these hut-foundations to have been constructed as follows: On the bed-rock was first put a layer of large, rough stones mixed with earth, and a flooring of cement some 40 centimeters thick was laid upon this. Then the cement walls of the round hut were erected upon this floor, and divisional walls of the same material were inserted to divide it into compartments. The walls of the huts bear the clear impress of wooden stakes, against which the cement had been plastered, and stakes were also used to hold together and strengthen the cement of the platform while it was drying. In all these platforms wooden stakes are found within the cement of the floor, generally running clear down to the foundation. There is therefore nothing surprising in the presence of wooden posts standing up above the ground to support the slides of the stone walls at the main entrance.

Some idea of the vast extent of these ruins may be had from the fact that the Niekerk ruins alone cover an area of not less than fifty square miles, and it is said that within their limits it is hardly possible to walk ten yards without stumbling over walls or buildings of rough, undressed stone. The general principle of these ruins is described as embracing nine or ten hills, each of which constitutes a separate unit, complete with its own buildings and divided at the bottom from its neighbor by a boundary wall. Such a boundary is the first in a series of concentric lines which rise one behind the other, at first low and wide apart, then higher and closer together, until the crown of the hill is reached. On one of the lower hills there were counted fifty distinct concentric lines from the valley to the top.

For what purpose could these walls have been built? Mr. McIver disposes of the idea that they were built for purposes of cultivation or irrigation, and concludes that they were intrenchment lines, which leads to the supposition that the inhabitants were subject to sudden attacks from hostile tribes.

In many of these fortified places objects of different kinds were found, including articles of copper, bronze, and iron; also stone implements, quartz and crystal arrow-heads. In one excavation Mr. McIver found the remains of ceremonial feasts, consisting chiefly of bones of antelope. They had been partially burned, and the great logs of the fire were discovered in several cases. There they had been placed, with the ashes from the fire and various small articles and implements, in large earthenware jars, which were found buried in groups of varying number, or sometimes in layers, one on the top of the other.

MSC-005 THE HOHOKAM CANALS AT PUEBLO GRANDE, ARIZONA

Woodbury, Richard B.; American Antiquity, 26:267-270, 1960. (Reproduced by permission of the Society for American Archaeology from American Antiquity, 26(2), 1960.

Interest in the surviving, visible remains of ancient irrigation canals in southern Arizona and northern Sonora has been long and intense, going back at least to Manje's careful notes on the canal at Casa Grande ruin in 1697 (Karns 1954:86), and including such observant travelers at Rusling (1877: 394-6) and the records of several local residents, particularly Patrick (1903) and Turney (1929). Nevertheless, the body of information available has consisted largely of unsystematic comments on the surface appearance of these canal remnants, and the investigation of Hohokam irrigation by archaeological techniques has proceeded very slowly. The work that Cushing directed at Los Muertos was reported by Hodge (1893) and supplemented by Haury's monograph (1945) which also summarized the available information on the subject. The only thorough excavation of a Hohokam canal that has been reported is the cross sectioning at Snaketown in 1935 which provided clear association between the stages of construction and use of the canal and the ceramic sequence being worked out at the site. On this basis it was possible to assign the beginning of the Snaketown canal to about A. D. 800 and suggest that it was in use for about 500 years. Careful mapping of the entire surviving Hohokam canal system, making use of aerial photographs, was begun by the Smithsonian Institution in 1930 but never completed due to the pressure of other activities and the lack of funds.

The interdisciplinary program in the utilization of arid lands which is being carried on at the University of Arizona with financial support from the Rockefeller Foundation of New York has made it possible to examine several surviving Hohokam canals, including (during October and November, 1959) the well-known pair of canals in the Park of Four Waters, Phoenix. This city park, of about 10 acres extent, is located just across the modern Grand Canal and the Southern Pacific tracks from the Pueblo Grande Museum, in the stockyards area of eastern Phoenix. Although the location is far from scenic, surrounded as it is with industrial activities, it has been protected from the encroachments that have destroyed all trace of most prehistoric canals in the Salt River Valley.

Prior to this recent excavation, which is reported in preliminary form here, the canals at Pueblo Grande were marked by two pairs of conspicuous parallel ridges, the remains of the banks which several centuries of erosion had not yet leveled. The actual channels were filled to about the level of the surrounding land, although the height of the banks gave the illusion of two deep channels. Both canals trend to the west and northwest, gradually swinging away from the Salt River which lies nearby on the south. At their eastern ends they are so close together that their adjacent banks merged into a single bank. This has been thought in the past to indicate that either (a) they forked just to the east from a common parent canal, now entirely destroyed by recent floods of the Salt, or (b) they both headed here, at a time when the Salt flowed closer to the spot than it does now. As will be shown, both of these beliefs are almost certainly wrong. The canals, at the point investigated, run along a low terrace of the river, only a couple of meters above the present channel, which is here nearly a half mile wide but flowing only in rare floods.

Excavation of a cross section of these canals was greatly aided by the generous loan of a Gradall, with its two operators, by the Salt River Valley Water Users Association. The 60-m. trench with sloping sides which the Gradall dug to a depth of two to three meters was further deepened by hand where it crossed the filled channels of the two canals, and one wall was cleaned to permit observation of the stratigraphy.

MSC-005 CANALS AND WATERWORKS

One of the most impressive revelations of this trench was the size of the original canals, about 10 and 6 m. wide at the former ground level, and about 26 and 18 m. wide from crest to crest of the banks, as shown in Figure 1. Also, the fact that subsequent filling of the channels had raised the level between the banks to slightly higher than the original ground level is of interest, since it vitiates inferences that have been made in the past concerning the relationship of river channel elevation and canal elevation. Such inferences have been based only on observations of present surface indication, which this cross section shows to be inadequate for estimating original depth (or profile).

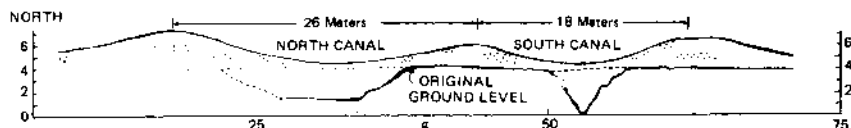


Fig. 1. Canal Cross section.

The North and South canals proved to be quite different in profile; the North Canal being flat-bottomed with the sides sloping at about 35° , the South Canal V-shaped in profile with the lower part of the sides sloping at 5° to 60° . Nevertheless, they contained rather similar fills, ranging from coarse sand through fine sand to silt, much of it laminated and indicating successive phases of deposition, with either periodic intentional cleaning or natural removal of the deposits. Both canals were dug through an otherwise undisturbed layer of fine-grained, river-laid sand ranging in thickness from 1.5 to 2.0 m., and both were dug into underlying coarse gravel, a most unpromising material for holding the water that the canals were constructed to carry. There is, of course, a possibility that the water table was high enough in ancient times for the canal bottom to have penetrated it, and thus considerably reduced the loss of water in transit. However, in the North Canal, the remains of a substantial clay lining were found resting on the lowest of the sandy fills in the channel. The lining consists of a compact, homogeneous layer of chocolate brown clay, from 5 to 9 cm. thick, with a cracked and uneven upper surface as though exposed to the sun. Careful examination revealed no lamination or horizontal structure within the clay, such as would indicate that it was naturally deposited in standing water. Furthermore, although the layer of clay was not traceable across the bottom of the canal, where it had probably eroded away, it was well preserved for a considerable distance up the sides; if this were the remnant of a water-laid layer it would have originally been over a meter thick, a wholly unreasonable deposit in such circumstances. Instead, the evidence points clearly to its having been laid by hand, with clay brought from a source not yet identified but possibly within a few miles. The total extent of this clay layer can only be guessed, but its presence was verified in test pits 40 and 145 m. to the west. With an observable width of at least 8 m., and assuming a minimum thickness of 5 cm., such a lining would have needed at least four-tenths of a cubic meter of clay for every linear meter of canal. Only a very critical need could have justified bringing in such a quantity of material. The need was undoubtedly for a canal bottom that would lose less of its water in transit, as the channel is here dug into coarse material into which water would percolate easily. Many modern irrigation

canals are, of course, lined with concrete for the same purpose, the cost being more than offset by the saving in water. No other Hohokam canal has been found with an identifiable lining, although some early and unsubstantiated reports mention the use of adobe or clay for this purpose. It is doubtful if this was ever a common practice but in this instance there seems little doubt that at least part of a large canal was carefully lined to render it practically watertight, even though the cost in labor must have been enormous. It should be noted that the canal saw use for at least a short time prior to the addition of the lining, as shown by the deposit underlying it (number 1 in the cross section).

The canal banks are made up, as would be expected, initially of the material excavated from the channels during construction. All three banks contain, at the base, unstratified sandy material identical with the undisturbed material below it except for the latter's laminated condition. The presence of a few sherds at the contact between the stratified and the homogeneous material helped in determining the position of the original ground level. As the construction of the canals progressed and the diggers encountered coarse gravel, this was piled on the banks above the finer, sandy level. This gravel, being the last material dug out of the channels, should have formed the tops of the banks, and probably did at first. But the banks were further augmented by fine material, silt and sand, cleared from the channels, so that today the banks still stand 2.0 to 3.0 m. high even after enough material has been washed down from them to completely refill the canals. This should, then, be a rough indication of the quantity of sand and silt dredged from the channels during the years that they were kept in use.

It was hoped that clear evidence would be found in the central bank, shared by both canals, for the priority of one canal or the other. This proved difficult to determine, as no clear line could be found separating the material piled onto the bank from the North and South canals. Nevertheless, the position of the gravelly zones in the central bank suggests that the larger zone, extending from 44 to 48 m. in the profile, comes from the South Canal, and is overlain by finer material at its north end as a result of the subsequent excavation of the North Canal. The position of two smaller gravelly zones high in the north side of the central bank also suggests that the North Canal was dug after the South Canal had been in use long enough to require considerable clearing. Therefore, it is probable but not certain that the South Canal is the older.

The difference in elevation between the bottoms of the canals is of considerable interest. If the two canals were branches of a parent canal (now destroyed by the river), they would have to be approximately the same elevation. Therefore, this widely-held belief must be discarded. The bottom of the South Canal is about 1.5 m. below the bottom of the North Canal, and is about the same elevation as the dry bed of the Salt immediately to the south. It is possible, therefore, that the South Canal headed only a short distance to the east; the North Canal would have had to head some little distance further upstream to gain its higher elevation. It is much less probable that both canals headed nearby to the east, and that lowering of the river channel by erosion resulted in abandonment of the higher, northern channel and digging of the new channel to a greater depth. Much less labor would have been required for the deepening of the already existing channel.

The successive fills of the two canals could not be correlated with each other, and there is no way to determine at what point in the history of the South Canal the North Canal came into use---if, as we suspect, they were used in this sequence; their spans of use may, of course, not have overlapped at all. The fills, as observed in cross section, are separated by fairly clearly defined discontinuities. However, the material of one fill is very similar to another,

the variation being in fineness of particles and in changes in the thickness and dip of the bedding planes that record each layer's manner of deposition. A detail of excavation technique is of interest in connection with these fills; observation of details was made easier by the passage of a few days because the loss of color difference due to drying was less important than the clear and delicate etching that was produced by the strong winds that blew nearly every day. The relief that was developed between the more compact and less compact laminae could be only partly achieved by gentle jabbing with a fine-bristled paint brush, but this substitute for a few days' wind action was helpful in making possible immediate interpretation of exposed portions of the profile.

The fill of both channels shows one characteristic shared with modern irrigation channels and permanent streams. When the rate of flow is increased by an increase in the volume of water, previously deposited materials are removed, but mainly from the bottom of the channel and to a lesser extent from the sides. This can be easily observed in the cross section of the North Canal; the deposits labeled 1, 3, and 4 are entirely absent at the center of the canal but remain at one or both sides. In the South Canal, the oldest fill, No. 1, appears to have been two or three times as thick as the remaining portion at the center of channel, with all but a small portion against the south side cut away prior to deposition of fill 2.

Dating the construction and use of the canals has proved difficult. Their proximity to Pueblo Grande would suggest use during its occupation, which probably extended from the 12th century to the end of the 14th, with a large part of its construction during the Soho phase, approximately 1150 or 1200 to 1300. However, examination of the few sherds found in and under the canal banks and in the canal fills shows no evidence of construction before the Soho phase or of use after it. The small number of sherds makes such a conclusion somewhat less than final, and the possibility cannot be eliminated of a much earlier canal having been completely cleaned out or totally re-excavated and enlarged, thus removing evidence of its original date.

The total extent of these canals was recorded by both Patrick (1903) and Turney (1929), Turney probably depending heavily on Patrick's much earlier first-hand observations. The North Canal is shown as extending for about 9 miles, the South Canal about seven. Both are shown heading about a half mile east of the Park of Four Waters. There is an apparently reliable local recollection, however, that before the end of the last century one of these canals could be traced another two miles eastward, to a point opposite Tempe Butte (O. S. Halseth, personal communication). It may never be possible to establish the original length of these canals precisely, but the general order of magnitude suggested here is undoubtedly correct. Both canals are comparable in length to some of the modern canals in use today. It might be expected that canals of such size, involving substantial and probably protracted labor in their construction, would have been used for more than the century or so suggested by the ceramic evidence. On the other hand, many causes may have been responsible for their abandonment after a relatively brief span of service---excessive silting, water-logging of the fields they served, or changes in the river.

It is too early in the current study of prehistoric land- and water-use in the Southwest to attempt answers to the many questions posed by Hohokam irrigation. Its origins, its extent, and the reasons for its decline need much further study, and the social and economic implications of this extensive system of large canals are not yet understood. As this study progresses it is hoped that all of these aspects of Hohokam irrigation will become better known. A more detailed report on the canals at the Park of Four Waters, and reports on the other investigations now in progress will be presented in the future.

MSD-004 ON THE CELTIC ANTIQUITIES OF AMERICA

ch, John; American Journal of Science, 1:7:149-161, 1824.

From our earliest infancy we are accustomed to admire every thing connected with ancient times. The sentiment seems implanted in our nature, and if the monuments we see, or those we read of, belong to our native country, or even to one which we have made our home, the interest becomes more intense, and every faculty of the mind is exerted, to trace their origin and investigate their use.

With communities of men, as with individuals, great importance is attached to a long line of glorious ancestry, and the first desire of all civilized nations has been, to investigate the history of the tribes who first visited the countries they inhabit, and it is an honorable feeling which prompts men to ascertain the history and migrations of the ancient inhabitants of the earth.

While the people of Europe boast their descent from the Goths, the Celts, and a hundred other barbarous tribes which the page of history has immortalized; the natives of America are considered as "novi homines," because their existence can be traced only during two or three centuries of years. It is the duty of Americans to refute this groundless accusation, and at the same time fill up a chasm in the early history of their country; this may be effected by calling their attention to the rude stone monuments with which their country abounds, although they have hitherto escaped their notice, or been passed over as unworthy of regard.

Who is there within the limits of the wide world, that has not heard of the name and fame of the Druids, of their religious sacrifices, and of their instruments of gold, with which they severed the sacred mistletoe from the venerable father of the forest, the wide-spreading oak. The object of the present essay is to extend their empire a little farther than has hitherto been imagined, and to suggest that the Aborigines of America were of Celtic origin, that their monuments still exist in the land, and are the most ancient national memorials which America can show, and that if antiquity is to be a boast, this continent can produce monuments nearly as old as any in Europe, and derived from the same common ancestry.

Man lives a few years; but he erects monuments, and thus survives in the recollection of posterity, and the various tribes who have successively inhabited the world may be traced by the peculiar features of their architecture. That of barbarous nations was distinguished by its simplicity, and large massy stones were the first objects of attention and respect. The primitive families of the earth were destitute of tools with which to shape and polish masses of rocks; and the first national monuments we read of in sacred writ, were rude stones, either placed alone, formed into a circle, or piled into a heap.

These shapeless stones are proofs of the highest antiquity in any nation where they are found, and were erected by men of whom tradition has scarcely preserved even the name; they remind us of times to which our calculations and our history do not reach.

The Celts or Scythians, who gradually migrated from the borders of Assyria and Palestine, have left remains of their language and religion, in the central and northern regions of Asia, in England, France, Germany, Russia, and Scandinavia. Let us ascertain if no memorials of their residence can be traced in this country.

The monuments which they erected, while in distinct hordes they successively traversed the various quarters of the world, may be divided into five species. 1st. Cromlechs. 2d. Stones of memorial or sacrifice. 3d. Circles of memorial. 4th. Rocking Stones. 5th. Tumuli or Barrows.

1. We begin with the ancient and venerable cromlechs, by which, as an unerring guide, the tribes of men who erected them may be identified; they are of a peculiar structure, one huge stone, elevated two feet or more above the ground, higher at one end, and supported by several stones placed underneath. In England, some of the top stones, or rather rocks, are of an enormous size, and similar structures are found in various parts of Europe and Asia. These majestic and durable stone monuments appear built to defy the knowledge and foil the curiosity of the present race of men; the purpose for which they were erected is unknown, and various have been the opinions upon this subject.

They have successively been called tombs, small temples for the residence of country divinities, and altars contaminated with the dreadful sacrifice of human victims.

"The barbarous priests some dreadful God adore,
And sprinkle every stone with human gore."

The voice of history, with perhaps too just a decision, affixes the perpetration of this enormity upon all the tribes who departed from the land of Scythia; but whether these were the altars consecrated for such purposes, is one of those secrets which perhaps even time can never solve.

On my arrival in this country, I thought I had left the land of Celts and Druids far behind me, and great was my astonishment, on a perusal of Silliman's Philosophical Journal, when I read in the second volume, page 200, to which the reader is requested to refer, the description of a most noble cromlech, although the writer, the Rev. Elias Cornelius, is evidently not aware of the valuable relic of antiquity which he has described. It is mentioned by that gentleman on account of a geological fact supposed to be connected with it; the highest stone is of granite, and the pillars which support it are of primitive limestone, which is therefore supposed to be of equal age with the granite above; but in fact, it is a magnificent cromlech, and the most ancient and venerable monument which America possesses, and establishes a common origin between the Aborigines who erected this monument, and the nations who erected similar cromlechs in other parts of the world.

It is thus described:---"In the town of North-Salem, and State of New-York, is a rock which, from the singularity of its position, has long attracted the notice of those who live in its vicinity; and being near the public road, seldom escapes the notice of the passing traveller. Although weighing many tons, its breadth being ten feet, and greatest circumference forty feet, it stands elevated in different parts, from two to five feet above the earth, resting its whole weight upon the apices of seven small conical pillars. Six of these, with their bases either united or contiguous, spring up like an irregular groupe of teeth, and constitute the support of one end of the rock. The remaining pillar supports the other end, and stands at the lowest part of the surface over which the rock is elevated.

"Notwithstanding the form of the rock is very irregular, and its surface uneven, its whole weight is so nicely adjusted upon these seven small points, that no external force yet applied, has been sufficient to give it even a tremulous motion. There is no mountain or other elevation near it, from which the rock could have been thrown."

The Geologists in Europe have made an attack upon some of these ancient monuments, and assert that they were produced by the decomposition of rocks of granite; but in this instance, the pillars underneath being of limestone, and the large stone on the top of granite, we cannot consider it as the production of nature, because those rocks seldom or never occur in that relative situation. It may also be supposed that it is a boulder of granite, deposited by diluvian

torrents in its present situation; but against this opinion, it may be asserted with some confidence, that primitive limestone never appears above the surface of ground in the shape of small conical pillars, but in large massy blocks, which may be readily seen at some distance. Others may suppose that some ardent admirer of Celtic antiquities erected this monument for his own amusement, but the immense weight of the upper stone renders this improbable.

2. Stones of Memorial or Sacrifice.---Mr. Kendall, who travelled in the northern parts of the United States, seems to have had a very correct idea of the value of these monuments in an historical point of view; and mentions some of those which occur in Massachusetts. He says: "In different parts of the woods are six or seven masses of stone, on which the few Indians who still hover around their ancient possessions, make offerings; and on this account the name is given to them of Sacrifice Rocks. Two of these are on the side of the road leading from Plymouth to Sandwich; one of them is six feet high, the other four, and they are ten or twelve feet in length. They differ in nothing as to their figure from the masses of granite and other rocks, which are scattered over the surface of the surrounding country. All that distinguishes them are the crowns of oak and pine branches which they bear, of which some are fresh, others are fading, and the rest decayed."

Captain Smith, in his description of Virginia, relates that the Indians had certain altar stones, which they call Pawcorances; these stand apart from their temples, some by their houses, others in their woods and wildernesses, where they met with any extraordinary accident or encounter. As you travel by them, they will tell you the cause of their erection, wherein they instruct their children as their best records of antiquity, and sacrifices are offered upon these stones when they return from the wars, from hunting, and upon many other occasions.

Charlevoix mentions the worship of rocks as one of the superstitions of the Northern Indians.

In Messrs. Lewis & Clarke's Travels there are noticed several of these rocks.

Stone Idol Creek, on the Missouri, derives its name from three rude stones which the Ricaras, a tribe of Indians, worship. Whenever they pass by, they stop to make some offering of dress, in order to propitiate these sacred deities.

On the bank of the Chessetaw Creek is a rock which is held in great veneration by the neighbouring savages, and is visited by parties who go to consult it as to their own and nation's destinies.

The fate of the Mandan tribes depends upon the oracular responses of another sacred rock, whose commands are believed and obeyed with the most implicit confidence. Every spring, and on some occasions during the summer, a deputation from the savages visits the sacred spot where there is a large porous stone, twenty feet in circumference.

In Major Long's Tour to the Rocky Mountains, it is stated, that the Minnitaree Indians worship the Me-mo-ho-pa, a large, naked, and insulated rock in the midst of a small prairie, about two days' journey from the village of that nation. In shape it resembles the steep roof of a house; and the Minnitarees resort to it for the purpose of propitiating their Great Spirit by presents, fasting and lamentation, which they continue for a space of three or five days.

Under this class of Indian monuments may be arranged as the figured rock at Dighton, in the State of Massachusetts, which has been described in various publications; also the sculptured rocks that occur in many parts of the American continent, at Tiverton, Rutland, Newport, Scaticook, Brattleborough, Ohio, &c. &c.

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It is to be regretted that a manuscript of the late Dr. Stiles, which is in the possession of the American Academy of Arts and Sciences, and contains an account of many of these remains, has not yet been published.

Perhaps the intricate question of American ancestry might be solved by the annals of Mexico, or the histories of Peru, and a deep research into the books of those countries, would no doubt amply repay the toil.

Acosta relates that, amongst the ancient Mexicans, worship was paid to rocks or large stones, and that in the highways they found great heaps of them, which had been offered to the gods; but he adds, that in his time, this superstition of worshipping great stones had altogether ceased.

Gomara, in his account of Peru, mentions the same practice as still continued amongst the old inhabitants in that country.

Thus in the various regions of America, the natives had carefully preserved the stones of memorial and sacrifice, in the use of which they had been instructed by their Celtic ancestors, and which in some instances may have been the individual monuments erected by that people.

If accurately examined, there can be little doubt that America contains an abundance of these rude stones, which were erected by the ancient inhabitants as memorials of their history and exploits in war, or as altars on which to sacrifice to the Deity. The books of the first historians of America, contain many accounts of the homage which was paid by the natives to shapeless rocks, and the sacrifices offered upon them; but in the lapse of time, the Indians being nearly destroyed by diseases or by war, and these stones offering no particular feature to the common observer, scarcely a trace of their present position can be distinctly marked; but to the historian these rude stones are objects of the highest interest, and every exertion should be made to identify the situations where they occur.

3. Circles of Memorial were the next monuments erected by the ancient Celts; they consist of nine, twelve, or more rude stones, placed so as to form a circle, and were generally placed upon an eminence.

They answered several purposes; they were dedicated to religious services, and sacrifices were made either within the sacred circle, or in its vicinity; at the election of chiefs and leaders, the nations assembled here, and public business was supposed to be sanctioned by the gods, if transacted within the boundary of their temples. They were also used by the priests for astronomical purposes.

There appear to be at least three of these sacred circles in America. I have been informed of one by Dr. E. James, the scientific tourist to the Rocky Mountains. It is situated upon a high hill, one mile from the town of Hudson, in the State of New-York, and attracted his notice many years ago, on account of the remarkable size of the stones, and their position.

In Machenzie's tour from Quebec to the Pacific ocean, there is noticed a circle of stones, artificially laid on a high rock, upon the banks of the river Winnipeg, which discharges itself into a lake of the same name. The Indians are accustomed to crown this circle of stones with wreaths of herbage, and with branches; for this reason, the carrying place which passes it has received the appellation of *Le Portage de Bonnet*.

In Purchas' *Collection of Voyages*, vol. 3, page 1052, one of the historians of Peru, in describing the manners and customs of the children of the sun, says: "To make the computation of their year sure and certain, they did use this industry; upon the mountains which are about the city of Cuzco, where the kings held their court, there were twelve pillars set in order, and at such distance that one from the other, as that every month one of these pillars did note the rising

and setting of the sun. They were called Succanga, and by means of these stones, they taught the seasons fit to sow and reap, and other things; they did certain sacrifices to these pillars of the sun."

These are no doubt connected in their history with the other Celtic remains, and resemble those druidical circles, which are so common in Europe and Asia, and which from their immense size and the majesty of their appearance, received from Tacitus the expression "rudes et informes saxorum compages," and from Cicero the appellation "mirificae moles." But the scientific assistance of individuals who reside near these monuments is requested, that an accurate account of them may be published, and thus a small ray of light be thrown over the history of the Aborigines of America.

Tradition sometimes conveys along the stream of time a name attached to these stone monuments, which informs us of their use. In Erin's bright green isle, which was a favorite resort of the Druids, these stone circles, placed upon an eminence, are called in the Irish language Carrich Brauda; and in Wales, similar structures have retained the name Cerrig Brudyn, to the present time; the appellation is the same in both countries, and means Astronomer's circles. And thus in ages long since past, perhaps at the same instant of time, though under different skies, the Druids of England, and the priests of Cuzco, the astronomers of Ireland, Hudson, and Winnipigon, seated upon the lofty hills, and surrounded by their sacred circles of stone, were calculating the progress of the seasons, the revolutions of the planets, and the eclipses of the sun, by the same formulae which their ancestors had first practised in the central plains of Asia.

4. Rocking Stones, are memorials raised by the same people, and the same race of men, who elevated the cromlechs; they consist of an enormous stone so equally poised upon its base, that a very small force is sufficient to move it; sometimes even the touch of a finger will cause it to vibrate.

There are several of these memorials of a former race, in the United States of America, but of the origin of the whole of them we cannot be certain, until an accurate account is published of their size, appearance, and situation, and it would be desirable if they were illustrated by correct drawings. In the State of New-York there are probably three or more. Professor Green has described one, in the American Journal of Science, vol. 5, page 252. It is situated near the top of a high hill, near the village of Peekskill, in Putnam country; the moveable stone is thirty-one feet in circumference; the rock is of granite, but the mica contained in it being schistose, gives it some resemblance to gneiss, and it is supported by a base of the same material. This rocking stone can be moved by the hand, although six men with iron bars were unable to throw it off its pedestal. From the drawing which accompanies the description in Silliman's Journal, this rock presents every appearance of an artificial monument, and may perhaps with safety be classed amongst the celtic antiquities of North-America. ---Putnam's rock, which was thrown from its elevation on one of the mountains in the Highlands during the revolutionary war, may have been a rock of this description.

There is also a rocking stone in Orange County, State of New-York, of which no account has yet been published.

In the State of Massachusetts, I have heard of some near Boston, between Lynn and Salem, but do not vouch for the accuracy of the statement, until they undergo a careful examination.

There is one at Roxbury, near Boston, described in the Journal of Science, edited in that city.

A small rocking stone occurs at Ashburnham, in the same State.

In New-Hampshire there are two; one at Andover, weighing fifteen or twenty tons, and the other at Durham. This was a short time since a very splendid

rocking stone, weighing between fifty and sixty tons, and so exactly poised, that the wind would move it, and its vibrations could be plainly seen at some distance. But, two years ago, a party from Portsmouth visited it, and after several hours of labor succeeded in moving it from its position. A proper feeling on the part of the persons who effected this mischief, would cause them to restore it to its original place. The rock is forty five feet in circumference and seven in thickness.

5. Tumuli or Barrows, are found in every part of the immense expanse of American territory, from the Lakes of Canada to the Mexican sea, from the shores of the Atlantic, to the borders of the Pacific ocean, and they may be considered merely a continuation of the same monuments which extend from the icy promontories of Kamschatka, through the barren steppes of Tartary, the level plains of Russia, and all the northern regions of Europe.

These tumuli were the simple repositories of the Celtic dead, the tombs of their warriors, the last resting place of those who were wise in council and valiant in war, and an enlightened people should respect the remains of the former chieftains of North America.

It is a spot upon the escutcheon of Virginia that a tumulus which had belonged to an ancient Indian nation, and been described by the pen of the philosophic Jefferson, should now be nearly destroyed by the encroaching spirit of agriculture, and the bones of Celtic warriors allowed to blanch under a meridian sun, but in the western states this may be said to occur every day, and thus the vestiges of former times are effaced by the advance of the plough, and even Antiquarians have assisted to open and rifle these sanctuaries of the dead. Surely the land has been acquired cheap enough from its aboriginal possessors, and humanity might dictate that their tumuli, their mounds, their camps, their altars, and the bones of their warriors should be allowed to rest in peace.

It seems probable that if these untutored nations wished, in a more particular manner, to perpetuate the memory of some one, who was near and dear to them, who had given his nation important councils in peace, or raised the fame of his country in war, then they thought the mound of earth too humble a covering for his remains, and raised high a pile of stones, to mark to future times, the tomb of their favorite chief. In the Celtic language, these were called Cairn.

J. C. Atwater mentions them as occurring near Newark, and in the counties of Perry, Pickaway and Ross.

In Dr. Dwight's travels in Connecticut, there are noticed two of these stone tumuli, which appear to have been erected over offenders against the law.

Adair, in his History of the North American Indians, says, "in the woods we often see innumerable heaps of small stones in those places, where according to tradition, some of their distinguished people were either killed or buried. There they add stone to stone, still increasing every heap, as a lasting monument and honor to the dead and an incentive to great actions in the survivors."

In the same volume it is said, "the Cherokees continue to raise and multiply heaps of stones, as monuments for their deceased warriors."

Mr. Jefferson says they occur in Virginia;---they are also mentioned by other historians, and tradition relates that the Indians in passing these tumuli still add a stone to the heap to shew their respect to the memory of the heroes of other times, the ancient Celtic chiefs.

These monuments of the aborigines, carry with them undoubted evidence of their Celtic origin, and although few are at present described, yet when the country is fully explored, many other remains of the same character may be observed. Moderns build their temples in crowded cities, and the talent of eminent architects is put in requisition, to erect the most splendid edifices

that skill and taste can produce, but the wild and untutored Goth, Celt, Scythian, Indian, and Druid, thought it a disgrace that their Gods, who created the immensity of the heavens should be confined in buildings made by the hands of men. They worshipped them in the solitude and silence of retired groves and woods, and it is there we must look for the remains of their altars and cromlechs, their kistvaen and Tolmin.

It may be asked if these are really druidical remains, which are the Stonehenge, or the Abury, or the Carnac of America, the reply is that the insular situation of Britain, and the mountainous country of Bretagne were favorable to the institutions and genius of the Celts, and it was in those countries alone that the Druids erected those more splendid monuments of their religion, which have attracted the most powerful feelings of admiration and awe from passing ages.

What connexion can there be between the ancient Celts and Germans, who have been described by the pencil of a Tacitus, and the wandering tribes who now inhabit the interior parts of America?

Beneath the majestic language of the Roman historian, you may discover a picture of uncivilized tribes, varying not much from the North American Indians. But these scorned even the slight trammels, which must be the bond of any civilized society, and wished to be as free as the air they breathed; the love of liberty was to these poor savages a meteor light, which divided them into weak, independent tribes, who were continually at war.

Before I close this essay, may I be allowed to say one word to plead for the preservation of these monuments, which should be to all Americans a subject of the most anxious care.

In other climes, superstition and despotism have contributed to the overthrow of many a noble Celtic monument, but in this land of freedom, it would be well, if legislative power, or better still, if public opinion would throw its shield around these remains, and protect the last monuments of a former race. Americans should consider that one of these cromlechs or Cairns, does more to elucidate the history of their native country, than the learning of Robertson, or the genius of Buffon.

The Celts erected these monuments in order that they might speak to their children.

"Quid nobis dicunt isti lapides?
Positi sunt in monumentum."

They prove that a nation of Celtic origin once inhabited this continent.

Note. In concluding this essay, I wish to express my obligations to the members of the New-York Historical Society, for the very liberal manner in which they have allowed me access to the valuable library, collected under their auspices, which is extremely rich in all works connected with American Antiquities.

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MSD-005 STONE MONUMENTS

Fewkes, J. Walter; Scientific American Supplement, 76:248-251, October 18, 1913; and 76:264-265, October 25, 1913.

Introduction. A seemingly well defined phase of human culture history, attained independently in localities widely separated geographically, has been designated the megalithic. The dominant racial feeling, religious or cultural, was expressed in this epoch by great commemorative monuments constructed of stone and called "monoliths," or, when sculptured in life forms as representations of animals, men, and gods, they are termed colossi.

The close connection, in the mind of primitive man, of culture and religion is preserved in the Latin word *cultus*, or its English derivative, culture, the stimulus for which is desire for improved condition of life in thought and act or a striving for higher ideals, so well brought out in Mr. Matthew Arnold's scholarly essay, "Sweetness and Light." The megalithic epoch expresses objectively a consciousness of power and is largely correlated with religious feeling and the cult of the dead.

This phase in racial history culminated in the later Stone Age, and in some cases lasted long after the discovery of metals, echoes of it appearing sporadically even in the highest civilization. Many races appear not to have had a megalithic epoch in their history; in others the expression was individual, not racial; some peoples had not sufficiently advanced to have attained it, while others have progressed so far beyond this condition that its very existence is at present known only by monuments; the names and the races of the builders have passed out of memory, or are unrecorded.

It is an instructive study in religious or culture history to trace the distribution of megalithic monuments characteristic of this epoch, to compare the varieties of forms they assume in different localities and consider their purpose; but the vastness of the subject limits my consideration to one aspect, monoliths and colossi, rendering it necessary to pass over a large number, perhaps the majority, of megaliths.

Why do these monuments occur in certain geographical localities and not in others, and how are they to be interpreted by the student of human geography? What is the nature of the feeling they express?

The causes which have led one race and not another to develop a megalithic habit may be sought in certain psychical conditions difficult of interpretation, but the custom appears to have originated independently and spontaneously under different physical conditions. The erection of monoliths is not due to similarity of environment so much as to identity of thought, the feeling originating subjectively rather than in response to surroundings. Westropp ("Prehistoric Phases") writes:

"It is now a generally accepted canon that there are common instincts implanted by nature in all the varieties of the human race, which lead mankind in certain climates and at a certain stage of civilization to do the same thing in the same way, or nearly so, even without teaching or previous communication with those who have done so before."

The significance of megalithic monuments is correctly pointed out by Mr. Fergusson who writes:

"Honor to the dead and propitiation of the spirits of the departed seem to have been the two leading ideas that, both in the East and West gave rise to the erection of these hitherto mysterious structures which are found numerous scattered over the face of the Old World."

In somewhat the same vein are the words of Mr. John Stuart:
 "The remains of most ancient people attest that greater and more enduring labor and art have been expended on the construction of tombs for the dead than in abodes for the living."

Sir James Stimpson held somewhat the same belief:

"There is no longer reason to doubt that the Egyptian pyramids are megalithic tombs of the dead."

A study of the megalithic epoch has its historical and its geographical sides; the historian being concerned with its appearance in time; the geographer with place. The anthropogeographer embracing both in his consideration asks the pertinent question: Why has this epoch occurred at a certain place at a certain sequence in culture history and not elsewhere at another time?

It is unnecessary to remind you that culture history is not limited to written records, and that concerted actions of races, whether recorded or not, constitute their history. Those inventions that have most profoundly influenced culture, like the discovery how to make fire, are more important in results than great battles that have brought about dynastic changes.

Monoliths, as expressions of a desire to perpetuate the memory of ancestors or to commemorate past events, are naturally found only where the race had arrived at a self consciousness of its own power. Their geographical distribution over the earth's surface corresponds roughly with the awakening of that consciousness. The megalithic custom, therefore, has an independent origin among different people, and its prevalence among widely separated races by no means implies, much less proves, acculturation or contact. It is autochthonous and its origin, being mental, can be traced to what for a better name we call psychic influence.

The megalithic habit is necessarily dependent on the nature of convenient rock formations and other geological conditions.

It is self evident that except in so far as the production of megaliths is dependent on transportation of material used, the distribution of monoliths is largely geographical, correlated with that of stones suitable for their manufacture. Great plains or sandy deserts furnish scanty material for construction of monoliths, and if megaliths are used by people living in this environment the distribution of rivers and the direction of their flow, by which they were transported from a distance, must be given weight. Monumental structures are not to be expected in cold regions where the earth's surface is covered with snow or ice clad; while generally children of the deserts, they occur in forested regions, and are commonly found in those regions of the earth that show a long continued habitation by man. They are tropical and warm temperate zone structures and exotic elsewhere.

Natural monoliths or huge stones, unchanged by the hand of man, have been set up by all races, occurring with equal abundance in Europe, Asia, Africa, America, and the islands of the Pacific. They are found singly, or in groups, regularly or irregularly arranged, taking the forms of rectangles, circles, and other various combinations.

Old World Megalithic Epoch. In certain regions of the earth's surface, as in France, England, the Mediterranean Islands, along the coast of northern Africa, Syria, Egypt, and India, monoliths are more abundant than in regions situated in higher latitudes. They are not found very far from the historic zone of civilization. The similarity of these objects along both shores of the Mediterranean Sea and beyond the Pillars of Hercules has suggested to some students that they were erected at the same time by the same race, but the constructors of monoliths have not necessarily a racial connection.

It is believed that the unworked monolith was used far back in human history for some religious purpose. While its erection as a commemorative object would seem to be secular and to have developed from the habit of throwing together a heap of stones to mark some event, a large stone has almost invariably acquired a religious meaning. Worship of stones is universal, the Greeks early worshipped a shapeless stone, probably a meteorite, in Ephesus that was later replaced by a beautiful statue representing Diana. The Kaaba of Mecca, as is well known, antedates the Mohamedan era; the shrine of the Earth and Fire god of the Hopi Indians of Arizona is a log of petrified wood.

The following interpretation of the structure of megaliths known as cromlechs has been suggested by Herr W. Pastor. They present three distinct regions: (1) a centrally placed altar; (2) one or more concentric circles of stone surrounding this altar; (3) an entrance passing to the holy enclosure formed by rows of stones cutting the concentric circles at right angles.

Since monoliths from their very nature are commemorative they early became the media on which pictographs were incised, and there is an instructive connection between the origin of writing and the construction of monoliths. Man first inscribed his ideas on the face of cliffs, rocks, or boulders, and it is a significant fact that the races that have invented writing have likewise been foremost in erecting monoliths. The relation, however, is not necessarily one of cause and effect. On Easter Island, for instance, where great colossi in human form exist, we also find evidence of writing. The glyphs of the Central American stelae are well known. The Egyptians who excelled all people in the grandeur of their megalithic monuments, have left the largest known corpus of hieroglyphic material. In the majority of cases the most perfect monoliths, like the obelisk and colossus, in the New World as well as the Old, bear hieroglyphics.

We find at various places in the old and new continents monoliths arranged in alignment or rectangular or circular forms which were connected with solar or stellar ceremonies. These combinations bear various names, being known in the New World as Indian enclosures, ball courts, or corrals; while in the Old World they are called dolmens, menhirs, and cromlechs.

Columns or pillars supporting roofs of buildings, which are so common in sacred architectural constructions, are regarded as monoliths related to those commemorative or religious forms we are considering. In the same architectural category are huge stone blocks used in foundations or construction of buildings or monolithic roofs of tombs. The covering of the grave of Theodoric the Great at Ravenna, Italy, is a good example of this type of monolith, as are likewise the huge stones found in buildings in Japan, at Ostia near the mouth of the Tiber, in Peru, and elsewhere.

The best known of all megalithic monuments is the famous Stonehenge, in Wiltshire, England, the purpose of which has been variously interpreted by different authors. This monument consists of many monoliths and trilithons, some of which are more or less artificially worked, others natural, surrounded by rings of stone.

The stone circles of Avebury, measuring 1,200 feet across, were the largest and finest megalithic monuments in existence, "exceeding Stonehenge as a cathedral does a parish church." Other stone circles occur at Stanton Drew in Somersetshire, in the Orkneys and other English islands.

Simpler forms, like "Kit's Coty House," one of the best known dolmens in England, are reproduced almost in duplicate in Sweden, Holland, Denmark, Portugal, France, India, on the banks of the Jordan, in the deserts of Arabia, India, Syria, Mexico, and Peru.

The evidence available shows that rude undressed stones, like menhirs, dolmens, and cromlechs, are essentially sepulchral or memorial stones, but

their wide distribution over the earth's surface precludes our limiting them to any one race of men. In some parts of Europe they have been ascribed to the Druids, but the presence of dolmens and cromlechs in lands where Druids never lived shows that this popular belief must be somewhat modified. In their distribution around the shores of the Mediterranean, Corsica, Sardinia, and the Balearic Islands, they seem to have followed certain laws which might lead us to refer these monoliths to a center of distribution situated on the shore of the eastern Mediterranean, but this law can not account for the presence of similar monoliths of the New World or in eastern Asia or southern Africa.

Some of the dolmens now above ground were formerly buried and were superficially indicated by mounds or barrows. But perhaps the religious character of menhirs, cromlechs and dolmens is best indicated by those buried in mounds:

"The great Lanyon dolmen in Cornwall was uncovered about one hundred years ago by a farmer who supposed it to be a mere heap of earth which he thought might be usefully applied to farming purposes. By degrees, as the earth was carted away, the great stones began to appear and when operations were completed and all the soil had been cleared away the dolmen, much as it now exists, was disclosed containing in its interior a heap of broken urns and human bones."

A work on Irish antiquities, by Vallancey, published near the close of the 18th century, shows a plan view and section through a mound and megalith, with the chamber at the center, and passageway at the side.

The geographical distribution of megalithic remains is almost parallel with that of stone buildings, which in turn are identical with caves, natural and artificial.

Mr. Baring Gould describes and figures buried dolmens in south France upon which churches were constructed, the chamber of the dolmen serving as the crypt of the church, a perpetuation of the sacred character of a building used for religious purposes in prehistoric times before the introduction of Christianity. This fact is in evidence in its bearings on the former religious use of the megalithic monuments.

Windle, in considering the use of monoliths, writes:

Such stones have been in other countries not merely memorials of some great deed or departed hero, but objects of worship, and the same was probably the case in this country.

Mr. Gomme, in an instructive work, "Survivals of Worship," shows how the reverence once attached to them persists in folk practices.

"At the village of Holme situated on one of the moors of Dartmoor is a field of about two acres, the property of the parish and called Plog Field. In the center of this field stands a granite pillar (menhir) 6 feet or 7 feet high. On May mornings before daybreak the young men of the village used to assemble there and then proceed to the moor where they released a ram lamb, and after running it down brought it in triumph to the Plog Field, fastened it to the pillar, cut its throat and then roasted it whole."

The evidence drawn from a study of the monoliths known as menhirs, dolmens, and cromlechs seems conclusive that they were connected with religious beliefs and always related in some way to the dead or mortuary ceremonials. In western Europe these stones have long since ceased to be used in religious rites, although survivals of former ceremonials persisting in peasant folk lore, are significant. We must look elsewhere in other lands where similar objects occur for light upon the meaning of monoliths. Asia and Africa furnish important aid in this study.

Herr Kremer in his accounts of the ancient cults of Arabia makes frequent

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allusions to natural stone worship, and in the village of Tarf there was worshipped a great irregular stone block identical with a goddess whom Herodotus called Urania. The Phoenicians were very much given to the worship of stones called baetylia, and wherever the influence of this wide roving race of traders was exerted there these monoliths are found. They are scattered along routes of trade of this people and to a degree their distribution follows the same law as that of Greek colonization so ably pointed out by Prof. Myers. Apparently the same paucity of these monuments is found on the coast of the Adriatic Sea, for the same reason that it has no Greek colonies. These baetylia are most abundant where Greek and Phoenician settlements, especially the latter, are most numerous.

Certain districts of India, as the Neermul Jungle, are said to swarm with monoliths and megalithic monuments. In Berrary, alone, Dr. Forbes Watson counted 2,129 megalithic monuments, and menhirs, cromlechs, and dolmens have been recorded in Sorapoor and Khasia; they also occur elsewhere among the hill tribes. The Todas in the Nilghery Hills have large stone circles similar to those of England, and in the Deccan, in India, villages are said to have circles of large stones sacred to Vetac. Col. Leslie records stone circles in Ceylon, and according to Palmer there are stone circles over 100 feet across near Mt. Sinai in Arabia, where Kohen mentions three large stone circles consisting of lofty trilithons 10 feet high, standing on raised foundations. Stone monuments occur in Morocco, Algiers, Tripoli, and along the whole coast of northern Africa; Lieutenant Oliver has compared the megalithic structures found in Madagascar, among the Hovas, with those of the Channel Islands.

The upright stones of some of the East Indian dolmens in the Deccan are, according to Capt. Meadows Taylor, perforated and used by the natives for various purposes one of which is to facilitate the passage of food to the manes of the dead.

Similar "holed-stones," according to Mr. W. G. Wood-Martin, which "may, in most instances, be regarded as pillar-stones," are found in Ireland: they occur in Scotland, England, and France, and thence they can be traced to India. It is stated that in the last mentioned country these perforated stones are "used by devotees, as a means of attaining forgiveness of sins, or for spiritual regeneration. If the hole is large enough, the suppliant creeps through, but if it is small the hand alone is passed through."

The artificial monolith includes all single stone monuments of size worked by human hands, from a rude hewn slab set on end to a finely carved obelisk inscribed with hieroglyphs. Some of these stones are enormous in size, but how they were cut from the quarries and transported long distances are facts difficult to explain with our limited knowledge even of the Egyptians, whose every art and craft is illustrated on the walls of tombs and temples by picture writing. Many of these large stones were apparently moved without the use of machinery, yet we find this accomplished without leaving any traces of roads or highways. To indicate the magnitude of the work of transporting these great stones consider the amount of labor in transporting the monolithic pillars of the Treasury building in Washington, which are among the largest single stone blocks in the United States, and have been calculated to weigh 38 tons; some of the Egyptian obelisks weigh 300 tons, or nearly eight times as much.

The columns or pillars of the Cathedral of St. John the Divine in New York are even larger than the monoliths of the Treasury building.

Several of the obelisks quarried and moved by the Egyptians weighed several times as much as these.

The estimated height of the Lateran obelisk is 105 feet 6 inches and its weight 510 tons; Cleopatra's Needle in New York is 69 feet 6 inches high and

weighs 224 tons. The obelisk still in the quarry at Syene is 95 feet long and it is estimated to weigh 770 tons, which may be a greater weight than the Egyptians could move.

At the great ruin Zimbabwe, in South Africa, there are huge boulders about 50 feet high; immediately below the highest is a curious little plateau adorned by huge monoliths and soapstone pedestals supporting gigantic stone birds, the tallest of which stood 5 feet 4 inches in height. Several of these monoliths are decorated with life figures, one of which, 11-1/2 feet high, is made of soapstone and adorned with geometrical patterns. In Bent's account of this ruin occurs the following forcible description:

"Such is the great fortress of Zimbabwe, the most mysterious and complex structure that it has ever been my fate to look upon. Vainly one tries to realize what it must have been like in the days before ruin fell upon it, with its tortuous and well-guarded approaches, its walls bristling with monoliths and round towers, its temple decorated with tall, wierd-looking birds, its huge decorated bowls, and in the innermost recesses its busy gold-producing furnace. What was this life like? Why did the inhabitants so carefully guard themselves against attack? A thousand questions occur to one which one longs in vain to answer. The only parallel sensation that I have had was when viewing the long avenues of menhirs near Carnac, in Brittany, a sensation at once fascinating and vexatious, for one feels the utter hopelessness of knowing all one would wish on the subject. When taken alone this fortress is sufficiently a marvel; but when taken together with the large circular building below, the numerous ruins scattered around, the other ruins of a like nature at a distance, one cannot fail to recognize the vastness and power of this ancient race, their great constructive ingenuity and strategic skill."

Obelisks. The most finished type of monolith is the obelisk, a stone structure best represented in the valley of the Nile and adjacent territory. In architectural proportions the Egyptian obelisk is a perfect monolith. Although from the early times transported by conquerors of Egypt to different localities in Europe and adopted throughout the world as a commemorative or mortuary monument, the obelisk in its present form originated in a narrow geographical area skirting the Nile, in northeastern Africa.

The purest type of obelisk, like that of Heliopolis, is a monolith tapering from base to apex, its height being about 10 times the length of one side of the base. In true obelisks all four faces are plain surfaces equal in width, although sometimes as observed by Verninac at Karnak there is a marked entasis or convexity similar to the curves in pediments of temples. When obelisks bear hieroglyphics they are regularly arranged in three rows reading from above downwards, the oldest vertical row being always in the middle.

The original inscriptions on some obelisks have been erased and new ones added, a method adopted by some rulers to express their consummate egotism.

The various Egyptian obelisks not only vary slightly in proportions but also in decorations: some have pictures and inscriptions, others not. There is a variety in mounting; thus, the obelisk of the Piazza del Minerva in Rome and one at Catania in Sicily are carried on the backs of stone elephants. Supporting the corners of Cleopatra's Needle now in Central Park, New York, were bronze props representing crabs, which probably belonged to a later cult and were placed under this monolith when it was first moved and set upright in Alexandria.

Egyptian obelisks, as those of Karnak (Thebes), commonly stood in pairs before the gates of the temples and were made of hard stone obtained from quarries at Syene, from which fact the word syenite has come to designate this geological formation. They commemorate the deeds of rulers whose cartouches

they bear, accompanied by invocations and grandiloquent references to the mighty deeds of the builders, or subsequent rulers.

Many theories have been framed to explain how these obelisks were quarried. A large specimen still remaining in place in the quarries at Syene is attached to the rock by one side, the other three sides have been fashioned into shape. It is supposed by some authorities that the form of the obelisk was first marked out on the surface by cutting a groove, and that the rock was cracked by first building fire on it, after which the ashes were swept away and water poured into the groove---a method still used at the present day by the East Indians. Other authorities have supposed that holes were made at intervals and a series of wedges was placed in these holes and thus the stone was cracked off. Having been quarried the obelisk was dressed and inscribed, after which it was moved to its future home. The means by which it was transported on rafts are known, but how the great weight was set on end after the obelisk had been brought to its future site is as yet not clear.

As we depart from the Nile, the home of the obelisk, southward into Abyssinia, we find representations of the obelisk of somewhat different forms and probably of different development. The main difference outside of the form appears to be the absence of inscriptions and a departure from the square section with equal faces.

The best Abyssinian obelisks would seem to represent sacred buildings, or sun houses consecrated to Baal, being connected with sabeism or sun-worship, a pagan cult that antedated the introduction of Christianity into Abyssinia, but which has left in that country several architectural survivals, among which may be mentioned circular churches with doorways at the cardinal points, and ceremonial rites as dances before the church altars.

The monoliths of Russia, commonly called babas, or old women, grannies, may be classified as colossi and are probably of Mongol origin, being found from Mongolia to the banks of the Danube. They represent a connecting link between the statue menhirs or engraved dolmens of Aveyron, south France, the "steinfliguren" of Germany and the colossi of China, to all of which they are akin. They show that monoliths and colossi are the same in intent, and that the basal principle of both is ancestor worship or the almost universal cult of the dead.

Colossi. The highest expression of the megalithic art appears in great single stones carved into life forms known as colossi, of which the statues of Memnon are good examples. In these monoliths man attempted to express his ideas of the greatness of his gods or ancestors by the mammoth size of his idols.

We detect very clearly in the colossus the influences of geographical environment. They can be traced to a sedentary life, for a wandering people is not one that produces great sculptures. The dependence of the sculptor on available rock formation has long been recognized, for the production of a colossus of great size is impossible unless a certain kind of rock is available for that purpose. Colossi were made in the most advanced stage of the megalithic epoch and are abundant in both the old and new worlds.

With exception of the sculptured menhirs, "steinfliguren," and babas, European colossi are small and inconspicuous. Monolithic colossal statues are not characteristic of ancient Greek, Etruscan, or Roman art in Europe, but occur in Asia, northern Africa, Central America, and Polynesia.

We find some of the largest known colossi in Egypt where the megalithic age reached its highest development. The great sphynx at Ghizeh, the statue of Rameses II and the enormous seated figures of the vocal Memnon, at Thebes, one of which is still a monolith, attest the barbaric power of the ancient Egypt-

tians in this line of expression.

In the buried cities of Ceylon there are many monoliths and colossi of Buddhas. The interior of the first temple of Dambulla contains "the gigantic recumbent figure of Buddha, which together with the pillow and couch on which it rests, is cut of the solid rock, and measures 47 feet in length." "The reclining figure of Buddha," says Burrows in his description of Gal Vihara (rock temple) of Ceylon, "is by far the finest of the three. It measures 46 feet in length and has suffered little from the ravages of time."

The colossi of China are best illustrated by the stone figures lining the road or dromos to the tombs of the Ming dynasty, about 40 miles north of Peking, recalling the avenue of colossal sphinxes in Egypt. These huge images take the forms of men, griffins, elephants, camels, and turtles, 32 in number, arranged in pairs; one of the latter having an obelisk on its carapace reminds one of the elephant bearing an obelisk now in the Piazza del Minerva at Rome, and can be traced directly to Mongol influences, although in southern China where it is not as strong, giant images of Buddhas are frequently encountered.

The existence of colossi on Easter Island, one of the most isolated islands of the Pacific Ocean, so far from all other monumental works of magnitude, is one of the archeological enigmas. Here and there on Pacific islands there are stones that may be called monoliths, but the images of Easter Island surpass them all in size and importance.

The latter are thus described in a report on a visit to this island in 1876 by Paymaster William J. Thomson, United States Navy:

In order to form an estimate of the magnitude of the work performed by the image-makers, every one on the island was carefully counted, and the list shows a total of 555 images . . . Of this number 40 are standing inside of the crater . . . The largest image is in one of the workshops in an unfinished state and measures 70 feet in length; the smallest was found in one of the caves and is a little short of 3 feet in length. One of the largest images that has been in position lies near the platform which is ornamented, near Ovahe; it is 32 feet long and weighs 50 tons . . .

The images were designed as effigies of distinguished persons and intended as monuments to perpetuate their memory. They were never regarded as idols, and were not venerated or worshipped in any manner . . .

The work of carving the image into shape and detaching it from the rock of which it was a part, did not consume a great deal of time, but the chief difficulty was, in the absence of mechanical contrivances to launch it safely down the slope of the mountain and transport it to a distant point. It was lowered to the plain by a system of chocks and wedges, and the rest was a dead drag accomplished by main strength. A roadway was constructed over which the images were dragged by means of ropes made of indigenous hemp, and sea-weed and grass made excellent lubricants. The platforms were all built with sloping terraces in the rear, and up this incline a temporary road-way was constructed of a suitable height, upon which the statue could be rolled until the base was over the proper resting place. The earth was then dug away to allow the image to settle down into position, the ropes being used to steady it in the meantime . . .

The fact that these huge monoliths rise from platforms recalls conditions in South Africa already considered where monoliths and gigantic birds stand on similar great stone platforms.

There is abundant evidence that Mr. Thomson has correctly interpreted the Easter Islands colossi as "effigies of distinguished persons . . . intended as monuments to perpetuate their memory." Investigation of the monoliths and colossi of other Polynesian islands points to the same conclusion regarding them.

Only a few of the more advanced people of America show evidences of the

megalithic phase of culture, but the races dwelling on the Cordilleras of South America and those inhabiting the lowlands of Central America were in this stage of cultural development before the discovery of America by Europeans. The best examples of megaliths occur in Peru, Columbia, Guatemala, Honduras, Mexico, and Yucatan, in all of which countries there are fine examples of both monoliths and colossi. They often bear glyphs or calendar symbols, which are characteristic of the New World as the Egyptian hieroglyphs are of the country bordering the Nile. No satisfactory evidence has yet been brought forward that phonetic writing arose independently on the American continent. The Indians of the territory of the present United States never developed a megalithic stage, although sporadic instances of natural rocks which have a religious role might be mentioned.

With few exceptions where we find monoliths and colossi, cyclopean walls likewise occur, evidently intended to express the same consciousness of power. This is particularly true of the Incas and pre-Incan races who handled the largest blocks of heavy stone and fitted them together with an accuracy that has astonished everyone from the time of their Spanish conquerors to the present.

We find in various parts of tropical America circles and alignments of monoliths recalling menhirs or cromlechs of the Old World, and called Indian corrales and ball courts. One of the largest and best known of these described by Schomburgk, near San Juan de Maguana in Hayti, was formed of granite stones each from 30 to 50 pounds in weight and arranged in a ring measuring 2,776 feet in circumference. In the center of this dolmen was a rock over 5 feet high supposed to be an idol. Peruvian and Bolivian "sun-circles," are structurally comparable with stone circles in Taumalipas and Vera Cruz, except that they approach the circular rather than rectangular forms.

As Egypt is the native land of the Old World obelisk and colossus, so Central America is the home of the colossi and commemorative monoliths of the New. The American counterpart of Egyptian obelisks are the so-called stelae of Tikal, Quirigua, Ocosingo, Copan, and the ruins of the Uucimacintla valley, in Honduras.

According to Mr. C. P. Bowditch:

"Monoliths are scattered all over the northern and eastern slopes of the Cordilleras as they run through the State of Chiapas in Mexico, and through the Republic of Guatemala into Honduras . . . and in the whole extent of the peninsula of Yucatan . . . The monoliths may be roughly divided into two kinds, according to their shape. One kind (called stela, plural stelae) is tall, measuring in one case 28 feet in height, while they are not over 4 feet in width or depth. The others are low and take various forms, being square, oblong, or round as a rule, though some are carved in the shape of an uncouth animal.

The stelae of Copan and other related Central American ruins have carved upon them representations of men or women wearing symbolic ceremonial paraphernalia, and like the Egyptian statues of Rameses are not intended for divinities but represent priests wearing symbols or headdresses characteristic of gods. These American monoliths or stelae, like Egyptian obelisks, bear vertical rows of lines of hieroglyphs; they generally stand in front of temple mounds or on ceremonial plazas, in much the same relative position as obelisks, indicating by the position, general form, and accompanying glyphs that they are both memorial and religious in character.

The great animal effigies of the Lake of Menagua in Nicaragua, described by Dr. Carl Bovallius, belong to the group of monoliths architectural rather than religious in character, being intermediate between unworked monoliths and colossi. Perhaps the best known Aztec megalithic statue is that called Huitzilopochtli, the God of War, which Mr. Payne, with good reason, identifies

as the Corn Snake goddess, a colossal representation of an effigy made of corn stalks used in ceremonial dances. The great stone tiger found a short time ago in excavations made in a street back of the cathedral near where the old temple of the Aztecs once stood in Mexico City, is a colossus, and the giant serpent's head, part of the ancient wall of the temple now set in the foundation of an adjacent modern building, belongs to the same category.

No colossi have been reported from the Gulf coast north of Taumalipas, but the pillar stones in rude human form, like those of the Huastecs, occur from Cuba to St. Vincent, West Indies, showing the presence of the monolithic feeling among the former people of the Antilles, as well as the Spanish Main.

Our studies of megaliths in America would be incomplete were we to neglect the cyclopean buildings of Peru, with monoliths so remarkable that they have excited the imagination of all travelers. Considerable literature exists regarding these structures; the impression after reading descriptions of them is of great wonder at the magnitude of these buildings.

Mr. E. G. Squier has figured and described one of these monuments which he aptly designates the "American Stonehenge":

"The temple seems to me to be the most ancient of all the distinctive monuments of Tiahuanaco. The stones defining it are rough and frayed by time. The walls between its rude pilasters were of uncut stones; and although it contains the most elaborate single monument among the ruins, and notwithstanding the erect stones constituting its portal are the most striking of their kind, it nevertheless has palpable signs of age, and an air of antiquity which we discover in none of its kindred monuments. Of course, its broad area was never roofed in, whatever may have been the case with smaller, interior buildings no longer traceable. We must rank it, therefore, with those vast open temples (for of its sacred purpose we can scarcely have a doubt) of which Stonehenge and Avebury, in England, are examples, and which we find in Brittany, in Denmark, in Assyria and on the steppes of Tartary."

The monolithic gateway of Tiahuanaco, Bolivia, is the best known megalith of South America. Squier says:

"We must imagine a block of stone, somewhat broken and defaced on its edges, but originally cut with precision, 13 feet 5 inches long, 7 feet 2 inches high above ground, and 18 inches thick. Through its center is cut a doorway, 4 feet 6 inches high and 2 feet 9 inches wide. Above this doorway and as it now stands on its southeast side or front, are four lines of sculpture in low relief, like the Egyptian plain sculptures, and a central figure immediately over the doorway sculptured in high relief. On the reverse we find the doorway surrounded by friezes or cornices, and above it on each side two small niches, below which, also on either side, is a single larger niche. The stone itself is a dark and exceedingly hard trachyte. It is faced with a precision that no skill can excel."

Among other examples of South American structures illustrating South American monoliths may be mentioned the sun-circles (*intihuatana*), first described by Squier, of Sillustani and the stone pillars of Hatuncolla, the latter decorated with figures of serpents, lizards, frogs, and elaborate geometrical designs. The sun-circles consist of rings of well-fitted flat stones forming a platform, on the inner edge of which are erect uncut stones arranged in ring shape, while in the enclosure thus formed are other upright stones that also show no sign of tools. These sun-circles reminded Squier of megalithic monuments of England and northern Europe, and in certain particulars they recall to my mind the bately or ball courts of the West Indies, Mexico, and Central America.

In the limited time available only a few of many megalithic structures in Peru can be instanced; the list might be much enlarged by the addition of mono-

lithic doorways and other examples, but these suffice to show that the erection of megaliths attained a high development in South as in Central America. A people where this power was so highly developed naturally built stones of great size into their temples and fortresses as that of Sacsahuaman, which Squier regarded the greatest specimen of cyclopean style in America. The measurements of the size of the corner-stones of buildings at Cuzco, or salient angles of the component stones of the trinchera-like walls of this fortress are extraordinary; one of the foundation stones is said, by Squier, to be "27 feet high, 14 broad, and 12 in thickness."

The plain near Acora, Peru, is covered with many rude monuments in the forms of circles and rectangles constructed of unwrought upright stones, which Squier finds "almost identical" with cromlechs of Europe, and "might be transferred to Brittany or Wales and pass for structures contemporary with the thousand rude monuments of antiquity found in those regions."

The long, and at times seemingly tortuous, trail we have followed has led the writer to the following generalization. Although the megaliths are among the oldest buildings or architectural structures erected by man, all, from the simplest to the most complex, belong to a series wholly distinct from that including habitations of the living. From the rude uncut monoliths to the perfection of architectural expression, the Parthenon, there are many and varied forms of religious edifices, temples, and shrines, but none of them were erected primarily as human residences. Man has never built as good a dwelling for himself as for his ancestors or gods. Man's noblest architectural efforts are not for abodes for himself while living, but in response to a striving for ideals far higher than personal vanity or shelter for his family. Even dwellings of despots shrink into insignificance in comparison with the creations of a race influenced by the highest religious feeling. The habitations of the builders of the great temples whose ruins astound us by their magnitude, are forgotten; they do not belong in the same series as the megaliths we have studied; they were built by individuals for shelter and personal comfort. Megalithic monuments are expressions of a community feeling influencing man to co-operate for ideals higher than self and should be judged by a very different standard. Temples are not modified human dwellings, but evolutions of the same religious ideal which led man in early times to erect monoliths and colossi.

After what has been said on the geographical distribution of monoliths we may dismiss without serious consideration the theory that they were made by one and the same great race. Equally unattractive is the specious corollary that migrations of culture, save within limits, can be traced by them.

They represent a phase of religious thought, of spontaneous origin almost identically expressed. Commonly associated with tombs or burial places, they are almost universally connected with the cult of the dead. They are both cultural and religious, or expressions of a phase of racial feeling at a time before the two had been differentiated.

In closing it is well to emphasize the main object of the preceding pages and to point out that monoliths and colossi are geographically widespread and not limited to one continent or to any one race of man.

They express a profound racial self-consciousness of power amounting to a religious feeling; incidentally as in arts, institutions, beliefs, and languages, environment furnishes material for or modifies the expression of this consciousness and stimulates endeavor, but culture is due to mental efforts to overcome environment by invention.

MSF-006 FORT MOUNTAIN

Hackleton, Robert, Jr.; American Antiquarian, 15:295-304, 1893.

What Anthony Wayne is to the imagination of Ohio, De Soto is to that of Georgia. In Ohio, if a section of old corduroy road is discovered, it is likely to be at once ascribed to Wayne, even though he may never have been within a hundred miles of the spot. If an aboriginal fortification is found, that, too, must have been built by Mad Anthony. So important were his services to the state, by his march northward from the Ohio, and his overwhelming defeat of the Indians at the battle of Fallen Timbers, that the popular imagination has made his personality omnipresent.

So it is in Georgia with DeSoto. No one knows where he marched; where he fought; where he met savage ambassadors. But he went somewhere through Georgia, and so there are fields and caves and valleys and mountains connected by legend or fancy with his name. Small wonder then that Fort Mountain, which bears upon its summit a curiously remarkable prehistoric stone fortification, should be deemed one of the places where he paused on his way to the Mississippi.

The earliest settlers found the fort there and asked the Indians to tell them by whom it was made. But the Indians could not. The traditions of their tribes said nothing of its origin. Their picturesque fancy had failed to frame a tale wild enough to fit the fort and its awe-inspiring location. They looked up at the rocky heights. They shook their heads. It was all a mystery. And perchance, as they gazed, some dark cloud flung its heavy folds about the jagged precipices, and the savages, gravely solemn, turned away, for their Manito would be angered should they question into what he so evidently intended to be hid.

From the top of the mountain there is a magnificent view. Other mountains stretch off into the distance, while below are tree-covered slopes and rocky precipices, and mile after mile of forests and fields and farms. The eye never wearies of the glorious sight, and as one glances over the magnificent expanse he tries to imagine what were the thoughts of the mysterious people who centuries since dwelt on this height.

For here their simple homes once stood. Here their household fires burned. Here wives welcomed returning husbands, and mothers watched tenderly over their little ones, and young people lived and loved, and children happily played. And here, to guard against the assaults of enemies, a stone wall was built across the broad top of the mountain.

The wall has been sadly shattered and broken. It has been flattened out. Many of its stones have been scattered. But it still marks plainly the original line, as made, centuries ago, by the Mound-builders who constructed it.

Fort Mountain is in Murray County, in northern Georgia, and the point from which it may best be reached is the town of Dalton. From the low hills overlooking that pleasantly situated town there is a wide spreading scene. To the westward are the steep heights of Rocky Face Ridge, which Johnston so successfully fortified and which Sherman tried in vain to pierce, while to the eastward the eye sweeps over fourteen miles of level country to the beautiful Cohutta Mountains, with Fort Mountain standing out from among them impressively distinct and grand.

To reach the mountain one may obtain a conveyance in Dalton, or go by mail stage from Dalton to Spring Place and there make arrangements for the further trip, a distance of several miles. The entire distance, by road, from Dalton to the foot of the mountain, is about seventeen miles.

Nestled picturesquely near the foot of the height is the little village of Fort Mountain, where there are a few little houses, most of them of log, a couple of little stores, two blacksmith shops and two grist mills. The village is a center for many homes perched isolately upon the mountain sides or hidden among the valleys of the region, and therefore the number of places of business is more than would be expected from the actual population of the little place, there being within it somewhat less than one hundred souls.

It was a winter day that we ascended the height. The snow lay in great patches on the fields round about, and clung in long lines and sweeps against the abrupt sides of the mountain, the long white streaks alternating with the darker portions where the sun had melted the snow away.

A guide is needed, at least in winter, for without him hours would be lost in attempts to discover a practicable way to the summit. Yet a guide it was very difficult to obtain. The men of the village were loth to go. They said it was too dangerous; that there was too much snow; that there were stretches of slippery ice. Fortunately, however, there happened to arrive a tall, finely-formed mountaineer, athletic and active, an enthusiastic hunter, and one who, as he said, "knewed every foot o' the mounting." He was quite willing to make the ascent with us, and we started at once. Over the lower slopes and by way of the lower valleys, we wound gradually upwards, passing here and there lonely log cabins, whose occupants exchanged cordial greetings with us and eyed us curiously. The great outside chimneys of stone; the broad fire places, capacious-ly deep; the blazing logs, the myriad sparks; the drowsily-whirring spinning-wheels; the stately swing of the great looms---united to form a succession of peculiar and attractive scenes. We passed little fields, where advanced methods of agriculture are unknown and undreamt of, but where corn and vegetables are grown, and in some sheltered nooks, where soil has washed down from steep surrounding slopes, the ground is extremely fertile. In a pleasant, but isolated valley, we found the home of a widow, who lives there with her little children. "But is it not a lonely place to live?" No. Our guide does not think so. The chivalry of the mountains teaches protection of womankind, and the widow is safe there. She has a little farm: she has a good orchard. The men of the neighborhood cut plenty of firewood for her and carry it to her door. That she is a woman, and in need of protection, is enough to constitute every mountaineer her protector. Passing onward, the heights begin to grow steeper. Long sweeps must be made, up ravines and across steep inclines. We wade through snow in the hollows. We climb with precarious foothold over slippery ice. On the lower slopes are pine forests, sombre and dark, but higher up the pines are much less plentiful and the sturdy oak takes their place. Laurel bushes, too, grow on the high slopes, and wild grape vines clamber up rocky precipices or fling themselves from the tops of trees. What is locally known as the "ivy bush" is frequently seen, and our guide remarks: "The deer eats hit" ("Hit," for "it," is almost universal in the mountains.) "They likes hit, and hit is good for them; but for cattle or sheep or pigs hit is poison. No animal what has a gald can eat hit and live 'thout you pours grease down their throats aft'wads."

Now and then we notice deer tracks in the snow, or those of catamount and squirrel, wildcat and rabbit. There are but few rabbits on the mountains, however, for the "cats" catch them. Both rabbits and "cats" feed at night, while squirrels, feeding in daylight, are safer from such attacks. Crows call to us from the tree tops, or "Injun hens" (woodcock) fly swiftly off. At length, after wearisome climbing, the top is reached, but the necessary following of zigzag sweeps has carried us some distance from the end of the mountain where the fort is, and we walk along the undulating ridge till it is reached. The mountain

is a detached ridge, several miles in length, forming part of the Cohutta Range, and it towers in bold majesty, two thousand feet above the level land which stretches off to the westward. The fort is at the northern end of the ridge. The soil on the summit is rocky in the extreme, and myriads of stones, of all sizes and shapes, cover the ground. The northern end of the mountain breaks off in abrupt and wildly rugged precipices of rock, where only the most expert climbers can by possibility, in the most favorable weather, make their way, and where a misstep would be fatal. The views in different directions are magnificently grand, but when we asked our guide to tell us from what point could be seen the most wide and varied he was puzzled. The question has never occurred to him before, and, after a reflective pause, he answered, with cautious conservatism: "That thar's a fine view that-a-way, and (with a graceful sweep of his arm) this hyar's a fine view this-a-way." And, indeed, it is difficult to make comparisons, for everything is vast and magnificent. The forests of dark green pine, far, far below, alternate picturesquely with cleared fields and open spaces, while the little cabins and homes seem insignificantly small. The sun shines brightly, making the other mountain heights, snow-capped and white, shimmer and glisten with resplendent glory. The wind rushes over the mountain-top with wild and invigorating strength. The northern end of the summit is separated from the rest of the mountain by the stone wall which constitutes the fort. The enclosed space is some eight acres in extent, about one-half being almost level, and the remainder in easy slopes. The northern edge of this space needs no defensive wall, for there the cliffs descend in rocky inaccessibility. Rounding, too, on the eastern and western sides, the cliffs are wild and steep, and although not so sheer and abrupt as at the northern end, as yet so abrupt as to make it impossible for an attacking party to scale them in the face of even the slightest opposition. Toward the south, however, there is no natural protection, and there it is that the wall is built, stretching from side to side of the ridge. And the construction of the wall is remarkable in the extreme, considering that it was undoubtedly the work of an aboriginal race. It is not straight. It is not curved. Instead, it is built in zigzag lines, and quite evidently with the intention of making it impossible for any assaulting force to advance without being taken in flank, unless they should charge right against the outer point of one of the angles.

The wall, while of zigzag shape, is yet not built with regularity. The angles vary greatly in degree and the zigzags are of different lengths. One salient angle, which projects a rounding outward, measures, on one side, fifty feet to the beginning of the curve of the point. On the other side it measures sixty-four feet. The diameter of the curve of the point is twenty-four feet. The height of the wall is now not more than from two and a half to three feet, but the stones lie scattered in a width of from fifteen to twenty feet, and the universal testimony of all who know anything of what it was in former days is that it was narrower and higher. One very old lady in particular remembers that her father, who, about the beginning of the century, climbed to the top of the mountain with one of the first Moravian missionaries that entered this section of the state, used to speak of the wall as having been, when he first saw it, quite carefully made and of a good height. But in the years that have passed since then the wall has been sadly shattered. Picnic parties have at times ascended the height; barbecues and camp meetings have been held there; and it seems to have been considered the duty and privilege of very many of those who made the ascent to indemnify themselves for the exertion by tearing down the wall. More than this, too, treasure-hunters have been at work. A fortified camp, occupied, as they believe, by DeSoto, would, so it has seemed to them, be a place of deposit for much of mineral wealth, and so they have torn

and dug, vainly seeking for what they can not find.

The wall is from a fifth to a sixth of a mile in total length. The stones were heaped up---not regularly and evenly piled, and in this respect the wall resembles that of Fort Hill, in southern Ohio. In the Fort Hill wall, however, there is a considerable admixture of earth, while the wall on Fort Mountain is of stone alone. There are but few small pieces in the wall. Most of the stones are from two to five inches thick, range from eight to eighteen inches in length, and are from six to twelve inches wide. In places advantage is taken of huge stones firmly set by nature into the mountain side, and at such spots the wall runs up to either side of the rock. There is but one entranceway in the wall, and that, so it is claimed by some, was made in recent years to allow of a passage into the fort by horse-back riders, there being a long and roundabout way to the summit by which, in some weather, it is possible for a good horseman to ride to the top. Others, however, believe that the entrance was left by the first builders, and this view seems to us correct, but the entrance-way has been cleared in late years by some who found it blocked with scattered stone.

It is peculiar to find on Fort Mountain the same general plan of fortification that was constructed by the Mound-builders of northern Ohio. In central and southern Ohio, where the immense and elaborate works are, the types are usually squares or octagons or circles---something, that is, where there is a wall completely enclosing an interior space---while in northern Ohio the general type is that of a walled-off plateau, with abrupt banks on three sides and the wall on the fourth, this being the exact plan that was carried out on Fort Mountain. The northern Ohio walls, however, are always of earth, without any mixture of stone.

The type extends eastward; while at the Cattaraugus Indian reservation, in New York state, a missionary told us of an ancient fortification for which no one could account, but which, it was generally supposed, must have been built by the French at some very early period. We accompanied him there, and found a walled-off peninsula point, commanding a splendid sweep of view up and down a beautiful valley, and we saw that it was undoubtedly a fort of the northern Mound-builders. The Mound-builders of both north and south chose, whenever they could, a location which gave a fine view. Naturally, of course, when they chose an abrupt cliff, seeking for an easily defensible position, the view was usually a necessary incident, but observation of quite a number of such spots has convinced us that a fine view was definitely sought by them, and not defensiveness alone.

The Fort Mountain wall being of stone sets it off distinctly from most other Mound-builders' fortifications except that of Fort Hill, and the zigzag line of the wall makes it more remarkable still. At Fort Hill, so we became convinced after careful observation, it was intended that an entire community would be able to live: not continuously perhaps, for there was no reason why a portion of the people could not, in peaceful times, scatter about the plains below and there cultivate various patches of land. But in time of war, when danger was apprehended, all could withdraw to that place of defense, and, secure against assault, cultivate the plateau surface and secure, with what they might carry up from the lower fields before a siege began, an amply sufficient supply for the community's subsistence. To the summit of Fort Mountain, in like manner, such as abode on the plains or in the valleys could retreat in case of danger, and, uniting themselves with those whose permanent home was on the mountain plateau, defy any foe that might have the temerity to attack them. The soil on the summit is dark and sandy, "black mountain sand" the north Georgians call it, and it is considered very fine, especially for corn and vege-

tables, the very products that a Mound-builder community would cultivate. For the aborigines of our land were not restricted in their food to corn and meat. They had a varied supply of fruits and berries. They cultivated vegetables. Even in the colder climate farther north, the variety was considerable, and in the south it would be at least as great.

The top of Fort Mountain has never been cultivated by white farmers, but some adjoining and more accessible heights have been and the character of the soil is therefore well known. The soil is extremely stony, but it seemed to us as if the level space inside of the fort wall had been deliberately cleared of stones to quite an extent, although the snow which covered the greater part of the ground rendered it impossible to decide. Yet corn and vegetables could be grown, even though the stones were not first cleared away. At the foot of the mountain, and on the lower slopes, where the ground is so thickly covered with stones that it is almost impossible to step without touching them, the land is patiently cultivated; corn stands in long rows; even some cotton and wheat are grown. We were so convinced that the aboriginal inhabitants must have grown food on that summit, that it pleased us to receive what appeared to be quite a confirmation of the belief. On the day following that on which we first ascended to the summit we were standing, well up on the slope, with a mountaineer, and he began to name over the different heights which were in view: "Rich Mounting, Ball Mounting, Potato Patch Mounting." As he named this last his hand pointed to an eminence nearly as lofty as Fort Mountain, and we asked how it had acquired such a name. He replied that it was because Indians had grown potatoes upon its summit; that the first white settlers and backwoodsmen had found them thus cultivating the mountain top. It may be objected that the fact that Indians cultivated one mountain summit is no direct proof that Mound-builders cultivated an adjoining one, but we offer it to show the extreme probability of what had already, from all the surroundings and conditions, seemed a correct hypothesis. And the Mound-builders must have resembled the modern Indians, their conquerers, in many respects. They lived in the same forests. The same materials were at the command of each for clothing and for weapons. They fished in the same streams. They hunted the same game. They cultivated the same soil.

And, too, the conquered race was not completely exterminated. It was distinctively a custom of the Indians to incorporate among themselves quite a proportion of any people or tribe whom they overcame. A considerable number, then, of the Mound-builders would become members of Indian tribes, and from them the Indians would learn and adopt such of the Mound-builders' ways of living as it seemed to them advantageous to acquire. The Mound builders seem to have been a more advanced and peaceable people than the Indians, and the latter must have learned considerable from them, ignoring, however, as of no account, their religious forms and observances, and not valuing their fortified heights and towns.

Where the Fort Mountain community obtained their supply of water is not altogether apparent. There is no sunken water pit, as there is on the summit of Fort Hill, nor could we find a spring. There is, indeed, on the summit, a fine spring termed the "fort spring," but it is some little distance away from and outside of the wall, and in a hollow which could easily be commanded by a besieging force. It therefore could not have been the source of supply upon which the community relied. But the mountain is full of fine springs, and one could readily have been opened up at some protected point within the wall. Although the mountains are generally known as the Cohutta Range, some of the mountaineers will not believe but that this is a great misapprehension. "Why!" said one of them, with gracefully free emphasis and courteous manner, "of a

gentleman" (every one here, it may be mentioned, no matter who it may be, is either a "lady" or a "gentleman") "ef a gentleman says, 'whar's my stock?' I say, 'I seen them on Fort Mounting,' or, 'thar north of the fort spring', or, 'thar over on Old Grassy,' or, 'thar in sech a holler,' and then he knows where to go, and next day he goes and finds them thar. But ef I say, 'I seen them on the Cohutty Mountings,'" (this with an indiscrible accent of infinite pity and contempt for the mountaineer who could make such a reply) "he don't know whar to look; he knowed they war in the mountings; that's war he turned them out to range. What he wants to know is which mounting. No. Thar's no name for all on them. Each mounting has a name."

We were not able to obtain any relics which are of distinctive value as throwing any particular light upon the aboriginal people. From the summit we obtained some arrow points of dark flint, of a type common both in the north and south. From the slopes we obtained a few fine specimens of arrow points of quartz crystal, like some which we have obtained at other points in Georgia and also in the valleys of the Shenandoah and Passaic. These crystal arrows are quite commonly picked up, too, in various fields near the base of the mountain. The crystal points are more difficult to successfully make than are those of flint, and are seldom, in fact, equal to good flint arrows in shape and workmanship. That they were made to such an extent in a district which, like this of Fort Mountain, has so much of flint rock to offer, seems to us one of the many proofs that the aborigines loved beauty, the clear white crystal being certainly a prettier material than most flints. At the very base of the mountain we obtained a large grooved battle-axe, ten and three-quarters inches in length by five in width, made of fine-grained, greenish-blue sandstone.

That this is a Mound-builders' country does not rest alone on the fact of the existence of the stone fort. There are a number of mounds in northern Georgia, and General Sherman, when in this part of the country as a lieutenant, some twenty years before his Atlanta campaign, made a special visit to the even then famous Hightower group on the Etowah River. On Kelley's (once known as Cunningham's) Island, in Lake Erie, is a large rock, curiously marked with hieroglyphics of the Mound-builders, and at the little village of Independence, near Cleveland, is another. Here in the south we were for a time in hopes of finding a stone equally curious with those two of the north, for we heard of a stone covered with strange letters--characters which the erudition of the mountains could not translate. The accounts were so explicit that we could not but believe that a marked stone had actually been discovered, and we searched long and earnestly over the mountain top. But we could not find it. Then we tried to find some one who himself had seen it, and this was unexpectedly difficult. Those who heard of it could but describe it from hear-say, and then refer us to one or another who, so they thought, had most likely seen it, and in our quest we traveled miles of distance and traversed hills and valleys. At length, when on the point of deciding that the entire story was a myth, we were told of a man who, our new informant said, had actually found the stone. He was six miles away, but we at once sought him out. An honest sort of man he seemed, and one quite willing to tell all that he knew. Yes, he had found the stone of which people talked so much. He had come across it some fourteen years ago. He had noticed a flat stone, about the size of a table-top, lying by the fort entrance, and had from some impulse turned it over. There on the lower side, were the characters. "Were they cut in the stone?" No, they were not cut. They were painted on with red paint. "Was the flat stone lying over another stone, or were the letters right against the ground?" They were right against the ground. "An' they must hev ben thar ever sence the fort war a-built on the mounting!" The letters are no longer to be found. How long they existed, with the paint against

the damp earth, is a problem of easy solution. We have explained this at some length, so that other visitors to the mountain who may hear similar stories of the mysterious stone, may know somewhat of their foundation and origin.

Since talking with that discoverer we have been told of some other mountaineer, name unknown, who one day clambered perilously to some cave, by such a dangerous route that "a million dollars" would not tempt him to try it again, and who found by the cave-mouth a strangely marked stone, with "about a thousand" strange characters upon it, in "either Latin or Greek." This man, and his cave, and his thousand letters, we have not endeavored to find.

They are an interesting and curious people who now inhabit the mountains and the mountain valleys, and they are destined to become as extinct as the very Indians and Mound-builders. Here, still, is the primitive wilderness, the pioneer backwoods; where men go into the forest for fuel and for much of their food; where women knit and spin, and with their own hands make the family linen and stockings; where the rifle and pistol is always carried; where there is splendid physical beauty and development of both men and women, and where clear, bright, fearless eyes calmly meet your own. At a lonely spot, on a road at the mountain's foot, stands a plain church, of squared logs. A little burying ground is close by, and all about is a dense forest of pine trees, darkly hemming the church and the burying ground in. Only a few of the graves have headstones. Most of them bear neither name nor date. Built up about some are frameworks of log, with logs laid over the top as well, to protect the buried bodies from prowling beasts. Some of the graves are covered all over with pretty little fragments of mineral and rock, and the effect of this simple ornamentation is touchingly pathetic. Over that lonely little grave yard the great mountain grandly towers, and silence and unspeakable mystery brood among the dark pine trees that solemnly keep watch round about those humble graves.

MSF-007 ANCIENT WORKS IN NEW YORK

Marvin, David S.; American Naturalist, 15:489-490, 1881.

There are within ten miles of Watertown, N. Y., many ancient fortified village sites, not to speak of those obliterated by the plow. We cannot use the term mound, as applicable to this locality, for there are no artificially constructed mounds found here. One of the most marked features is, that all these sites were fortified, or defended with ditches. They are nearly all located upon the sandy moraines of extinct Adirondac glaciers, or sand strewn hills. A few fishing stations along the shores of Lake Ontario and Black River bay are the exceptions, and even these are upon sandy slopes. There seems to be no uniformity in the shape or construction of the lines of defence; one at Black River bay had the ditches in the form of circles, one within the other, and a lunette towards the water, with a protected roadway to the shore. One in Rutland, on the farm of Mr. Gragg, has the trench cut across the base of a peninsula, between two forks of Sandy creek, a steep hill serving as embankment for the rest of the enclosure, and usually the lines run along the edges of an escarpment. I am informed by several of our elderly inhabitants, that these lines of entrenchments near our cemetery, were a mile and a half long, and some of the trenches five feet deep. Pottery of the usual forms, and nearly always broken into small pieces, is a constant accompaniment of these forti-

MSF-008 FORTS

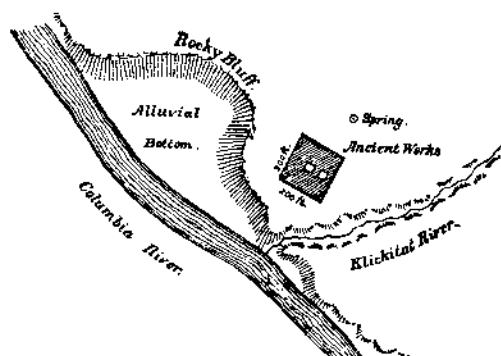
fied sites, and it is generally blackened on the inside with charred food, showing that the owners cooked with heated stones thrown into the vessels. The jar or pot, the most perfect specimens I have met with, was dug up in the town of Rutland many years since, and is owned by Mr. J. A. Lawyer of this city. Arrow-heads, stone-axes, scrapers, knives, bone awls, charred corn, etc., found west and south, are dug up from the graves of these people, or strew the sites of their homes.

MSF-008 ABORIGINAL WORKS AT THE MOUTH OF THE KLIKITAT RIVER, WASHINGTON TERRITORY

Whitcomb, T. M.; Smithsonian Institution Annual Report, 1881, Government Printing Office, Washington, 1882, p. 527.

The works represented in the accompanying sketch consist of a stone wall 5 feet high, filled inside with earth, except the two squares within. These are 8 feet deep and 15 feet on each side, the whole work being about 200 feet on either side. There was formerly some kind of wooden structure on the stone wall, as the remains of cedar timbers occur at certain points on the top. The wooden work was evidently destroyed by fire, since all the cedar is charred.

None of the Indians in this country have any knowledge of the builders or of its use. There is a tradition among them that it was finished a long time ago. Large quantities of arrow-heads are found in and about the works. The place is eminently adapted for defense, being 100 feet above the river. The scarcity of aboriginal works of a permanent character on the Pacific coast makes this an object of peculiar interest to the archaeologist.



MSG-001 MIDWINTER SUNRISE AT NEWGRANGE

Patrick, J.; *Nature*, 249:517-519, June 7, 1974.

New Grange is a passage grave in a Neolithic cemetery in County Meath, Ireland, about 30 miles NNW of Dublin (O 301 703). Two large samples of charcoal which were collected from caulking in between the roof slabs, yielded dates of 2475 ± 45 b.c. and 2465 ± 40 b.c. respectively. Depending upon which correction curve is used, this gives an age of 3100 ± 100 B.C. for the building of the tomb. It consists of a huge, artificially constructed cairn of water-rolled stones, which is approximately 80 in. diameter. A passage, 19 m long, runs into the mound to give access to a large chamber about 3 m square and 6 m high. There are three recesses that open into the chamber, so that the ground plan has a cruciform appearance (Fig. 1). In each of these recesses is a large stone basin which was used to hold the burnt remains of the interred occupants.

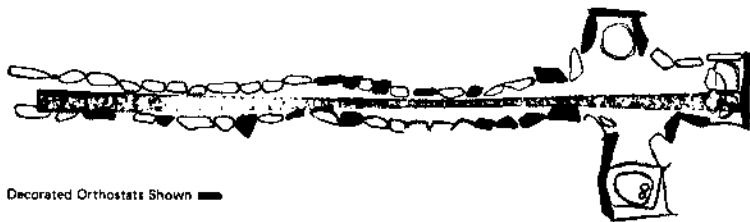


Fig. 1. New Grange plan view.

Carvings. The tomb has been open to visitors since 1699 and an unknown amount of the original burial deposit may have been removed since then. In 1967 excavation of the tomb floor in front of the basin stones revealed the burnt bone fragments of about five people. These were accompanied by some grave goods characteristic of this type of tomb in Ireland, including stone pendants and beads, stone 'marbles' and bone points.

At the base of the mound is a continuous kerb of large slabs. It is believed that dry-stone walling was built on top of the kerb to a height of 3 m and that this wall was made of quartz for about 30 m on each side of the entrance. The sun on the glistening white quartz would have presented a spectacular sight from the surrounding countryside. Most of this wall collapsed soon after completion of the monument, and the kerb stones became completely buried and remained hidden until uncovered again at the start of this century. Outside the kerb, there are 12 large standing stones that may form part of a circle, but their true relationship with the mound is not known for certain. They may be older than the passage-grave.

One of the most outstanding features of Newgrange is the decoration on the stones. The Entrance Stone, set in front of the passage, is regarded as one of the most impressive pieces of Megalithic art in Europe. The artist who executed this piece of work has succeeded in using the shape of the stone to the utmost advantage in creating its aesthetic appeal. Another small but remarkable design is the three-spiral figure in the rear recess. There are many other decorations within the passage and chamber, and on the kerbstones, virtually making New-

grange a Megalithic art gallery.

Astronomical alignment. Perhaps the most interesting feature of Newgrange is the 'roof box'. Dry stone walling has been constructed on top of the passage orthostats to support the second roofslab at a higher level than the first, leaving a gap about 20-25 cm high and 1 m wide. The gap is protected from the weather by a box like structure of slabs supported on dry walls. This is open to the front. For further protection against the weather the rear edge of the first roof slab and the front edge of the second roof slab have water channels cut on them. The leading edge of the uppermost roof slab of the roof box has an excellent relief carving of lozenges.

During the winter solstice in 1969 Professor M. O'Kelly observed that 4 min after sunrise the Sun's rays shone through the roof box, along the passage, and up to the rear recess of the burial chamber, which became fully illuminated. The spectacle lasted for 17 min. before the sun moved out of alignment. Later, Mrs. O'Kelly recalled a tradition that at a certain time of the year the sun lit up the three-spiral figure in the end of the chamber.

In 1972 Professor O'Kelly asked me to make an accurate survey of the roof box to see if this phenomenon would have occurred when the burial chamber was first built. The passage is in the form of two curves, so that for a ray of light to travel directly from the roof box to the back wall of the rear recess it must be in the azimuth range $133^{\circ} 42' - 138^{\circ} 24'$, the elevation of the distant horizon ($0^{\circ} 51'$) is the minimum elevation of which the Sun's direct rays can enter the slit. The floor of the chamber is about 15 cm lower than the roof box, so at the minimum elevation sunlight will extend across the floor and into the rear recess. Light rays will not enter the chamber when the elevation exceeds about $1^{\circ} 40'$. This range of azimuths and elevations, reliable to about $15'$ and $5'$ respectively means that the Sun's rays will shine directly into the chamber if its declination lies between $-22^{\circ} 58'$ and $-25^{\circ} 53'$. It therefore seems that the sun has shone down the passage to the chamber ever since the date of its construction and will probably continue to do so forever regardless of secular changes in the obliquity of the ecliptic. It also means that the spectacle occurs for a number of days before and after the winter solstice.

Unfortunately, the vagaries of time have had their effect on the passage and some of the stones are now leaning inwards, thus trimming down the width of the beam of light. At the time of construction the beam would have been about 40 cm wide whereas now it is only 17 cm. The two principal orthostats causing the obstruction are L18 and L20 (Fig. 1). The first 10 orthostats on either side of the passage have been straightened but there is no way of straightening the rest without dismantling the whole structure.

There are about 200 passage graves in Ireland with many more allied tombs in Scotland and Brittany, but to my knowledge none of them has a roof box like that at Newgrange. As this structure is unique, and as the whole monument is so grandiose, it seems likely that its orientation is deliberate.

The monument best known for its astronomical orientations is Stonehenge on the Salisbury Plain. After it had been built, it was remodelled several times, and the main astronomically oriented structures were erected in its third phase, which is dated at around 1800-2000 B.C. This is about 1,000 years after the construction of Newgrange, and there is little connection between the two monuments or between the cultures which built them. The unambiguous definition of both direction and altitude at Newgrange is by far the most convincing evidence that some Megalithic structures were deliberately oriented on astronomical phenomena. This must lend greater credence to the theory that different cultures in the British Isles were investigating the basic solar cycles. It is quite possible that data passed between different cultures, so that Stonehenge eventually became an important repository of astronomical knowledge.

MSG-002 BRETON ORIGIN FOR TOMBS

Anonymous; Nature, 228:1019-1020, December 12, 1970.

New radiocarbon determinations for megalithic tombs in Brittany substantiate the very early dating for these stone monuments and suggest that these tombs are the oldest in Europe. The unexpected possibility of a Breton origin for the custom of burial in megalithic tombs in Britain and even in the rest of north-western Europe must now be taken seriously.

The impressive megalithic collective tombs of western Europe have always seemed an astonishing achievement, somehow beyond the capabilities which could be ascribed to neolithic man. The very early carbon-14 dates produced by the French radiocarbon laboratories for the megalithic tombs of Brittany, setting them before any such tombs dated elsewhere, have been regarded suspiciously by prehistorians. For although the pros and cons of a West European rather than an East Mediterranean origin for the megaliths has long been argued, Iberia at the southern extent of their distribution and Denmark at the north have seemed the most likely regions for the development of megalithic architecture.

The very early dates in Brittany for what seemed the most sophisticated of these monuments, the corbelled passage graves, have also been doubted. The impressive burial chamber in these graves is reached by a long underground passage, and is roofed by a false vault of drystone construction. Examples of this building technique are seen in the tombs of Spain and Portugal, in Ireland (New Grange, Knowth) and in Scotland (Maes Howe) as well as in Brittany. A Breton example, Ile Carn, was dated in 1959 by the Groningen radiocarbon laboratory to 3280 B.C., and other Breton megalithic tombs were dated by the French laboratories to about 3500-3000 B.C. These determinations were too early for most archaeologists to accept. Unfortunately, one or two dates were more than a millennium higher---there is a determination of 6850 B.C. for a stone cist grave at St. Michel. The necessity of explaining these as the consequence of the prehistoric use of bog oak did little to increase confidence.

Since 1959, however, further dates in the time range 3500 to 3000 B.C. have been accumulating, and radiocarbon determinations by Delibras, Guillier and Labeyrie (Radiocarbon, 12, 421; 1970) give 3390 B.C. for the principal chamber at Ile Carn, and 3440 and 2890 B.C. for adjacent dolmens. These dates substantiate fully the previous early dates for Ile Carn and for other Breton tombs.

At present there are few carbon-14 dates for Iberia---conventionally the most favoured area for the origins of the European megaliths---and, in any case, the custom of collective burial in megalithic chambers may have developed independently in different parts of Europe. Yet, for the British Isles at least, these Breton dates may have considerable significance because the British neolithic farming economy was undoubtedly brought across the English Channel during the fourth millennium B.C.

It has been considered that the unchambered long barrows found in England were a component of the first neolithic communities, with megalithic chamber tombs a later development. Recently, it has been suggested that the timber mortuary house revealed by excavations in some British earthen long barrows (Ashbee, P., Archaeologia, 100, 1; 1966; Antiquity, 43, 43; 1969) may have been the prototype for the supposedly subsequent megalithic tombs of Britain (Daniel, G. E., Antiquity, 41, 315; 1967). The early Breton dates now suggest a different conclusion, at which the earliest British megalith date---3160 B.C. for Monamore Cairn in the island of Arran (McKie, E., Antiquity, 38, 52; 1964)---was just beginning to hint. It now seems possible that collective burial in

MSG-003 GRAVES AND MOUNDS

megalithic chamber tombs was already a practice known to the first immigrant farmers, who reached Britain around 3500 B. C. Indeed, any migrants who sailed from Breton shores after that time can scarcely have avoided a knowledge of megalithic architecture. It may be significant that the megalithic tombs of Britain lie chiefly in the west.

It remains to be seen whether a Breton origin for the British megaliths will find favour among archaeologists, at a time when migrationist explanations in prehistory seem to be going out of favour. Yet if the skills of the farmer were taken to Britain by immigrants, as undoubtedly they were, could not these first farmers have carried with them also the specialist skills of the megalithic undertaker?

MSG-003 ARCHAEOLOGY OF FANNING ISLAND

Anonymous; Nature, 146:494, October 12, 1940.

Further information relating to the ruins of Fanning Island, one of the equatorial islands of the Pacific, was obtained by Kenneth P. Emory in 1934 when he visited the island again after an interval of ten years (Bernice P. Bishop Museum, Occasional Papers, 15, 17; 1939). Three additional ruins were noted and examined and four basalt adzes found after the departure of the first expedition were studied. The three ruins now described lie on a ridge of sand along the south side of a trail from the lagoon jetty and the cable station. Of the first only a small pile of coral 10 ft. in diameter and a foot high remains. Several small slabs on edge are planted here and there, and an area less than 16 ft. is covered with scattered stones. The next structure, nearly 60 yards to the west, is a small collection of loose slabs which may originally have formed an alignment. The third ruin, 47 yards farther west, is the most definite. It seems to have been a mound or platform covering two vaults constructed at ground-level. At the south end kerbs mark a rectangle 6 ft. by 10 ft. Around the outside edges are many loose slabs in disorder and smaller stones which must have served as the fill of a grave or have formed a platform built over the vault. Human teeth, fishbones and one-piece fishhooks found within the rectangle point to its use as a grave. Firmly embedded kerbs and two large limestone slabs north of the rectangle suggest another grave. There is a suggestion of a retaining wall at the north border of the ruin. About 400 ft. south-west is a place where limestone slabs had been quarried in ancient times. The four adzes resemble those of Samoa and Tonga, and not those of the Marquesas, Hawaii, Cook Islands, Society Islands and other groups of marginal Polynesia. The fishhooks, composite and one piece, relate to Tonga. The dressed stone enclosure has affinities with the royal burial places of Tonga and its sixteenth century dressed stone work, but nothing like it is found outside Tonga. The marking of burials with conspicuous superstructures of stone is a strong feature of western Polynesia, weak or absent in eastern and marginal Polynesia.

4-018 MEGALITHIC RINGS: THEIR DESIGN CONSTRUCTION

van, Thaddeus M.; *Science*, 168:321-325, April 17, 1970. (Copyright 1970 the American Association for the Advancement of Science.)

Sometime between 3500 and 1000 B. C. several thousand megalithic structures were erected in western Europe. Some of those in the British Isles, such as Stonehenge, are thought to have served as astronomical observatories, while others, like the mound at New Grange, Ireland, seem to be burial places. Those that are ring-shaped fall into four categories of design: circles, flattened circles, ellipses, and eggs. Thom in an investigation of the geometry of these designs has made a substantial contribution to the solution of these enigmatic shapes; he has given us a tractable geometrical analysis which is esthetic in its simplicity. Essentially, he has considered each ring perimeter as a set of arcs drawn from various centers within the design. Thom's geometrical analysis is given in Fig. 1; only the geometry of the ellipse and that of the type II egg are not his.

In this article I extend Thom's proposal and suggest the manner in which the designs were scribed. I confine my remarks to the simpler rings and do not discuss the compound rings, exemplified by the Avebury monument in Wiltshire, although there are features which suggest that even these fit the pattern of construction described here.

Thom's geometry suggests that ropes attached to anchor stakes placed at the arc centers were used to scribe the designs. Surprisingly, Thom has questioned the use of the rope and stake as a scribing tool. He claims that the rings are too accurate to have been scribed by such a procedure. Presumably, he is referring to the propensity rope has for stretching. He suggests that the megalithic designers used two rods of standard length (a "megalithic yard") and measured the distances by carefully laying out the rods end to end much as one would use a yardstick. There are two sources of cumulative error in such a procedure. One is associated with the picking up and placing of the rods; the other is the problem of trying to keep the rods properly aligned. On the other hand, a little experience with a rope would quickly tell how much tautness is needed to keep the stretch to a minimum.

The assumption here is that two anchor stakes and two other stakes, "pivot stakes," were used in the construction of each simple ring, with the possible exception of the circle. Furthermore, it is assumed that the anchor stakes and the pivot stakes were always aligned at right angles. On the surface, this relationship is of minor interest, but further consideration shows that, in constructing the various rings, the needed placing and movement of the anchor and pivot stakes may follow an evolutionary pattern.

Thom convincingly argues that the people who built these structures were obsessed with a concern for perfection---so much so that all their measures were laid out in integral units. The circular megalithic ring, with its perfect radial symmetry, must have especially appealed to them, particularly since its construction represents the utmost in simplicity. To a geometer, probably few things are more intuitively satisfying and esthetically appealing than an absolutely perfect circle drawn by rotating a radius around a point. Undoubtedly discovery of the irrational ratio between the diameter and the circumference was frustrating to the megalithic geometers. Quite possibly this discovery instigated the search for rings whose perimeters were such as to make this ratio integral. Perhaps it was at this point that the flattened circle was developed.

The Flattened Circles. Figure 1 shows the various simple rings, their geometry, and the proposed methods of construction. For the flattened circle of type A, Thom suggests four centers (a_1 , a_2 , p_1 , and p_2) from which four

MSH-018 HENGES, ORGANIZED STRUCTURES

arcs are drawn. Suppose an anchor stake was placed at point a_1 and two pivot stakes were driven at points p_1 and p_2 . With a rope of appropriate length tied to stake a_1 the designer could, in one sweep, inscribe all of the type A ring, except for the top arc, by moving the rope so that it swung around the pivot stakes when it came against them. The resulting figure is very nearly a perfect cardioid. The design could be completed by re-anchoring the rope at a_2 and marking the top arc.

TYPE	GEOMETRY	STAKE LINES	INSCRIPTION	
Flattened Circle Type A				
Flattened Circle Type B				
Oblate Circle				
Egg Type I				
Egg Type II				

Fig. 1 The geometry, stake lines, and scribing method for the five classes of designs discussed. The solid circles are anchor stakes.

Since the top arc smooths over the indentation in the cardioid, one might guess that the builders dismissed this shape because it served as merely an auxiliary figure. There is evidence from other megalithic structures, however, that this was not the case, and indeed the cardioid may have been regarded as quite exceptional. The structures in which cardioid shapes seem to be important are the numerous passage tombs found throughout Britain and Ireland. Examples include the chambered tombs of the Severn Cotswold culture. One of these, the tomb at Parc le Breos Cwn at Glamorgan, is obviously cardioidal, albeit misshapen.

Figure 3 is an outline of the exquisitely chambered passage tomb at New Grange, Ireland. This is considered to be one of the finest of the passage tombs; its date of construction has been placed at about the third millennium B. C. The end of the tomb is in line with the pivot points, and the entire chamber (exclusive of the passageway) just fits between the arcs below the cusp of the cardioid used to construct the design. These fits require the assumptions that the passage marks the vertical diameter and that the center of the finishing arc is located within the ring rather than on the perimeter.

How were the positions of the anchor and pivot stakes found? In all type A rings, points a_2 , p_1 , and p_2 lie on radii that divide the circle with center a_1 into three equal sectors. Thus the ring is a two-thirds-perfect circle with a flattened arc over the remaining third. Someone has remarked that perhaps all of these misshapen rings were attempts to make ring structures such that the ratio of circumference to diameter would be 3. That the radial lines divide the ring into thirds suggests that an equilateral triangle was constructed with p_1 and p_2 occupying two vertices and with the third vertex located at a point below a_1 , the center of the triangle. The intersection of lines drawn from any two vertices to the midpoint of their bases would locate a_1 . The construction of this triangle and its center would not be difficult, and it may be said with some confidence that the type A design construction was based on an equilateral triangle.

Neither the lower vertex of the triangle nor the cardioid cusp point in the type A ring are conspicuously evident in the final construction. Nor did they necessarily serve as pivot points during the construction as did the other triangle vertices. Their importance might have been enhanced if one served to mark the other. If the lower type A triangle vertex was located at the cusp point and the other two vertices, which remained pivot points, were placed in line with a_1 , then a type B circle could be drawn in much the same manner as a type A circle. In a type B circle the length of rope needed for scribing the circumference was determined by measuring the distance from the anchor stake to the top vertex of the equilateral triangle by way of the outside of one of the pivot stakes. This procedure would give a correct measure of the needed length of rope only if the pivot stakes were placed, as most of them were, one-third of the radial distance from the center. Only one of Thom's type B sites did not conform to this plan. Thus, as in the case of the type A design, one may say with some assurance that the equilateral triangle played a role in the construction of the type B rings.

The Ellipses or Oblate Circles. Thom and others describe a number of rings as "elliptical." These are nearly circular, but one axis seems to be slightly shorter than the other. However, if the anchor and pivot stakes were used, aligned at right angles for all designs, then the rings cannot be true ellipses; rather, they must be regarded as oblate circles.

Where were the stakes placed in constructing these sites? Note that the flattened circles are symmetrical about their lesser diameter, whereas the egg-shaped rings, dealt with below, are symmetrical about their greater diameter. The oblate circles, while not radially symmetrical, have a bilateral

symmetry with respect to both their major and minor axes. This suggests two things: first, the anchor and pivot lines reflect this double symmetry, and second, the oblate circle represents an evolutionary midpoint between the flattened circles and the eggs. If the anchor and pivot lines were made to intersect perpendicularly at their midpoints, then a rope tied to a_1 and then to a_2 could scribe the design in the same way that the flattened circle designs were constructed. Experimentation with a compass quickly demonstrates that an oblate circle can be constructed from these points---one which, to the eye, is indistinguishable from an ellipse.

A pattern to the shift of anchor and pivot lines begins to emerge. The anchor line seems to be drifting upward from its position in the type A flattened circle to its position in the type B ring, and finally in the oblate circle the two lines bisect each other. From here on, the only movement the anchor line can make to produce a new figure and yet remain at right angles to the pivot line is a lateral shift. This is precisely the step taken in the production of the egg designs.

The Egg-shaped Rings. The construction of a type I egg seems to have involved a shift in the anchor line just to the end of the pivot line (see Fig. 1, row 4). Before the design was scribed, a rope would be attached to a_1 , then placed on the inside of p_2 at the right angle of the triangle formed by a_1 , p_1 , and p_2 , and allowed to loop back to a_1 . From this position all but one of the side arcs could be drawn in one sweep as before. The remaining arc could be drawn by re-anchoring the rope to a stake placed at a_2 .

This shift of the anchor line carried with it a number of consequences. The most obvious one is the change in the orientation (symmetry) of the ring from its anchor line to its pivot line. Also, the pattern of the lines seems to mirror that of the type B flattened circle; in both, one line is at the end of the other. Despite these changes, the stake lines remain at right angles, and the arcs of the perimeter remain in the same positions relative to themselves and their centers (or, equivalently, the lie of the scribing rope relative to the four points is the same). This points to a certain topological equivalence between the simple rings discussed so far. Thom suggests that the megalithic geometers knew rudimentary trigonometry. Perhaps they were nibbling at the edges of topology as well. They must have been impressed by the peculiar changes in the perimeters of these rings made by the straightforward manipulation of the stake lines---a quasi-topological observation at the very least.

A common feature of the type I egg is the appearance of perfect Pythagorean triangles formed by the stake points. Thom has discovered a number of these, particularly of the 3, 4, 5 variety. The perfect right triangle is conspicuously missing in the flattened circles. How did the Pythagorean triangle come into being here? In all likelihood it did not, like Athena, spring fully matured from the brow of its creator. Probably there was a good deal of experimenting, perhaps starting with the equilateral triangles. If the builders were an inquisitive lot, as no doubt they were, they must have contemplated the distance between, say, the point at the cardioid cusp of the type B ring and the anchor point directly below. The side and altitude of an equilateral triangle and half of the base are in the ratio $1:3-1/2:2$, which is close to 4:7:8 in quarter units. This is nearly Pythagorean ($4^2 + 7^2 = 65 \approx 64$) but not so close that the difference would escape detection. If, as Thom suggests, these people were obsessed with integral measurement, the discovery of the nonintegral altitude of the equilateral triangle may have motivated them to seek a right triangle with integral sides.

The geometry suggested by Thom for the type II egg is considerably different from that given here. Our scribing method could not be reconciled with Thom's

geometry, and this necessitated a search for another solution. Once the pattern of stake-line variation was established, the solution was quickly found. If the orientation of the stake lines of the type B circle had its counterpart in the type I egg, the stage lines of the type A circle should have its counterpart in the type II egg. That is, the anchor line of the type II egg should lie outside the pivot line, just as the pivot line lies outside the anchor line in the type A circle (see Fig. 1). This was indeed found to be the case.

There remained the problem of how far away from the pivot point the anchor line was placed. Since the distance between a_1 and the pivot line in the type A circle was determined by an equilateral triangle, it was thought that the same thing might be true for the type II egg. Unfortunately, any number of equilateral triangles can be constructed around the pivot stake p_2 . As Fig. 1 suggests, the anchor stake might have been positioned at the intersection of the circumference of the larger circle and two of its trisecting radii. The principal differences in the perimeters of the type II egg produced by Thom's geometry and by the geometry suggested here is that Thom assumed that the top and bottom sides (as shown in Fig. 1) were straight, whereas here they are very shallow arcs. The use of shallow arcs rather than straight lines has precedent. Thom suggested such arcs in considering Woodhenge, and so did Borst in his analysis of the crypt of William the Englishman.

The designs of the four type II eggs listed by Thom were reconstructed on the basis of the geometry suggested here. Thom's measurements of the distance between the centers of the large and small near-semicircular ends and the radius of the large end arc were kept. With the geometry proposed here, the designs of two rings (Leacet Hill and The Hurlers in England and Wales, respectively) were virtually identical to the designs proposed by Thom. On the other hand, the designs of the Borrowston Rig and Maen Mawr monuments in Scotland and Wales could be constructed on the basis of Thom's measurements only if the locations of a_1 and a_2 were free to shift on the circumference of the larger arc. There are rationales for these diversities, however.

The passage tomb at New Grange had an outside megalithic ring which was possibly a type II egg. A good construction of it can be produced if an equilateral triangle is used, as shown in Fig. 4. There are three places where the construction seems to miss its mark---the north, southeast and southwest locations. This makes it uncertain that the type II egg was its model. However, this construction fits as well as, or better than, any of the others, including Thom's type II geometry.

If the passage tomb at New Grange is a type II ring, then an interesting question arises regarding the apparent evolution of the designs, for here the earliest (a type A flattened circle) and the latest are present in the same site. There are a number of ways in which this could have come about. The outside egg could have been constructed well after the inner flattened circle. It is difficult, however, to think why such a ring would be added to a site already occupied by a tumulus. If it should be found that the tumulus was built within an existing ring (whose presence perhaps indicated hallowed ground), this would be far more understandable. If the type A inner ring was developed (hence built) after the type II egg, implying a structural evolution in the reverse order of the one proposed here, then we must conclude that the Pythagorean triangle was discovered and then suddenly abandoned---a possibility which seems untenable. Such a conclusion also runs contrary to the earlier proposition that the Pythagorean triangle evolved from the type-B-ring equilateral triangle.

Of course, the tumulus and the outer ring could have been constructed at the same time. In this case all ring types would have been known and used concomitantly. This could have happened if the different types evolved fairly rapidly,

or if each ring design served a unique function. The specific function each design served remains a mystery.

Despite the difficulty in eliciting a rationale, there are reasons for believing that the outer ring was constructed after the tumulus. Although the center triangles of the ring and the tumulus are oriented in approximately the same manner, they do not coincide or share a common center (see Fig. 4). If the ring and the tumulus were built simultaneously, they undoubtedly would have the same center. If the ring had been built first, then its center could have been found fairly easily, and the design of the tumulus built around that center. Suppose the tumulus was constructed first, however. During the later construction of the ring it would have been necessary to ascertain the center of the tumulus from the top of the mound, if a common center was desired. This would have been difficult at best.

Final Comments. I have attempted to show how some of the simple megalithic rings were drawn, and this attempt, I believe, not only affects existing analyses of these sites but leads to new conjectures concerning the mathematical talents of the designers. Were the hypothesized scribings really used? Or are they another of a number of explanations that merely fit the field data? There are two indications that the evidence for the scribing method is more than circumstantial. The first is the existence of sites in which the cardioid appears to have been used. The second is the fact that the change in the pattern of the stakes from one ring to another is too orderly to be circumstantial.

Perhaps the best witness to the talents of these megalithic builders is the scribing method itself, for here is a procedure for geometric construction that is unique. There are only three known nonalgebraic or nongraphic geometric constructions: the Poncelet-Steiner circle method, the fixed compass or Mascheroni method, and the common method involving use of the flexible compass. No existing technique approaches that of the megalithic geometers, except for the well-known method of scribing an ellipse. The Poncelet-Steiner circle is the most restricted of the known constructions; it requires only a straightedge and a fixed circle. The Mascheroni method allows the use of any number of circles or arcs with a fixed radius, and the flexible compass further allows the use of arcs of varying radii. If all restrictions on radius length were removed so that the radius could be of any length at any time during the construction, then virtually any two-dimensional figure could be drawn. The proposed megalithic scribing method allows the length of the radius to change discretely and in one direction (toward shorter lengths) in the middle of a sweep. For this reason this technique might possibly constitute the next step in a hierarchy of construction methods. While this scribing method may not contribute profoundly to mathematical theory, it may at least have consequences of interest to recreational mathematics.

The megalithic geometers knew rudimentary trigonometry and may have had a standard length which, for all we know, may have been the precursor of the yard, and they had a unique method of geometric construction.

Is there something more? Perhaps much remains hidden in these remarkable sites.

MSH-019 PREHISTORIC TIMBER CIRCLES

nington, M. E.; Antiquity, 1:92-95, 1927.

The photographs here reproduced, were taken from the air on 30 June 1926, by Squadron-Leader Insall, V. C., M. C., who was then stationed at Netheravon. The large circular earthwork which appears with a series of concentric dots within its area had always been regarded as a "ring" or "disc" barrow much wasted and defaced as a result of many years cultivation. The ring barrow is a type of pre-historic burial place which occurs comparatively frequently on the Downs of Wiltshire and adjacent counties but is rare elsewhere. It consists of a circular earthen bank with a corresponding ditch, usually on the inner side. The actual burials, apparently invariably after cremation, are usually found in one or more mounds near the centre of the circular area thus enclosed. The banks and ditches are continuous and form unbroken rings; they vary in size from a few yards in diameter up to nearly 200 ft. The smaller dark rings shown on the lower part of the photographs near the Amesbury road probably represent the filled-in ditches of barrows that have been destroyed by cultivation.

The earthwork under discussion, in its wasted state, seemed outwardly to have all the characteristics of a very large but otherwise normal ring barrow, i. e., a ditch within a circular bank, and a raised area in the centre. The earthwork lies in a large open arable field, and at the time the photograph was taken the whole area, earthwork and all alike, was covered with a flourishing crop of wheat, already in ear and nearly its full height. The arable field is bounded on the east by the high road from Netheravon and Upavon to Amesbury, it being distant about one and a half miles from the latter village; on the north, it is bounded by the new Fargo road to Larkhill camp; the rectangular light patch adjoining the earthwork is an uncultivated plot used as a stand for ricks; the light lines running over the earthwork and all across the arable ground are deep plough furrows. To grasp the full significance of the photograph it must be borne in mind that when it was taken the whole area was covered by a tall crop of wheat so that what is seen must be irregularity in colour and growth of the wheat, the actual surface of the ground being hidden. The soil here is only a few inches thick over the chalk, and the long fibrous roots of the wheat penetrate into it with difficulty, if at all. On the other hand, wherever a hole has been previously dug into the chalk the disturbed chalk disintegrates and becomes comparatively soft, and is moreover generally mixed with soil and decayed organic matter, so that the long rootlets penetrate it with ease, and finding congenial conditions the corn grows finer than on the surrounding undisturbed chalk. This is really the secret of many archaeological discoveries from the air. Old ditches, pits, and so on, completely filled in and obliterated on the surface, reveal themselves in the growth of crops, creating conditions easily seen with the naked eye but requiring a bird's eye view to follow up.

It was, therefore, realised at once that the dark spots within the earthwork appearing on the photograph in all probability represented pits of some kind, just as the dark ring enclosing them represents actually only the taller and deeper coloured growth of corn over the filled and obliterated ditch, the ditch and bank being themselves quite hidden.

The plan of the circles of holes thus revealed is more or less suggestive of that of Stonehenge, and at once excited great interest among archaeologists to whom the photograph was shown by Squadron-Leader Insall.

Arrangements were made to test the site by excavation and this was done in August 1926; the work was carried on for five weeks when the southern half of the circle was examined, with most interesting results. Presuming that the unexcavated half of the circle agrees with that already done, as the photograph

MSH-019 HENGES, ORGANIZED STRUCTURES

gives every reason to believe, there are six roughly concentric rings of holes surrounded by a ditch immense in proportion to the area enclosed. To test the ditch three sections were cut through it, one each on the east, south, and west sides; in each section it showed the same general features and was found to be unexpectedly large, measuring some 25 ft. across the top, from 10 ft. to 14 ft. wide at the bottom, and some 7 ft. deep. On the photograph there appears to be a break in the continuity of the ditch on the N. E. side towards the Fargo road; this no doubt represents the entrance to the circle but it has not as yet been proved. The diameter of the earthwork, measured from bank to bank, is approximately 250 ft. On the outer side of the ditch there are still slight remains of the bank which must once have been proportionate in size to that of the ditch. It must, of course, be understood that the ditch and all the holes were completely filled up and invisible on the surface.

Clear evidence was obtained in excavation that the six concentric rings of holes once held posts or tree trunks varying from 1 ft. to 3 ft. in diameter according to the size of the hole. Plate II, fig. 1 is from a photograph of a model made to scale of the series of holes as excavated; a, b, c, represent trial sections cut through the ditch; the position of the entrance at d is approximate only. The holes of the second and third circles appear oblong on plan on account of their ramps, and this brings out how irregularly spaced the holes are. The site was indeed that of an elaborately designed timber construction, possibly comparable in some respects to the more familiar stone circles.

The size and depth and distance between the holes varies in each circle, but in each circle is fairly consistent throughout. In the outermost circle the holes are 6 ft. apart from centre to centre, from 1-1/2 ft. to 2 ft. deep and from 2 ft. to 3 ft. in diameter. In the second circle the holes were larger and further apart, averaging about 4 ft. in depth, and from 3-1/2 ft. to 4 ft. in diameter. The largest of all were those of the third circle, being about 6 ft. deep, with a diameter at top of from 4 ft. to 5 ft.; the holes of the three inner circles were all much alike, about 3-1/2 ft. to 3 ft. in depth and 2 ft. to 3 ft. in diameter. It is computed that the outer circle probably consists of 64 holes; the second 32; the third, 16; the fourth, 20; the fifth, 20; and the sixth, 14 holes. In addition to the six circles of post holes there is an inner seventh series of holes of quite different character; they are shallow and very irregularly cut; whether they really form a seventh circle, and what purpose they served, are both alike at present uncertain.

Two burials were found during the excavations, one, a crouched skeleton of a child, near the centre, and the other a crouched skeleton of an adult in a grave dug below the floor of the ditch in the eastern section.

As a result of excavation it was found that the raised centre of the circle was not due to the remains of a mound but to the fact that the ground had been pared off all round from the centre, towards the edge of the ditch, so that the centre is the natural level of the ground, and only appears raised as a result of the artificial lowering of the surrounding area.

The monument is, so far as at present known, unique either in the British Isles or abroad, but probably there are others as yet undiscovered waiting to be revealed by photography from the air or by other means. As it stands at present it is the most sensational archaeological discovery made by means of photography from the air, because unlike that of the continuation of the avenue at Stonehenge, it was quite unsuspected and reveals a new type of monument.

As to the purpose for which it was designed, or the date of its construction, it would be premature to speak now, only about one half of the circles have been examined. The objects found have been few, and pottery, which usually affords the most valuable clue for dating purposes, was present only in small fragments.

MSH-020 [NORWICH WOODHENGE]

Anonymous; *Antiquity*, 3:257-259, 1929.

Another Woodhenge has been found, just outside the City of Norwich. Like the first it was discovered from the air by Wing Commander Insall, V. C., who was flying over it, pin-pointing, on 18 June last. The discovery was accidental, in the sense that it was totally unexpected and it is of the first order of importance.

The site lies in a grass field called Bridge Meadow, in the northern corner of the parish of Arminghall (Norfolk, 6-inch sheet 75 NE) opposite Old Lakenham. It consists of two concentric rings surrounding a circle of 9 dark spots representing without doubt wooden post-holes. The rings are revealed by the dark green grass which grows upon them and which contrasts strongly with the parched brown grass of the rest of the field. It is a gift of the drought. The rings represent ditches of which no other sign is visible. The soil is a sandy gravel. The outer ring is 10 feet wide; it is partially obscured on the south by a modern hedge and by an old field-bank running from a tree to the hedge at an acute angle. The inner ring is 25 feet wide and broken on the south-west by a gap or causeway about 14 feet wide. The holes have a diameter of 6 to 7 feet.

We visited the site with the finder on 26 June and it was possible to see both circles and holes marked out in the grass with the utmost clearness; the line of division between brown and green was sharp and distinct, enabling the dimensions to be taken with considerable accuracy.

The rings surround a knoll, and the interior of the circles is a saucer-shaped depression which has the appearance of having been hollowed out. There is no indication of anything at the centre. (The large dark splotch east of the gap is a patch of stinging-nettles growing over the outflow of a modern drain, and there are other smaller patches visible near by). The river Yare is less than a quarter of a mile distant on the north-west. Not far off is a small circle whose ditch (of varying dimensions) is 8 feet wide on the north side. There is a hint of another circle (perhaps double) in the barley field on the opposite side of the road, due south of the new Woodhenge.

Before discussing the general bearings of the discovery we must describe another and almost equally important one made during the same flight. It consists of two concentric rings, but here the outer-most ring is the wider of the two; they are both perfect and unbroken by any gaps. The position is just over half a mile south-west of the new Woodhenge, on a tongue of land forming a promontory between the Yare and the Tas, just before they unite. The field is sown with barley, and the circles are revealed by the darker green growth above the silted-up ditches. Not only is the barley darker in colour, but it is also as much as six inches higher. There is a distinct suggestion of something inside the inner circle. There can be no doubt that these circles represent a disc-barrow, and that the narrow inner ring surrounded the small central burial-mound. The site is a gravelly hillock; but it is not, like the other, saucer-shaped on the summit. Outside on the south-west is a mysterious D-shaped enclosure. The field is on the parish of Markshall and is called Monks on the tithe-map of 1840. The site is a mile north of the Roman town of Caistor (*Venta Icenorum*) of which an air-photograph was published in our last number. The Ordnance Map marks several other antiquities in the neighbourhood.

There is a strong probability that the Norfolk Woodhenge is contemporary with the neighbouring disc-barrow. A similar and even closer association occurs at the original Woodhenge in Wiltshire, which, as many of our readers will remember, was also first announced in *Antiquity* (Vol. 1, plate opposite page 92). There, in the foreground, is a disc-barrow in which was found later a beaker and skeleton. The interment was furthermore proved to be contempor-

MSH-021 HENGES, ORGANIZED STRUCTURES

ary with Woodhenge. What does all this indicate? That Woodhenges and disc-barrows (to say nothing of Stonehenge) were the work of the Beaker-folk who invaded England at the end of the neolithic period of this island, and who probably brought with them the knowledge of metal. Now the evidence of the beakers themselves shows, as Lord Abercromby pointed out long ago, that the invaders came from somewhere near the mouth of the Rhine; and this is precisely where timber circles are most abundant at the same period (see Antiquity, 1, 100).

MSH-021 NORFOLK WOODHENGE

Anonymous; Nature, 136:365, September 7, 1935.

As stated in the preliminary announcement of the arrangements for the Norwich meeting of the British Association this year, the Norwich Research Committee has undertaken the excavation of the remarkable example of the type of monument, known to archaeologists as 'Woodhenge', in the parish of Arminghall in the south-eastern outskirts of the city. The generic term 'Woodhenge' was first used by Mrs. M. E. Cunnington to describe the circle near Amesbury with wooden uprights in place of stone, which she excavated in 1926 and 1928. The Norfolk Woodhenge, which was discovered from the air in 1929, was known from air photographs to be a striking example of the type, consisting of two concentric rings, in the inner and broader of which was a gap giving access to the central space, around which were nine dark patches, presumed to be the post holes of the uprights of the circle. The completion of the work of excavation, which has been carried out under the direction of Mr. J. G. D. Clark, will enable members of the British Association, who have not previously had the opportunity, to form an idea at first hand of this striking development in the history of prehistoric monuments. In a preliminary report of the results of the excavation communicated to The Times of September 3, it is stated that excavation has confirmed the surface indications of a diameter for the outer circle of 262 ft. and for the central area within the smaller circle of 87 ft. The outer circle was found to be a ditch 12 ft. wide and 4 ft. 8 in. deep, the inner circle a ditch 25 ft. wide and 7 ft. 8 in. deep. As anticipated, the dark patches of the photographs are post-holes with ramps. The posts were found to consist of oak trunks some 3 ft. in diameter, set to a depth of 7 ft., after charring for preservation. It was evident that they had been dragged into position before the construction of the great inner ditch. No trace of burial was found in the enclosure, though there is evidence of burials nearby. Pottery of the Beaker type dates the structure at 1800-1500 B. C.

MSH-022 ARMINGHALL TIMBER MONUMENT

Anonymous; Nature, 138:470, September 12, 1936.

The prehistoric monument at Arminghall, near Norwich, discovered by aerial photography in 1929, and excavated by Dr. J. G. D. Clark immediately before the Norwich meeting of the British Association last year, proves, like "Woodhenge" in Wiltshire, excavated by Mrs. M. E. Cunnington, to have been a circle in which the place of stone uprights was taken by wooden posts. The

character of the monument in detail, its purpose, dating, and affinities, have now been made the subject of close study by the excavator (*Proc. Prehist. Soc.*, N. S. 2, 1; 1936). The monument consists of two concentric ditches separated by a bank, and surrounding a central portion, in which had been erected eight wooden uprights in U-shaped formation, and approached by a causeway interrupting the inner ditch. In this central area there was no sign of disturbance, excepting the post-holes and the ramps, by means of which the posts had been erected. The size and depth of the post-holes and the size of the ramps indicate that the posts were of considerable height--oaks, as shown by the charcoal found in the holes, probably of about a hundred years old. The absence of any burial precluded the idea that the purpose of the monument was sepulchral. The primary material obtained from the inner ditch consisted of 107 flints of indeterminate age, and fragments of hand-made 'rusticated' pottery, that is, pottery decorated with pinches or jabs, of a type to which the specific name 'Arminghall' is here given. On archaeological evidence this pottery is shown to date the monument as belonging to the Beaker period, as do other 'henges' in Britain which so far have been satisfactorily dated. Two hypotheses as to the origin of this class of monument are current---one that they are derived from the palisade barrows of the Low Countries, the other that they are degenerate megalithic cairns; but at present there is no decisive argument in favour of either.

MSH-023 MOUND BUILDERS' TEMPLE, OHIO

Anonymous; *Nature*, 146:455-456, October 5, 1940.

Exploration of a mound near North Benton, Ohio, has brought to light the remains of a structure identified as a temple in which a number of objects are apparently new to knowledge of the culture of the Mound Builders. The mound was excavated by Mr. Roy Saltman and Mr. Willis H. Magrath. It has been assigned by Mr. Richard I. Morgan, curator of archaeology in the Ohio State University, to the Hopewellian phase, the most advanced of the Mound Builder culture, which extended from Ohio down the Mississippi and Tennessee valleys. In an account of the excavation (*Scientific American*, August 1940), it is stated that within a circle of stone slabs there was evidence of an inner wall of wood in the form of charred stumps, which had supported a circular building nearly 70 ft. in diameter. A corridor from a gateway in the west side led to a fireplace in the middle of the temple floor. Stone altars and clay cones flanking the corridor bore charred bones and offerings of stone implements, mica, galena and copper.

The most striking feature of the temple was the figure of an eagle of white sandstone flags on an understructure of moulded clay, which measured 32 ft. across and 16 ft. from head to tail. It was headed towards the rising sun. Overlying the wings were two human skeletons, male and female. Numerous broken fragments of human skull bones and similar fragments on the nearby altar stone suggest human sacrifice as part of a burial ceremonial. Not only is the eagle figure unique, but also human sacrifice is a new element in finds in other branches of the Hopewellian culture. The culture of the Mound Builders, which developed between the beginning of the Christian era and Columbian times, had disappeared before the arrival of Europeans. The suggested connexion between this culture and that of Mexico and Central America might well account for the appearance of human sacrifice, to which the inhabitants of Mexico were particularly addicted.

MSH-024 HENGES, ORGANIZED STRUCTURES

MSH-024 THE METEORIC CYCLE AND STONEHENGE

Edmonds, R. ; Nature, 32:436-437, September 10, 1885.

We are now passing through the hundredth meteoric cycle of nineteen years, which commenced with A. D. 1882 and will terminate with A. D. 1900. These cycles began with the year of our Saviour's birth, and our prayer books contain tables showing for many successive years on what days Easter days and our movable festivals will occur. At the end of every such cycle the new and full moons happen within an hour and a half of the same time of the year as they did at the beginning.

With these cycles is commonly associated the name of Meton, an astronomer of Athens, who wrote a book on the subject, by which the Greeks regulated the recurrence of their festivals. He flourished 432 years B. C. But the knowledge of these cycles existed in England centuries before the time of Meton, as I will presently show, and it is probable that the four very ancient erections supposed to have been temples of the sun near Penzance, had reference to this cycle of nineteen years, as they each consisted originally of nineteen stones placed upright and rising from 3 to 6 feet above the ground in rude circles varying in diameter from 65 to 80 feet. These temples are still existing, although some of their stones have fallen, and they are miles from each other, but are all called in the printed maps, as well as immemorially, by one and the same name, viz. "Nine Maidens," which is simply an abbreviation for Nineteen Maidens.

The following quotation from Diodorus Siculus (Book II, chap. iii, Booth's Trans., page 139), who flourished about forty-four years B. C., will be an historical confirmation of what I have above stated:-

"Amongst those who have written old stories much like fables, Hecataeus (born 549 years B. C.) and some others say that there is an island in the ocean over against Gaul (as big as Sicily) under the Arctic pole, where the Hyperboreans inhabit, so called because they lie beyond the breezes of the north wind; that the soil there is very rich and fruitful, and the climate temperate, inasmuch as there are two crops in the year."

This description does not apply to the whole of the island referred to, but represents Mount's Bay, its most south-western extremity, and we may therefore conclude that those from whom Hecataeus and the others derived their information were the Phoenician traders who for centuries previously frequented Mount's Bay for tin and fish, and who imagined all Britain to possess the same rich soil and mild climate as Mount's Bay where still "there are two crops in the year." But to proceed with the quotation:-

"They say that Latona was born there, that they worship Apollo above all other gods, and the inhabitants demean themselves as if they were Apollo's priests, who has there a stately grove and a renowned temple of a round form, and that there is a city likewise consecrated to this god. The sovereignty of this city and the care of the temple (they say) belong to the Boreades."

This city and this "Renowned temple of a round form" are doubtless those of Old Sarum and Stonehenge, the inner oval of which, immediately around the altar, consists of precisely nineteen stones (see the plate in Dr. Stukeley's "Stonehenge," page 20). But the four temples of the sun above described of nineteen stones each, placed upright "in a round form" to represent the cycle of nineteen years, are not mentioned by Diodorus, as they were probably deemed not worthy of notice after alluding to the renowned temple of Stonehenge. The passage concludes as follows:-

"They say, moreover, that Apollo once in nineteen years comes into the island, in which space of time the stars perform their courses, and return to the same point, and therefore the Greeks call the revolution of nineteen years 'the great year.'"

The quotations from Diodorus are usually given to "prove" that the ancient Greeks knew about Stonehenge. Above a different stone circle is involved. Stone circles do seem to be worldwide.

MSH-025 STONEHENGE --- AN ECLIPSE PREDICTOR

Hoyle, Fred; Nature, 211:454-456, July 30, 1966.

The suggestion that Stonehenge may have been constructed with a serious astronomical purpose has recently received support from Hawkins, who has shown that many alignments of astronomical significance exist between different positions in the structure. Some workers have questioned whether, in an arrangement possessing so many positions, these alignments can be taken to be statistically significant. I have recently reworked all the alignments found by Hawkins. My opinion is that the arrangement is not random. As Hawkins points out, some positions are especially relevant in relation to the geometrical regularities of Stonehenge, and it is these particular positions which show the main alignments. Furthermore, I find these alignments are just the ones that could have served far-reaching astronomical purposes, as I shall show in this article. Thirdly, on more detailed investigation, the apparently small errors, of the order of $\pm 1^\circ$, in the alignments turn out not to be errors at all.

In a second article Hawkins goes on to investigate earlier proposals that Stonehenge may have operated as an eclipse predictor. The period of regression of the lunar nodes, 18.61 years, is of especial importance in the analysis of eclipses. Hawkins notes that a marker stone moved around the circle of fifty-six Aubrey holes at a rate of three holes per year completes a revolution of the circle in 18.67 years. This is close enough to 18.61 years to suggest a connexion between the period of regression of the nodes and the number of Aubrey holes. In this also I agree with Hawkins. I differ from him, however, in the manner in which he supposes the eclipse predictor to have worked. Explicitly, the following objections to his suggestions seem relevant:

(1) The assumption that the Aubrey holes served merely to count cycles of 56 years seems to me to be weak. There is no need to set out fifty-six holes at regular intervals on the circumference of a circle of such a great radius in order to count cycles of fifty-six.

(2) It is difficult to see how it would have been possible to calibrate the counting system proposed by Hawkins. He himself used tables of known eclipses in order to find it. The builders of Stonehenge were not equipped with such post hoc tables.

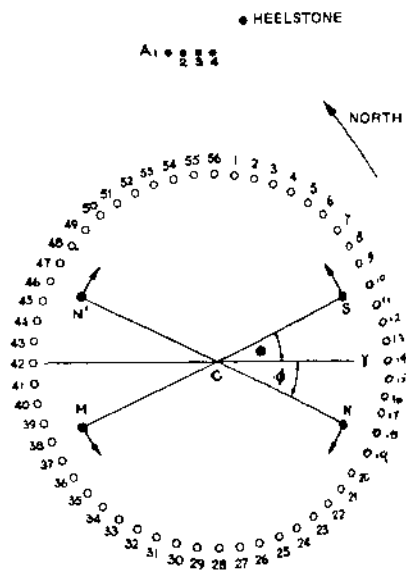
(3) The predictor gives only a small fraction of all eclipses. It is difficult to see what merit would have accrued to the builders from successful predictions at intervals as far apart as 10 years. What of all the eclipses the system failed to predict?

My suggestion is that the Aubrey circle represents the ecliptic. The situation shown in Fig. 1 corresponds to a moment when the Moon is full. The first point of Aries γ has been arbitrarily placed at hole 14. S is the position of the Sun, the angle \odot is the solar longitude, M is the projection of the Moon on to the ecliptic, N is the ascending node of the lunar orbit, N' the descending node, and the center C is the position of the observer. As time passes, the points S, M, N and N' move in the senses shown in Fig. 1. S makes one circuit a year. M moves more quickly, with one circuit in a lunar month. One rotation of the line

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of lunar nodes $\overline{NN'}$ is accomplished in 18.61 years. In Fig. 1, \underline{S} and \underline{M} are at the opposite ends of a diameter because the diagram represents the state of affairs at Full Moon.

If the Moon is at \underline{N} , there is a solar eclipse if the Sun is within roughly $\pm 15^\circ$ of \underline{N} , and a lunar eclipse if the Sun is within $\pm 10^\circ$ of $\underline{N'}$. Similarly, if the Moon is at $\underline{N'}$, there will be a solar eclipse if the Sun is within $\pm 15^\circ$ of coincidence



with the Moon, and a lunar eclipse if it is within roughly $\pm 10^\circ$ of the opposite end of the line of lunar nodes. Evidently if we represent \underline{S} , \underline{M} , \underline{N} and $\underline{N'}$ by markers, and if we know how to move the markers so as to represent the actual motions of the Sun and Moon with adequate accuracy, we can predict almost every eclipse, although roughly half of them will not be visible from the position of the observer. This is a great improvement on the widely scattered eclipses predictable by Hawkins's system. Eclipses can occur as many as seven times in a single year, although this would be an exceptional year.

The prescriptions for moving the markers are as follows: (1) Move \underline{S} anticlockwise two holes every 13 days. (2) Move \underline{M} anticlockwise two holes each day. (3) Move \underline{N} and $\underline{N'}$ clockwise three holes each year.

We can reasonably assume that the builders of Stonehenge knew the approximate number of days in the year, the number of days in the month, and the period of regression of the nodes. The latter follows by observers the azimuth at which the Moon rises above the horizon. If in each lunar month we measure the least value of the azimuth (taken east of north), we find that the "least monthly values" change slowly, because the angle $\phi \angle N'CY$ changes. The behaviour of the "least monthly values" is shown in Fig. 2 for the range $-60^\circ \leq \phi \leq 60^\circ$. The azimuthal values in Fig. 2 were worked out without including a refraction or a parallax correction. These small effects are irrelevant to

the present discussion.) The least monthly values oscillate with the period of Φ , 18.61 years. By observing the azimuthal cycle, the period of Φ can be determined with high accuracy by observing many cycles. At Stonehenge sighting alignments exist that would have suited such observations. With the periods of \underline{S} , \underline{M} and \underline{N} known with reasonable accuracy the prescriptions follow immediately as approximate working rules.

Suppose an initially correct configuration for \underline{M} , \underline{N} and \underline{S} is known. The prescriptions enable us to predict ahead what the positions of \underline{M} , \underline{N} and \underline{S} are going to be, and thus to foresee coming events---but only for a while, because inaccuracies in our prescriptions will cause the markers to differ more and more from the true positions of the real Moon, Sun, and ascending node. The lunar marker will be the first to deviate seriously---the prescription gives an orbital period of 28 days instead of 27.32 days. But we can make a correcting adjustment to the \underline{M} marker twice every month, simply by aligning \underline{M} opposite \underline{S} at the time of full Moon, and by placing it coincident with \underline{S} at new Moon. The prescription for \underline{S} gives an orbital period of 364 days, which is near enough to the actual period because it is possible to correct the position of \underline{S} four times every year, by suitable observations made with the midsummer, midwinter, and equinoctial sighting lines that are set up with such remarkable accuracy at Stonehenge.

Stonehenge is also constructed to determine the moment when $\Phi = 0$, that is, when \underline{N} should be set at \mathcal{Y} . The line \underline{C} to $\underline{A1}$ of Fig. 1 is the azimuthal direction for the minimum point of Fig. 2. By placing \underline{N} at \mathcal{Y} when the Moon rises farthest to the north, the \underline{N} marker can be calibrated once every 18.61 years. The prescription implies only a small error over one revolution of \underline{N} . If \underline{N} started correctly, it would be out of its true position by only 1° or so at the end of the first cycle. The tolerance for eclipse prediction is about 5° , so that if we were to adjust \underline{N} every cycle, the predictor would continue to work indefinitely without appreciable inaccuracy. The same method also serves to place \underline{N} at the beginning.

But now we encounter an apparent difficulty. The minimum of Fig. 2 is very shallow and cannot really be determined in the way I have just described. Angular errors cannot have been less than $\pm 0.25^\circ$, and even this error, occurring at the minimum of Fig. 2, is sufficient to produce an error of as much as $\pm 15^\circ$ in Φ .

The correct procedure is to determine the moment of the minimum by averaging the two sides of the symmetrical curve, by taking a mean between points 2, for example. The inaccuracy is then reduced to not more than a degree or two---well within the permitted tolerance.

What is needed is to set up sighting directions a little to the east of the most northerly direction. The plan of Stonehenge shows a line of post holes, $\underline{A1}$, 2, 3 and 4, placed regularly and with apparent purpose in exactly the appropriate places.

The same point applies to solstitial measurements of the Sun. In summer the sighting line should be slightly increased in azimuth, in winter it should be slightly decreased.

Hawkins gives two tables in which he includes columns headed "Error Alt.". These altitude errors were calculated on the assumption that the builders of Stonehenge intended to sight exactly the azimuthal extremes. The test of the present ideas is whether the calculated "errors" have the appropriate sign---on the argument given here "errors" should be present and they should have the same sign as the declination. In ten out of twelve values which Hawkins gives in his Table 1 this is so. The direction from \underline{C} to the Heelstone is one of the two outstanding cases. Here the "error" is zero, suggesting that this special

direction was kept exactly at the direction of midsummer sunrise, perhaps for aesthetic or ritualistic reasons. The other discrepant case is 91→94. Here my own calculation gives only a very small discrepancy, suggesting that this direction was also kept at the appropriate azimuthal extreme.

Negative values of the altitude error correspond to cases where it would be necessary to observe below the horizontal plane, if the objects in question were sighted at their extreme azimuths. This is impossible at Stonehenge because the land slopes gently upward in all directions. Such sighting lines could not have been used at the extremes, a circumstance which also supports this point of view.

It is of interest to look for other ways of calibrating the N marker. A method, which at first sight looks promising, can be found using a special situation in which full Moon happens to occur exactly at an equinox. There is evidence that this method was tried at Stonehenge, but the necessary sighting lines are clearly peripheral to the main structure. Further investigation shows the method to be unworkable, however, because unavoidable errors in judging the exact moment of full Moon produce large errors in the positioning of N. The method is essentially unworkable because the inclination of the lunar orbit is small. Even so, the method may well have caused a furor in its day, as the emphasis it gives to a full Moon at the equinox could have been responsible for the dating of Easter.

An eclipse calibrator can be worked accurately almost by complete numerology, if the observer is aware of a curious near-commensurability. Because S and N move in opposite directions the Sun moves through N more frequently than once a year, in 346.6 days. Nineteen such revolutions is equal to 6,585.8 days, whereas 223 lunations is equal to 6,585.3 days. Thus after 223 lunations the N marker must bear almost exactly the same relation to S that it did before. If the correct relation of N to S is known at any one moment N can be reset every 223 lunations; that is, every 18 years 11 days. The near-commensurability is so good that this system would give satisfactory predictions for more than 500 years. It requires, of course, S to be set in the same way as before. The advantage is that in the case of N it obviates any need for the observational work described above. But without observations the correct initial situation cannot be determined unless the problem is inverted. By using observed eclipses the calibrator could be set up by trial and error. This is probably the method of the Saros used in the Near East. There is no evidence that it was used at Stonehenge. The whole structure of Stonehenge seems to have been dedicated to meticulous observation. The method of Stonehenge would have worked equally well even if the Saros had not existed.

Several interesting cultural points present themselves. Suppose this system was invented by a society with cultural beliefs associated with the Sun and Moon. If the Sun and Moon are given godlike qualities, what shall we say of N? Observation shows that whenever M and S are closely associated with N, eclipses occur. Our gods are temporarily eliminated. Evidently, then, N must be a still more powerful god. But N is unseen. Could this be the origin of the concept of an invisible, all-powerful god, the God of Isaiah? Could it have been the discovery of the significance of N that destroyed sun-worship as a religion? Could M, N and S be the origin of the doctrine of the Trinity, the "three-in-one, the one-in-three"? It would indeed be ironic if it turned out that the roots of much of our present-day culture were determined by the lunar node.

MSH-026 POSSIBLE USE OF STONEHENGE

ton, R. R., and Jenkins, R. E.; Nature, 239:511-512, October 27, 1972.

Hawkins has suggested that the Aubrey holes at Stonehenge were used to count the years of a 56-year cycle, important in the motion of the Moon and the occurrence of eclipses. Hoyle and Colton and Martin have suggested other ways that Stonehenge could have been used to predict eclipses. Here we suggest a use of Stonehenge that has nothing to do with eclipses. We suggest also that the Aubrey holes, if they were used as counters at all, were used to count intervals of 56 months rather than 56 years.

In accounting for the Aubrey holes, we have considered only the original structure at Stonehenge, suggested by Atkinson to have been (a) the bank and ditch, which formed a circle broken by the entryway, (b) the 56 Aubrey holes named for their modern discoverer, which form a circle just inside the ditch, and (c) the Heel Stone, which marks approximately the point of Sunrise at the summer solstice as seen from the centre of the circle. There may also have been simple structures to give formal definition to the entrance and to the centre. Stonehenge probably retained this simple structure for about 150 yr, until it was altered by a newly-arrived people.

Thus, to explain the Aubrey holes, we should use only the Heel Stone. An explanation based on eclipse cycles seems unlikely because of visibility problems. Roughly speaking, one lunar eclipse out of two is visible at a particular spot and one solar eclipse out of six or seven. Eclipses unobserved through bad weather are a great hazard in trying to find eclipse cycles; Babylonian and Greek astronomers probably did not discover even the simplest cycle, much less the 56-year one, until more than a millenium after the Aubrey holes were dug.

About a third of the world's population uses a lunar calendar today, and the fraction was probably greater in ancient times. Thus it is plausible that the "Stonehengers" used a lunar calendar if they used one at all. Ancient peoples who used a lunar calendar often determined the beginning of the month by direct observation of the Moon. It was common to begin a lunar month with the first sunset at which the new Moon was visible in the west, and it was common to have an official charged with making this observation.

The new Moon sets soon after the Sun; the observer could easily note the relation of the points of Moonset and Sunset. An observer charged with watching the new Moon each month should soon notice that it sometimes sets northward from the Sun and sometimes southward. Since the observer at Stonehenge was presumably also concerned with the summer solstice, he might easily become concerned with the setting of the new Moon that came next after the summer solstice. We will call this the summer new Moon, and consider the time at which the summer new Moon crosses the summer Sun with regard to their setting points.

When this occurs, one of the two nodes of the lunar orbit must be near the celestial position of the summer solstice. After 223 lunar months (≈ 18 yr and 11 day), the position of the mean Moon is 10.8° east of where it started and the position of the node is 11.3° east of where it started. Thus the Moon is at almost exactly the same position with respect to the node and the node is still close to the solstice. If the summed new Moon crosses the Sun from, say, south to north at the beginning of a 223-month period, it will do so again at the period. However, at either 111 or 112 months, depending on the exact phases of the motion, it will cross in the opposite direction.

The numbers in the preceding paragraph are the ones that occur most often. Because none of the fundamental periods involved is commensurate, all simple cycles fail within a few repetitions. In order to test this cycle, we calculated 12 successive intervals between crossings of the summer new Moon, and found intervals of 111 and 112 months four times each, and the interval was lengthened by 12 months in the other four times.

We can easily imagine that the Stonehengers paid attention to the setting of the summer new Moon (or to some other phase; all such phases are governed by the same basic periods). For instance, they might have said that the Moon is dominant when the summer new Moon sets north of the Sun, and they might have said that the Sun is dominant when the summer Sun is to the north of the summer new Moon. We can also easily imagine that such periods had great importance in astrological or other matters and that the Stonehengers might have been greatly interested in predicting when such periods would end.

They could easily have made these predictions with the aid of a counting circle of 111 holes. If they preferred not to build a circle with this many holes, they could have used a circle of 56 holes just as easily. The doctrine would be: when the counter reaches the 55th hole on the second time around, note first whether this is the summer new Moon; if it is not, wait for the next new Moon. At the summer new Moon, whichever one it is, there are two possibilities: either the period is complete or it will be complete at the next summer new Moon. Whether the period is complete now or next summer could have been attributed to superhuman powers. This use of the Aubrey holes involves observations that were probably made each month, and it does not require any azimuth marker except the Heel Stone. It does not involve a complex scheme of counting.

It does not follow that the Aubrey holes had astronomical significance even if we assume that the Heel Stone did. We note the following points. (1) The Aubrey holes have dimensions of several feet, and they vary in both depth and diameter by factors of two or more. This suggests to us that they were not designed as members of a uniform series, as we should expect if they were intended as counters. They also vary in their use as receptacles for cremations. (2) The area around Stonehenge has many circles of about the same age as Stonehenge. Many of them have no apparent astronomical significance. For example, Avebury has a large ditch with four entrances, and with a circle of markers just inside the ditch. However, the azimuths of its entrances are approximately 70° , 165° , 250° , and 330° . (3) The number of positions in the circles diagrammed by Atkinson varies from 8 to about 100. We noticed no instance of 56 positions except Stonehenge, nor did we notice any number that seemed to be favoured. This suggests that the number was purely a matter of convenience to the builders. (4) The holes in the entryway to Stonehenge had unique positions and may have been looked upon as distinct from the others. That is, the number to be explained, if any, may be 54 or 55 rather than 56. (5) The significance, if any, may be social rather than astronomical. For example, perhaps there were 56 families, clans, or other social units who built Stonehenge and who were entitled to dig one of the Aubrey holes and to enter cremated remains therein if they wished. This could account for the variability in the size and use of the holes. (6) Finally, $56 = 7 \times 8$. Both factors occur frequently in numerology and need no explanation specific to Stonehenge.

There are many non-astronomical but plausible explanations for the number of Aubrey holes. If the holes were used to count an astronomical interval, that interval may have been in months rather than years. The use in counting months could arise simply, with no astronomical apparatus beyond a lunar calendar and a marker for the summer solstice. No observing or recording of eclipses would have been required.

MSH-027 MOUNDS AND LODGE CIRCLES IN IOWA

Starr, Frederick; American Antiquarian, 9:361-363, 1887.

In November last I examined certain mounds and other remains in the extreme northwest corner of this state. The locality is on the B., C. R. & N. R. R. near the station La Valley, or "Brown's." The spot is close to the "Little Sioux," on a high ridge overlooking that stream. Mounds in great numbers cover the hillside and crown the summit of the ridge. Across the river, in Dakota Territory, a similar ridge presents similar mounds.

The mounds show no evidence whatever of regular arrangement, and as my time was short I made no plot of the area covered by them. We spent two days on the ground and the following description includes my own observations and those of Messrs. Cotton, Nash, and White, who have spent more time there in the employ of the railroad company.

Most of the mounds are circular, 30 to 50 feet in diameter and from two or three to six or eight feet high. A few are oval and somewhat larger than the above figures indicate. There are perhaps some scores of these mounds here.

Among these mounds are many stone circles or ovals. These are made with "niggerheads" or boulders. These circles are scattered over the ridge without arrangement. Though some mounds occur among them, it may be said that the mounds surround the area covered with the stone circles, in a rude oval. This statement must not, however, be taken too emphatically. Circles of stone occur outside this area and mounds within it.

The whole ground about the mounds and circles is strewn with flint flakes, arrowheads, scrapers, fragments of pottery, etc. Stone mauls of good workmanship and neat appearance are picked up in this neighborhood.

To be more specific: We opened two mounds (Nos. 1 and 2), and have the specimens found in another (No. 3), and data regarding a fourth (No. 4). In mound No. 1 we found the material a hard gravel, difficult to dig. Patches of ashes were found. At two feet depth was a skeleton with head to the north and body extended toward the south. All the bones were found in fair preservation. No relics were discovered.

In No. 2 some fragments of bone, some ashes, and some bits of pottery were found. The following structure was revealed: 1. Gravel. 2. Black soil. 3. Ashes and black soil. 4. Gravel. The bones and potsherd were from layers two and three. Mounds three and four were alone, south of the railroad and south of the above mound.

No. 3 yielded skeletons of two adults, a child and a horse. A pipe was found here. Lower down another human skeleton was found---an adult---and also the skeleton of a dog wrapped in buckskin. With these remains were found six iron bracelets, fifteen feet of wampum (three shell wampum), a grinding-stone and a red pipe-stone pipe. The skeleton had earrings of copper, attached to the head. Where the copper had oxydized, it had preserved the skin and the hair. This peculiar specimen was sent to Burlington. This mound was encircled by a stone circle. Mound No. 4 yielded a peculiar "stone wheel," an arrowhead, a pretty little maul of reddish granite, part of a pottery jar, and some very hard bone fragments. A line of stones was laid along the surface at each end of this mound. These lines were six or seven feet apart. The stone wheel found here deserves description. It is of a hard, dark-colored rock, perfectly polished and of very fine finish. The wheel is six inches in diameter, perfectly round in outline, perforated at center by a small hole. The sides are perfectly concave. The stone at the central perforation is not more than a quarter or three-eighths

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of an inch thick, while at the rim it is one and a half inches thick. The surface of the rim is convex. The stone is evidently for use in some pitching game and is as fine as any of the specimens of the kind from the south. [This stone is probably a Chunky stone.]—Ed.

The stone circles interest me. From my note-book I copy one or two descriptions. The first is near mound No. 1. This "ring" is slightly elliptical. It consists of 110 boulders, averaging about one foot in diameter. They are set almost close together; the boulders are of all sorts---quartzite, gneiss, granite, schist, etc. In another ring the stones are nearly all of one kind---limestone. In a third about two feet intervene between stones. One ring was 63 x 37 feet and contained 197 stones. Almost all these stone circles have an opening from one foot to four and a half feet wide at the southeast. Some few are "double," one circle concentric with another. Some have "guard stones" at the opening. Some confluent circles are made, at points of contact, from some stones. One group of confluent rings consists of seven circles, two of them "double". The "circles" are generally supposed to be lines of stones to hold down the edges of skin tents. The fact that the "openings" or breaks in the rings face southeast while the almost continuous prevailing lines are from the northwest favor this idea. However all these lines of stones cannot be "tent anchors." For instance the "ring" around mound three, the lines upon mound four, or a very peculiar instance noticed on a steep side hill, where a great granite boulder is surrounded with a ring of lesser boulders and gravel stones, not accurately circular but rudely heart shaped. [The use of one kind of stone for the circles may be compared to the use of one kind of wood for graves noticed by Lapham, iron wood for one grave, oak for another, etc.—Ed.]

A missionary of the American Sunday School Union, visiting our collection, told me that the stone mauls, such as we found in considerable quantity, are yet common among the Dakotas, who use them in preparing food. Choke cherries are gathered, pounded to a pulp with these mauls, kneaded into cakes and dried. Also a peculiar tuber, with somewhat the structure of an onion, is gathered, the outer skin is husked off and the rest is pounded by these mauls into a meal, which is mixed with water moulded into cakes and cooked. Such are some of the uses of such mauls; probably there are many others, an Indian implement is capable of manifold uses.

The state of the bones, the condition of the wampum, the preservation of buckskin, the presence of iron and the bones of a horse, all show these mounds to be comparatively recent. The story told by these relics seems to be of a camp of Dakotas where tents were pitched closely together. The dead were buried in mounds near the outskirts of the settlement. The site was occupied for some years. Trade with the whites of the east had begun. The relics date back scarce a century but the mounds, the workmanship of the pipes, the "stone-wheel," the mauls and the pottery all speak well for the industry and taste of the makers.

MSP-002 THE ABORIGINAL MOUND BUILDERS OF TENNESSEE

Jones, Joseph; American Naturalist, 3:57-72, 1869.

Included in this subsection because of the pyramidal mound described by Jones, there are also several other little gems, such as the debunking of the Tennessee "Pygmy skeletons". The article is also a marvelous period piece.

When the first Anglo-American pioneers, about the middle of the last century, explored the country east and north of the Tennessee River, the territory between the Ohio and Tennessee Rivers was a vast unoccupied wilderness. The rich valleys, hills and plains of Tennessee and Kentucky were crowded with a dense growth of forest trees and canes, and formed an extensive park, held permanently only by the beasts of the forest, and abounding with immense herds of buffalo, flocks of wild turkeys, droves of deer and innumerable bears. The nearest permanent Indian settlements were on the Sciota and Miami on the north, and on the waters of the Little Tennessee on the south; and from these points the warriors of the Miami Confederacy of the north, and the Choctaws, Chickasaws and Cherokees of the south issued to engage in hunting and war, in this great central theatre. At this period, by common agreement of all the surrounding tribes, this section of country, which, for its fertile soil, numerous rivers and abundant supply of fish and game, was admirably adapted to the settlement of savage tribes, appeared to have been reserved from permanent occupancy.

That this country, in common with other portions of the great Valley of the Mississippi, was inhabited in ancient times by a comparatively dense population, who subsisted by the arts of husbandry, as well as by the chase, is evident from the numerous depositories of the dead in the caves and along the banks of the streams in the fertile valleys, and around the cool springs which abound in this limestone region, and from the imposing monumental remains and extensive earthworks.

A considerable portion of the city of Nashville has been built over an extensive Indian graveyard, * which lay along the valley of Lick Branch. A large portion of these graves have been removed in the building of North Nashville. In this section of the city I saw a number of these stone graves, exposed during the digging of the cellars of a row of houses, and obtained a small stone hatchet,

* An extensive burying ground lies on the opposite bank of the Cumberland, directly across from the mouth of Lick Branch, and another about one and a half miles lower down; another at Cockrill's Spring, two and a half miles from the Sulphur Spring; another six miles from Nashville on the Charlotte Pike, and still another at Hayesborough. Numerous stone graves are also found on White's Creek, on the Dickerson Pike, nine miles from Nashville, and at Sycamore, twenty-two miles from Nashville, on the plantation of Colonel Overton, and in and around Brentwood, at the Boiling Springs, and on the plantation of Mr. Scales. Extensive Indian burying grounds are also found in White County, near Sparta, and along the various streams flowing into the Cumberland and Tennessee Rivers, as Harpeth, Duck, Elk and Stone Rivers. At the plantation of General DeGraffenreid, two and a half miles above Franklin, numerous stone graves are found within an extensive earthwork, which appears to have surrounded a considerable Indian town. One large square mound, 230 feet in diameter, together with a chain of smaller ones, are found within the ancient fortification, with mounds and stone graves. One of the most remarkable stone-grave burying grounds is found on the west fork of Big Harpeth, six and a half miles from Franklin, at a place called Old Town, the property of Mr. Thomas Brown.

and another implement of hard, silicious stone, beautifully polished. This stone implement is supposed to have been used in the dressing of hides. All around the sulphur spring, traces of the aborigines are manifest in the form of fragments of large pots and various implements. It is supposed that this salt lick was frequented by the Indians for game and the manufacture of salt.

Extensive fortifications, several miles in extent, enclosing two systems of mounds and numerous stone graves, lie along the Big Harpeth, about sixteen miles below Old Town, at Mound Bottom and Osborn's Place. At these extensive fortifications, which enclose the sites of two ancient cities, are found three pyramidal mounds, about fifty feet in elevation, and each one containing an acre upon its summit, and besides these, numerous lesser mounds. Such structures must have required the labor of a considerable population for a series of years; and more especially must the erection of these earth pyramids have been slow and tedious, as the aborigines were without horses or carts, and the immense mass of earth must have been carried by hand in baskets and skins. The old road or trail which connected these two ancient cities can still be discerned in the forest, the well-worn way being in some places a foot or more beneath the general surface. It is evident from these facts that a chain of fortified towns extended in ancient days all along Big Harpeth, and from careful excavations and examinations and comparisons of the crania and relics, we are convinced that they were all erected by the same race. One of the most remarkable aboriginal remains in Tennessee is found in the fork of Duck River, near Manchester, and is known as the *Stone Fort*. The walls of the fort have been formed of loose rocks and stones gathered from the bed of the river. The gateway of the fort, which opens toward the neck of land between the two branches of the river, is carefully protected by an inner line of works, so constructed that the enemy entering the fort would be received in a blind pouch or bag. Directly in front of the gateway of the fort, and about half a mile distant, stands a remarkable mound, the structure of which is similar to that of the walls of the fort, being composed of rocks, none of which exceed a foot and a half in diameter. This oblong mound is 600 feet in circumference and forty feet in height, and the labor of collecting and depositing the loose rocks by hand must have been considerable.

It would be impossible for us upon the present occasion to enter into a minute description of the mounds of Tennessee. They are found upon the Cumberland, Little Tennessee, Big Tennessee, French Broad, Elk River, Harpeth, Duck and Stone Rivers. As a general rule these mounds are erected upon rock alluvial bottoms, and are either surrounded by extensive earthworks, or are located in the neighborhood of these fortifications, which mark the site of towns. The mounds vary in number and size, in a measure, with the extent and richness of the valleys and the size of the earthworks. The smallest are not more than a few feet in height, and about thirty feet in diameter, while the largest attain a height of seventy feet, and cover an acre or two of ground. Many of the smaller mounds were used for the burial of the dead, others for the purpose of religious sacrifice and for the burning of the dead, while the largest pyramidal mounds were most probably the sites of the temples and council-houses of the aborigines.

The ancient inhabitants of Tennessee also left singular paintings upon the rocks, representing the sun and moon. These paintings occupy the face of perpendicular cliffs on the Harpeth, Tennessee, French Broad, Duck and Cumberland Rivers. The paintings are executed with red ochre, upon high, inaccessible walls of rock overhanging the water, and were, without doubt, devoted to sacred purposes, and were emblematic of the sun, the god of the aborigines. The paintings of the sun on the rocks on Big Harpeth River, about three miles below the road which crosses this stream from Nashville to Charlotte, can be seen for a distance of four miles, and it is probable that the worshippers of the sun

assembled before this high place for the performance of their sacred rights. At Buffalo Gap, on the same stream, where the ancient trail of the buffalo is still distinct, a line of buffaloes is painted upon the cliff rock which overhangs from above, and is capable of sheltering a thousand men.

We have still another evidence of the existence of a numerous population, in the fact that the first settlers found the caves filled with human skeletons.

Haywood relates that in the spring of the year 1811, two human beings were found in a copperas cave, in Warren County, in West Tennessee, about fifteen miles south-west from Sparta, and twenty miles from McMinnville. One of these persons was a male, the other a female. They were interred in baskets made of cane, curiously wrought, and evidencing great mechanical skill. They were both dislocated at the hip joint, and were placed erect in the baskets, with a covering of cane made to fit the baskets in which they were placed. The flesh of these persons was entire and undecayed, of a brown color, produced by time, the flesh having adhered to the bones and sinews. Around the female, next her body, was placed a well dressed doeskin; next to this was placed a rug, very curiously wrought of the bark of a tree and feathers. The bark seemed to have been formed of small strands well twisted. Around each of these strands feathers were rolled, and the whole woven into cloth of a fine texture, after the manner of our common coarse fabrics. This rug was about three feet wide, and between six and seven feet in length. The whole of the ligaments thus formed of bark were completely covered by the feathers, forming a body of about one-eighth of an inch in thickness, the feathers extending about one-quarter of an inch in length from the strand to which they were confined. Its appearance was highly diversified by green, blue, yellow and black, presenting different positions. The next covering was an undressed deer-skin, around which was rolled in good order a plain shroud manufactured after the same order as the one ornamented with feathers. This article resembled very much in its texture the bags generally used for the purpose of holding coffee, exported from Havana to the United States. The female had in her hand a fan formed of the tail feathers of a turkey, curiously bound with buckskin strings and scarlet colored hair, so as to open and shut readily. The hair of these mummies was still remaining upon their heads, and was of a yellow caste and very fine texture. DeSoto, in his march in 1539 and 1540, saw great numbers of similar feathered mantles; the Mexicans at the time of the Spanish conquest were clad in similar garments.

The tribes of Indians inhabiting the immense territory called by the Spaniards, Florida, embracing a country of indefinite extent, bordering upon the Gulf of Mexico, and including a large portion of the Valley of the Mississippi, and the present States of Georgia, Florida, Alabama, Mississippi, and the middle and western portions of Tennessee, were more highly civilized, and farther advanced than those in more northern regions; they were worshippers of the sun, were governed by despotic princes, cultivated the soil, had made some advances in the arts, and their manners, customs and religion all pointed to Mexico as their native country.

The population was much greater at the time of the invasion of De Soto than it has been at any subsequent period. Large armies were frequently arrayed against him. In Potosa, Florida, he was furnished with seven hundred burden bearers. In Ocute, Georgia, he was supplied with two hundred of these Indian servants, and at Cafeque, in the same State, four thousand more transported the effects of his army. A numerous population was found in the province of Coofa, and large forces opposed him at Maubila, Chickasa, and Alabama. The invasion of De Soto resulted in the destruction of an immense Indian population in all the territory through which he passed; they were not only destroyed in the

bloody battles by thousands, but they were worn out by heavy burdens, and hunted down with bloodhounds. The European diseases, which the natives inherited from the Spaniards, served also to thin out their population. Again, the constant bloody wars in which they were afterwards engaged among themselves, and which, to a great extent, grew out of the invasions, still farther reduced their numbers.

The towns were surrounded with walls of earth and palisades, and had towers of defense. Entrenchments and ditches were also found in various parts of the country. The most remarkable of the latter was at Pascha, west of the Mississippi. Here a large ditch, "wide enough for two canoes to pass abreast, without the paddles touching," surrounded a walled town. It was cut nine miles long, communicated with the Mississippi, supplied the natives with fish, and afforded them the privileges of navigation.

The natives formed artificial mounds for purposes of burial, worship, habitation and defense. The houses of the chiefs, with but few exceptions, stood upon large and elevated artificial mounds. When the Indians of 1540 resolved to build a town, the site of which was usually selected upon low rich land, by the side of some stream, or in the neighborhood of a large never-failing spring, they first erected a mound from twenty to fifty feet high, round on the sides but flat on the top. The habitations of the chief and his family were erected upon the summit. At the foot of the eminence a square was marked out around which the principal men placed their houses, and around them the inferior classes erected their wigwams. Some of these mounds had stairways upon their sides, and were so steep as to be accessible only by the artificial way. They were thus rendered secure from the attacks of an Indian enemy. Mounds were also erected over the chiefs after their death, whilst others were formed by the slow accumulation of the dead through ages.

The aborigines, at the time of De Soto, worshipped the sun, and erected large temples, which were also receptacles of the bones of the dead. The natives worshipped the sun, and entertained great veneration for the moon and certain stars. When the Indian ambassadors crossed the Savannah to meet De Soto, they made three profound bows toward the East, intended for the sun; three toward the West for the moon, and three toward De Soto. Upon the eastern bank of the Mississippi all the Indians approached him without uttering a word, and went through precisely the same ceremony, making to De Soto, however, three bows much less reverential than those made to the sun and moon. Similar customs prevailed on the west bank of this great river. In the morning every Indian presented himself at the entrance of his cabin, and extending his hands toward the sun, as his first ray beamed from the eastern horizon, addressed a rude but fervent hymn of adoration to his glory. At noon they performed a similar act in token of their gratitude; and to the setting sun they addressed their thanks for all the bounties they conceived he had bestowed upon them during the day; and they were particularly careful that his last ray should strike their heads.

A remarkable temple was situated in the town of Talmaco, upon the Savannah River, three miles distant from Cutifachique, near Silver Bluff. It was more than one hundred feet in length, and fifty feet in width. The walls were high in proportion, and the roof steep and covered with mats of split cane, interwoven so compactly that they resembled the rush carpeting of the Moors. The roof was covered with shells of various kinds, arranged in an ingenious manner. On the inside beautiful festoons of pearls, plumes and shells extended along the sides down to the floor. The temple was entered by three gates, guarded by gigantic wooden statues, some of which were armed with drawn bows and long pikes, and others with copper hatchets. On the sides of the walls were large benches,

in which sat boxes containing the deceased chiefs and their families. Three rows of chests full of valuable pearls occupied the middle of the temple. The temple abounded with beautiful garments manufactured out of the skins of various animals, and in the most splendid mantles of feathers.

Upon the route through Alabama and the neighboring States, De Soto found the temples full of human bones. The large towns contained stone houses, filled with rich and comfortable clothing, such as mantles of hemp, and feathers of every color exquisitely arranged. The dress of the men consisted of a mantle of the size of a common blanket, made of the various barks of trees, and a species of flax interwoven and dyed of various colors; also, well dressed and painted skins, and garments worn with beautiful feathers. The mantle was thrown over the shoulders with the arm exposed. Great men were sometimes, after the manner of the Mexicans, borne upon litters by their subjects, while their heads were shielded from the sun by shades made of feathers or gaudily painted hides.

The important conclusion which we draw from these investigations is: That the race which erected the mounds and fortifications of Tennessee was existing and active at the time of the discovery of North America, and possessed the country with a numerous population, even as late as the exploration of De Soto. This conclusion, which is at variance with the theories propounded by various ethnologists of Europe and America, who assign a considerable period to the extinction of the mound builders, will be still farther sustained by the remarkable discovery which we have made during the progress of these investigations, of the cross, emblems of the Christian religion, and especially of the Trinity, the Saviour and the Virgin Mary in the mounds of Tennessee. We believe that the preceding conclusion is based upon incontrovertible facts and evidence.

We will proceed to consider, in the next place, the mode of burial practiced by the aborigines of Tennessee, as shown by their sacred and sacrificial mounds and stone graves.

The ancient race of Tennessee buried their dead in rude stone coffins or sarcophagi, constructed of flat pieces of limestone or slaty sandstone, which abounds in Middle Tennessee. Extensive graveyards are found in Tennessee and Kentucky along the river courses, in the valleys and around the springs, in which the stone coffins lie close to each other. These graves, although justly regarded as rude fabrics, nevertheless exhibit considerable skill in their construction, and are standing memorials of the regard in which the ancient race held the memory of the dead.

The manner of burial appeared to have been thus: An excavation of the proper size, according to that of the body of the dead, was made in the ground, and the bottom carefully paved with flat stones. Long flat stones, or slabs of limestone and slaty sandstone, were placed along the sides, and at the head and foot of the grave. The body or skeleton was then placed within the rude coffin, and the top covered with a large flat rock, or with several flat rocks. When a number of coffins were constructed together, the side rocks of the first coffin frequently constituted the side of the second, and so on. Many of the graves are quite small, only capable of containing the body of a new-born infant. Many of the short square graves, not more than eighteen inches, or two feet in length, contain the bones of adults piled together, the head being surrounded by, or resting upon the arm and leg bones. This class of graves, containing the bones of adults packed in a small space, was probably constructed at the general burying festival, or contained the remains of the dead which had been transported from a great distance.

In a small mound, about forty-five feet in diameter, and about twelve feet in height, which I opened, about ten miles from Nashville, on the banks of a small

stream and spring, and which contained perhaps one hundred skeletons, the stone graves, especially towards the centre of the mound, were placed one upon the other, forming in the highest part of the mound three or four ranges. The oldest and lowest graves were of the small square variety, while those near or upon the summit, were of the natural length and width of the skeleton within.

In this mound, as in other burial places, in the small square stone graves, the bones were frequently found broken, and while some graves contained only a portion of an entire skeleton, others contained fragments of two or more skeletons mingled together. The small mound now under consideration, which was one of the most perfect in its construction, the lids of the upper sarcophagi being so arranged as to form an even-rounded, shelving rock surface, was situated upon the western slope of a beautiful hill covered with the magnificent growth of the native forest. The remains of an old Indian fortification were still evident, surrounding an extensive encampment and several other mounds. In a large and carefully constructed stone tomb, the lid of which was formed of a flat rock, over seven feet in length, and three feet wide, I exhumed the bones of what was supposed to have been an ancient Indian chief who had passed his hundred summers. The skeleton was about seven feet in length, and the huge jaws had lost every vestige of teeth, the alveolar processes being entirely absorbed.

The hill upon which the residence of Col. Overton stands, about nine miles from Nashville, was in ancient times covered with a flourishing Indian village. The circular depressions of their wigwams are still visible. The aborigines appeared to have been attracted to this locality by the noble spring which bursts out at the foot of the hill. Thousands of bones were exhumed in excavating the cellar of the family mansion. The crest and south-eastern slope of the hill are covered with stone graves, many of which have been opened by curiosity hunters. A large number are concealed by the rank growth of weeds and grass. Those which I examined at this locality were all constructed upon the same plan. Here, as elsewhere, the graves were of various sizes, from that just sufficient to enclose the remains of a little child, up to the long stone coffin of eight feet. Some have supposed that these little graves enclosed a race of pigmies, but upon careful examination of many, at various localities, we discovered that they were simply the graves of the young; for we found the teeth in all stages of development, from the toothless child, through the period of dentition, up to the appearance of the wisdom teeth. Some of the small graves contained the bones of small animals, apparently of dogs, rabbits, squirrels and wild cats, and of birds, such as the wild turkey. These animals were buried with the children. Some of the burial mounds were evidently used also for sacred and religious purposes, and were held in high veneration as the resting place of royal families. Thus, in a small mound which I explored, about one hundred feet in diameter and about ten feet high, on the eastern bank of the Cumberland River, opposite the city of Nashville, and just across from the mouth of Lick Branch, at the foot of a large mound, which had been apparently used as a residence, I discovered the following interesting remains:

In the centre of the mound, about three feet from its surface, I uncovered a large sacrificial vase, or altar, forty-three inches in diameter, composed of a mixture of clay and river shells. The rim of the vase was three inches in height. The entire vessel had been moulded in a large wicker basket, formed of split canes, and the leaves of the cane, the impressions of which were plainly visible upon the outer surface. The circle of the vase appeared to be almost mathematically correct. The surface of the altar was covered with a layer of ashes, about one inch in thickness, and these ashes had the appearance and composition of having been derived from the burning of animal matter. The

antlers and jaw bone of a deer were found resting upon the surface of the altar. The edges of the vase, which had been broken off, apparently by accident during the performances of the religious ceremonies, were carefully laid over the layer of ashes, and the whole covered with earth near three feet in thickness, and thus the ashes have been preserved to a remarkable extent from the action of the rains.

Stone sarcophagi were ranged around the central altar with the heads of the dead to the centre, and the feet to the circumference, resembling the radii of a circle. The inner circle of graves was constructed with great care, and all the Indians buried around the altar were ornamented with beads of various kinds, some of which had been cut out of large sea-shells, others out of bone, and others again, were composed of an entire sea-shell, punctured, so as to admit of the passage of the thread upon which they were strung.

In a most carefully constructed stone sarcophagus with the face looking to the setting sun, a beautiful shell ornament was found resting upon the breast bone. It had a central sun, and the large circle around this curiously divided into three figures or equal parts, with two outer rows of suns (nine suns in the outer row, making twenty-three suns in these two rows), making with the central sun, twenty-four suns in all; and with stars encircling the suns. This ornament upon its concave figured surface, had been covered with red paint; upon the back the convex plane surface was smooth and plain, with the exception of three crescentic marks.

The material of which it is composed was derived from a large flat sea-shell; no fresh water muscle, in any part of the waters of Tennessee and of the surrounding States, could furnish a uniform thickness of flat shell equal to this; and the regularity of its convexity and concavity, as well as the perfection of all its parts, and the uniformity of its thickness everywhere, are proofs that it must have been derived from a very large shell from the sea coast. This skeleton had around the neck, arms, waist and ankles, numerous beads of various kinds. The smaller beads were all of the small sea-shells. This stone grave had been constructed with such care, that little or no earth had fallen in and the skeleton rested as it were in a perfect vault. The head, which was evidently that of a woman, was in a remarkable state of preservation.

From the nature of the ornament upon the breast, as well as from the care with which the sarcophagus had been constructed, we judged that this was the priestess of the sun. In the grave of a child, near the right side of the grave of the priestess of the sun, and at the foot of the grave of a gigantic old Indian, seven feet in length, and of great age, as manifested by the loss of teeth, and the absorption of the alveoli, a curious small black idol was exhumed. The features of this image resemble those of the Aztec, or ancient Mexican sculptures. The figure is kneeling, with the hands clasped across the breasts (forming a cross) in the attitude of prayer. This image is formed of a mixture of black clay and powdered shells, and is exceedingly hard, with a smooth polished surface. The under jaw of the old Indian, whose grave lay near this idol, was of remarkable size, and had only one long, sharp fang, like the tooth of a wild animal. On the left of the grave of the priestess of the sun lay two other most carefully constructed graves, in one of which numerous beads were found, enclosing or encircling various portions of the skeleton, and in the other a large sea conch. Also two copper ornaments, lying on the side of the head of the skeleton, or rather two round pieces of wood, with a hole in the centre, and covered with a thin layer of copper. Two skeletons, apparently those of a man and woman, were found on the southern slope of the mound near the altar, which had been interred without any stone coffin. In the hand of the woman was a beautiful, light reddish yellow vase, painted with regular black figures. Under

the head of the male skeleton lay a splendid stone hatchet with the entire handle and ring, at the end of the handle, cut out of a compact green chloritic primitive stone. A circle of graves extended around the inner circle, which we have described as radiating from the altar. The stone coffins of the outer circle lay at right angles to the inner circle, and rested as it were at the feet of the more highly honored and favored dead. In the outer graves no ornaments were found ---only a few small arrow heads and fragments of shells and pots. After careful examination, we were forced to the conclusion that this sacred mound was formed at the time of the death of some celebrated chief or chieftess, the representative of the sun; and the more distinguished members of the family were buried in the inner circle around the altar, where the eternal fire was kept, and the more humble relatives and attendants around at their feet. It is probable that this sacred mound marked the site of an ancient temple of the sun, in which the aborigines kept the eternal fire. The sacrifices upon the altar appear, from the bones of the deer, the antlers, etc., to have been not human, but animal.

That the aborigines of Tennessee were idolaters, is manifest from the stone and clay idols, which have been found in various portions of the State, some of which were found in caves, and others upon the summit of high mounds.

It is worthy of notice that some of the idols have the forehead flattened, making an exact line with the nose, and resembling in all respects the Toltec heads of Mexico, while others are represented with full round foreheads; and it is still further worthy of notice that the hair of the head of the idols is represented in a very different mode from that in which the nomadic tribes of North American Indians now wear it. In the female idols the hair is gathered into a knot or "waterfall" behind, while in the male idols it is bound into a cue behind, like the hair of the Chinese. These remarkable sculptures in hard sandstone, limestone and porphyry, correspond in features and mode of hair dress with the inhabitants of Central America, at the time of the Spanish conquest.

Herera, in describing the inhabitants of Yucatan, says: "They flatten their heads and foreheads, their ears were bored, with rings in them, their hair was long like women, and in tresses, with which they made a garland about the head, and a little tail hung behind."

The most important and interesting result in the entire series of investigations is the discovery of undoubted symbols of the Catholic religion in the stone graves and mounds of Tennessee. In a stone grave in a small mound within an extensive fortification on the banks of Big Harpeth River, two and a half miles from Franklin, on the plantation of General DeGraffenried, four copper crosses were exhumed, resting upon the skull of an old Indian. The copper had stained the bones of the cranium of a deep green color. In their general outlines two of these crosses presented the general contour of the human figure. The crosses appear to have been stamped upon the copper plates with a die.

This grave also contained a remarkable vase, fashioned of a light yellow clay and crushed river shells, upon the sides of which were painted in black, three crosses, surrounded with three circles and three crowns. The rounded body of the vase was accurately divided into three portions, by the black pigment disposed in three black bands, uniting at the base and neck of the vase, thus leaving three circular spaces, upon the rounded sides, which were ornamented with the central cross, an outer circle around each cross, while this circle was again surmounted by the crown. Each crown had ten prominences or points. The superior portion of the neck of the vase was arched and so turned as to form the mouth horizontally. The summit of the vase terminated in a well shaped nipple.

In a similar burial mound within the same enclosure, amongst other most interesting relics, we discovered two large vases, marked in a similar manner,

with three divisions, three central crosses, three circles around the crosses, and three crowns. In these large vases the points of the crowns were drawn out so as to resemble spikes and thorns, and in one of the vases the ends of the thorns, or those portions which would form the circle of the crown are represented as if platted together. Two vases of similar construction were also exhumed, one with the head of a Spaniard, with a helmet upon the crown. The resemblance of the features to those of a Spanish Cavalier is wonderful. This small vessel was used as a paint bowl, and still contains the red ochre. The other black vase is fastened on the summit after the manner of a hood. Another small idol fashioned of white clay, found in Middle Tennessee, painted with the same black pigment, and dressed in what appears to represent a woven garment, has the sign of the cross upon both shoulders. The idol found in the sacred mound, as we have before said, has the arms crossed upon the breast, in the attitude of prayer, the crown upon the head has three prominences, and the hatchet has three marks upon its head, and the beautiful shell ornament from the same mound has the symbol of the Trinity, both upon the anterior and posterior surfaces.

A circular shell ornament, with a well formed crown in the centre, which had been filled with some kind of red pigment, was discovered by Colonel Putnam in a stone grave near Nashville.

These religious relics are of a great interest in their bearing upon the probable date of the mounds and temples and graves in which they are found, and in the proof which they afford, that the inhabitants of America, have, at various times, come in contact with the civilization and religions of Europe, even before the recognized era of the discovery and exploration of the American continent.

In several of the crania, the os-Incae, characteristic of the Peruvian skulls, was observed. That this ancient race were descended from the Toltecs, and were probably a branch of the Natchez, is rendered probable, not only from the conformation of the crania, but also from the history of this once powerful, but now extinct nation of the Natchez.

MSP-003 MAGNETOMETER EVIDENCE OF A STRUCTURE WITHIN THE LA VENTA PYRAMID

Morrison, Frank, et al; Science, 167:1488-1490, March 13, 1970.

Abstract. The pyramid at La Venta, Tabasco, Mexico, was surveyed in May 1969 with a high-sensitivity difference magnetometer. The general pattern of the magnetic map is one of low (10-gamma) radial anomalies, which reflect the ridge and gully topography of the pyramid, with a larger magnetic high area (+30 gammas) centered 25 meters south and 10 meters east of the center of the pyramid. The anomalous region near the top has been interpreted with the aid of computer-calculated anomalies from three-dimensional rectangular blocks. The major high is probably associated with a basalt structure that rises to within 1 to 2 meters of the surface. A possible form for this structure was found to be a 10-meter-square horizontal platform with walls along its northern and eastern margin.

MSP-004 PYRAMIDS

MSP-004 THE GREAT MOUND ON THE ETAWAH RIVER, NEAR CARTERSVILLE, GEORGIA

Whittlesey, Charles; American Naturalist, 5:542-544, 1871.

This mound is situated on the river bottom, on the north bank, about three miles below where the railroad from Chattanooga to Atlanta crosses the Etawah river. Its base is an irregular figure, five hundred and eighty-five poles in circumference, covering about three acres. The bottom on which it stands is elevated eighteen to twenty-three feet above low water, and is seldom invaded by high water in any part. The mound is truncated, nearly flat on the top, which embraces about an acre of ground. This area is elevated fifty feet above the base, and seventy-three feet above low water. There is no high land within a quarter of a mile on either side of the river. Its slopes are very perfect and steep. Bushes, grass, vines, shrubs and trees grow luxuriantly on its sides and the level space on the top is annually planted in corn or cotton. There is a broad ramp or road fifty feet wide, commencing at the southeast corner which winds around the southerly face bending to the right, and reaches the summit on the west side. It has an easy grade for footmen and horses, but is too steep for vehicles. The mass of this mound I estimate at about one hundred and twenty thousand cubic yards, or about four-fifths of the contents of the British earth pyramid raised on the field of Waterloo. Rising over the alluvial valley where it is isolated it has an impressive aspect, like that of the pyramids of Egypt on a sandy desert. This valley, however, is everywhere rich and beautiful.

Like some of the larger pyramids it has two smaller ones which appear to be tenders. One is a square, truncated pyramid which stands one hundred feet east of the foot of the ramp and is twenty-two feet high, its flat top being about eighty feet on a side; its slopes, steep and perfect like the great mound. To this one there is no ramp or place of ascent.

The other is about one hundred feet due south of the southwest corner of the great mound, and is of about the same dimensions but has on its east side a ramp or graded way by which to ascend to the flat space on the top. Its sides and that of the other tender are from five to ten degrees west of the magnetic meridian.

All of this group are composed of the rich black alluvial earth of the adjacent bottom, with occasional lumps of red clay which constitutes the base of the river terraces that border the valley. About two hundred yards from the mounds on the north there are the remains of a ditch which has been mostly obliterated by cultivation and which encircles the group in a circular form a distance of about one-fourth of a mile, coming to the river below but not above. Within and without the trace of this ditch which the owner says had an interior embankment, there are low mounds partly plowed down. Near its upper or the easterly end, there are two large, oblong pits from which a part of the earth of the mounds may have been taken.

There are other small mounds in the valley below on both sides of the river. The valley is bordered by limestone bluffs about two miles apart which rise two hundred to two hundred and fifty feet above the river. On a rocky summit about two miles west of the great mound is what is called the "Stone Fort." It consists of a wall or heap of loose blocks of limestone surrounding the summit in an oval form, the largest diameter of the enclosure being two hundred and twenty poles. There are numerous openings in it at irregular intervals, some of them fifty feet broad. The space around the crown of the hill is clear of loose stones and this explains the existence of the wall, which has the appearance of a stone fence fallen down.

It does not have the appearance of a fort or stronghold, but of a high place dedicated to imposing ceremonies to which the people came up in all directions through the openings or passes in the line of stones. Probably, it was then as now covered with oaks. The crown of the hill is about fifty feet above the encircling wall, and presents from its summit a view of the valley and the country opposite that is hardly equalled for scenic beauty.

It is probably the work of the red man of our times and has no connection with the great mound or its builders.

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Professor W. C. Kerr said there is a mound quite similar to the one just described by Col. Whittlesey, in the valley of the Tennessee river, in Macon County, N. C., with sides equally steep, and outlines equally well preserved, of its use, date of construction, or its builders there exists no tradition in the region. Its form is the frustum of a cone, whose base is about seventy-five feet in diameter, and top about fifty, and its height thirty or forty feet. It stands on the alluvial river-bottom, and was doubtless built of the same material, although all signs of excavation for this purpose have been entirely obliterated by subsequent deposition. On digging into this pile, nothing was found which could throw any light on its history.

Prof. G. C. Swallow remarked that Hon. Godfrey Lesceur, grandson of the first Spanish commandant at North Madrid, Mexico, says the old Indians had a curious tradition respecting the mound builders. They said: "We did not build the mounds, we came to this (Mississippi) valley from the northwest. Here we found a quiet, peaceable people cultivating the soil and living in communities, and having mounds for the Great Spirit and burial. They begged us to leave them, as there was country to the northeast. We went, but found the country poorer, and after a time returned and drove out the mound builders, who went to the southwest. We burnt their wigwams and possessed the country." He remarked that no warlike implements had been found with the real mound builders, and there is ample evidence that their temples were destroyed by fire; at least those in North Madrid, Mexico, as remains of the charred wood-work still exist in the mounds.

MSP-005 ACCOUNT OF ANCIENT MOUNDS IN GEORGIA

Stephenson, M. F.; Smithsonian Institution Annual Report, 1870, 380-381, Washington, 1872.

The most extensive and perfect tumuli exist in Bartow County, on the Etowah River, near Cartersville, consisting of ten mounds, situated in the bend of the river, and protected from attack on the land side by a moat, which is from twenty to thirty feet deep and was doubtless once filled with water. The central mound is square, and measures one hundred and fifty feet on the top, * with raised platform on the east side twenty feet high and forty wide, evidently where sacrifices were offered, as an idol of sandstone was plowed up on it, with excavated disks or mortars six inches in diameter and of translucent quartz of elegant workmanship, the stone axe, a small native copper vessel, the perforated shell, (which is found in all the mounds,) the mica mirror, and the only gold beads ever found, native gold being found in the neighborhood. This mound is eighty-eight feet high, and a few rods from it is a circular one, sixty feet high,

MSP-006 PYRAMIDS

which twenty years ago had a parapet on top five feet in height. The remainder are small and only about twenty feet high. Two points in the ditch are excavated an acre square as deep as the moat, to procure earth to raise the mounds. The valley and country for thirty miles westward and northward is very fertile, and exhibits evidences everywhere of having been densely peopled by the mound-builders.

At the falls of Little River, near the Alabama line, on the crest of the fall, are three chambers hewed out of the solid sandstone; and at Nacoochee the crest of a conical hill was cut off at about fifty feet, so as to embrace an acre and a half, which on two sides is quite precipitous, and on the others has a ditch and wall, which was formerly six feet high, inclosing about twenty acres. This was doubtless used by De Soto in the battle he had with the Cherokees in 1540, which is proved by the relics which have been found.

At Macon are stupendous remains, as also in Campbell County, on the Chattahoochee. The Yond Mountain, four thousand feet high, of solid granite, is a cone, crested with trees, but perpendicular on all sides except one space, which was walled with stone; so was the Stone Mountain, which is, without exaggeration, two thousand three hundred and sixty feet high, a cone, and accessible on one side only; this was walled with stone. All defensible mountains in this country were fortified. Neither the Cherokees, Creeks, nor Seminoles had any tradition of this extinct race, which is proved to have been a powerful and despotic nation from the extent of their territory and the stupendous character of their fortifications and cemeteries.

* It is not exactly a quadrangle, but the north side is 150 feet; the eastern, 160 feet; southeastern, 100 feet; south 90 feet; and the western side, 100 feet.

MSP-006 NEW PYRAMID AT GIZA

Anonymous; Nature, 129:309, February 27, 1932.

The discovery of a fourth pyramid at Giza, as reported in the Times of Feb. 18 and subsequent issues, is likely to provide Egyptologists with a historical puzzle, as well as presenting some peculiar and interesting features in itself. The method of construction would appear to be unusual, for it is said that the southern face, which looks on the valley and is much weathered, is cut out of the sandstone. Another remarkable feature is the enormous granite slabs lining the passage which leads to the interior of the pyramid, and equally interesting are the two windows facing east, which open from the entrance chamber. These, it is suggested, may be connected with the enhanced influence of sun-worship usually attributed to the fifth dynasty. The most striking feature, however, is the fact that the names and titles of the owner of the large chamber cut out of the rock on the south-east of the pyramid show that it belonged to Queen Khent Kawes, "King of Lower and Upper Egypt". The name is not enclosed in the usual cartouche, but is ensigned with a royal uraeus. This title is not known to have been applied to any other queen of the Old Kingdom. The official communique suggests that, while not the actual ruler of Egypt, she may have been regent during her son's minority. It goes on to point out that it is possible that she may have been connected by birth with the fourth dynasty; but that otherwise it is singular that a pyramid should have been erected for her at Giza at the time of the fifth dynasty, which resided at Abusir.

MSR-001 [50-MILE MAYAN CAUSEWAY]

Anonymous; Nature, 117:630-631, May 1, 1926.

A lost city of the Mayas in Yucatan is described in a further account of Dr. Gann's journey of exploration in Central America, which appeared in the Morning Post of April 19 and two succeeding days. A reference to a migration of the people of Chichen Itza eastward to "the settlement of the priest of Coba," in a recently translated portion of the Book of Chilam Balaam, appeared to confirm information given to Stevens in 1842 and suggested a search in the neighbourhood of Chemax, an Indian settlement in the Chichen Itza region. The result was the discovery of a city of considerable size and at present unique in presenting three distinct types of Masa civilisation. The oldest style of Maya architecture is here represented by an enormous temple, stelae, and ranges of arched rooms. It is followed by the Tulum type, represented by flat-roof, stucco-covered buildings. Last comes the Labaantum type---a great stairway similar to that discovered by Dr. Gann and Mr. Mitchell-Hodges during their expedition last year. In no other town have these three styles previously been found together. The city probably was founded about A. D. 926. Although it was occupied throughout the Toltec domination, it nowhere shows the influence of that people. A remarkable structure discovered on the road to Coba was a raised causeway, 32 ft. wide, and said by Dr. Gann's native guide to be fifty miles long. It was built of limestone rubble, and had been cemented on the surface. Dr. Gann is of the opinion that it must have been a sacred way for ceremonial use from Chichen Itza to Coba. Nothing like it is known elsewhere in Maya culture.

MSR-002 [AMERICAN ORIENTAL AFFINITIES]

Anonymous; Nature, 118:314-315, August 28, 1926.

Prof. Elliot Smith, in the Morning Post for August 23, again raises the question of the origin of American culture, apropos of the articles by Dr. T. W. Gann on his discoveries on ancient Maya sites in Central America, which appeared in that journal in the early part of the year. Prof. Elliot Smith now offers the interesting suggestion that the remarkable stone causeways of the Maya found by Dr. Gann are distinctive of work of that period in Indo-China and Java, where there were definite reasons for their construction, and that they were introduced from those countries into Central America, where, however, the reasons for their construction no longer existing, they continued to be constructed from force of habit. He goes on to refer to the arguments recently advanced by Dr. C. Handy that the Maya temple and the Polynesian oracle-house were both copies of the Cambodian temple. A third class of evidence to which Prof. Elliot Smith directs attention is connected with the cultivation of the sweet potato. The methods of cultivation employed are identical not only in New Zealand by the Maoris and in America, but also throughout Oceania, Cambodia, China, and Japan. Further, it is held that Kumara, the Maori word for the sweet potato, also occurs in Ecuador and Peru as Kumar, but in addition, F. W. Christian has recently suggested that the word itself is to be derived from the Sanskrit word for the white lotus.

MSR-003 ROADS

MSR-003 EARLY MAYAN CULTURES IN NORTHERN YUCATAN

Anonymous; Nature, 130:30-31, July 2, 1932.

One of the most striking features of Coba is the network of artificially constructed raised roads connecting the various groups about the lakes and running off in all directions to distant sites. One of these leads to Yaxuna, a distance of 100 km., terminating only 20 km. from Chichen Itza. These roads are raised above ground-level and, for the most part, run perfectly straight. They are built of vertical slabs of roughly dressed stone, with an inside fill of large stone, covered with smaller stone. A fine plaster surface has not weathered away.

MSR-004 MAYAN ROADS

Anonymous; Nature, 132:715, November 4, 1933.

The Carnegie Institution of Washington in its News Service Bulletin, vol. 3, No. 9, reports on the results of an expedition recently sent out in charge of Senor Alfonso Villa by Dr. Sylvanus P. Morley, with the object of examining one of the Mayan roads which run from Coba, a Mayan city in Yucatan of consequence in pre-Columbian days. The city is a centre of raised constructed roads running in all directions to the various groups of ruins situated about the chain of freshwater lakes of the district. The road which was to be examined runs westward, and, it was thought, terminated at Yaxuna, about twelve miles southwest of Chichen Itza; but it had never been traversed or surveyed, owing to the density of the forest growth. The expedition started at Yaxuna and reached Coba three weeks later, after traversing sixty-two and a half miles. About two miles from Yaxuna the expedition found a stone cylinder, 13 ft. long and 2-1/2 ft. in diameter, weighing about five tons, which may have been used as a roller in the construction of these roads of paved stone. It was found on one side at the top of the causeway, as if left there when work was completed. The road starts at the Yaxuna end from a small pyramid and runs almost perfectly straight for forty-three miles. For the remaining distance it changes its original direction only four times and then but slightly. In width it varies from thirty to thirty-four feet, in height above the terrain from two to eight feet. There was evidence which appeared to point to the road having once connected various settlements. At several points were small platforms from thirteen to sixteen feet in height. They are of unknown purpose, but may have served as wayside shrines. It also appeared that walls had once been built squarely across the road, as if to bar it against enemies. Near Coba a series of six stones inscribed with Mayan hieroglyphs were found, scattered at fairly regular intervals over a distance of seven miles. These may record the completion of various sections of the road.

MSR-005 ANCIENT CIVILISATION IN THE RIFT VALLEY

Anonymous; Nature, 130:969, December 24, 1932.

Capt. G. E. H. Wilson discusses in Man for November the evidence for the existence of a forgotten civilisation in the Rift Valley, East Africa. The exis-

tence of ancient works, terracing, graded roads (the so-called elephant tracks) and irrigation works--canals and drainage--is now established not only in Tanganyika, but also in Abyssinia, Uganda, Kenya and Northern Rhodesia. The terraces, averaging in width at the top about one foot, but probably originally about three feet, follow the contours of the hills. The depth between terraces is about three feet. The roads, clearly not elephant tracks, point to a high state of civilisation. They are difficult to locate, though in places they are part of roads in use to-day. The points at present located suggest a system of communication running north and south on the eastern side of the Great Lakes, pointing to outlets by way of the Nile in the north and by Rhapta in the south, with possibly an intermediate route via Mombasa, the origin of which may prove very much more ancient than is thought. There are traces of an extensive system of irrigation at Uhehe, and in low-lying districts, such as the Mgeta River near Kisaki, there are river diversions which may be artificial. As to the authors of this civilisation, there are legends of an alien race dominating local peoples in both north and south Tanganyika. At present there is a great diversity of language and culture where these ancient works are found; but at some time the people may have been more homogeneous. If there has been an alien immigration, it is possible that it may have taken place so early as 1500 B. C., and that by the time of Solomon (970 B. C.) a flourishing trade already existed and the Sheban port of Rhapta had been established. It is suggested that this ancient civilisation may have originated in the north, spread through the Rift Valley over the highlands of the Great Lakes, and have reached Zimbabwe.

MSR-006 EXPLORATIONS IN THE NORTHERN FAYUM

Caton-Thompson, G.; *Antiquity*, 1:326-340, 1927.

The bones of strange ancestral mammals strengthen the overwhelming impression of a return to an extinct, uncanny, strangely beautiful, pre-human world. The region shows, compared with the low desert, few traces of human visitation. The little-used camel track to the Baharia Oasis passes through it for some distance: ancient flintmine workings on a hill top: remains of a stone circle of roughly-piled up blocks of basalt: an inscription on a rock, Ⲁⲓⲛⲓⲛⲓⲛⲓ : the 25-year-old traces of the Beadnell-Andrews camp: these, and above all in arresting interest, a long straight four-mile thread of ancient road running north.

This road was first noted by Beadnell in his official survey memoir, but he gives no photographs or details as to structure or probable age, beyond its label on the map "ancient quarry road." Since then no further details have, to my knowledge, been added. The road, at its lower extremity, availing itself of gaps in the scarp immediately west of the little dynastic temple of Qasr el Sagha, is not, in fact, recognizable as man's handiwork until it emerges on the level of the middle scarp, whose main features we have already indicated. Here, with the unbroken width of the scarp plain to cross in its progress northwards to

the hills---its ultimate destination---it straightens out into a line of paved track about 7-8 feet broad, carefully laid with slabs of whatever rock was handiest to collect at that point of its course. Much of this is rather friable sandstone, which has weathered badly, and forms a surface compared to which the stony desert on either side is smooth going. The slabs, however, though wide interstices separate them, still lie fairly flat.

At another point the sandstone paving is succeeded by a stretch of unusual---perhaps unique---road metal, the logs of fossil wood already referred to laid side by side, sleeper fashion across the road. The trunks naturally vary in size, but the average diameter is about 1 foot. Two big dumps of basalt blocks by the wayside give a clue as to the road's ultimate destination; but no pottery has yet been found to give a clue as to its makers. Nearing the final hills, the road becomes more broken---in places even difficult to trace---owing to destructive drainage from the hill slopes; but we picked it up again under the frowning peaks of Widan el Faras, at a point where it is raised and cambered above the surrounding level, in order, presumably, to avoid the racing spates in time of storm. Following on another 1/4 mile we suddenly come to the abrupt termination of our quest, sharply brought up against a steep hill-side, down which has shot a dark mass of basalt blocks from their sill-bed upon the summit: a nature-worked quarry. Not far away a large, sunk, sand-filled hollow, fringed with corrugated Roman pottery litter, gives a first clue as to the probable quarrymen. The presumptive evidence seems strong, supported as we were afterwards to find it, by lumps of basalt, and Roman sherds at a low level, far away, near the present lake. On the other hand, none of the Graeco-Roman towns and temples of the Fayum show any trace of basalt in structure or decoration. Dime an important and extensive ruin calling for excavation, lying 4 miles nearly due south of the road's termination near Qasr el Sagha, shows, superficially at least not a trace of this material; nor does the other nearest Ptolemaic town of Kom Ashim, though this has been extensively excavated, and lumps of basalt may actually be found on the low desert in its direction. Road metal for export? We know of none.

The only possible alternative to the road's Roman origin would seem to lie in connexion with the dynastic temple of Qasr el Sagha: its termination, a great elongated dump of colossal, weathered basalt blocks, is within a stone's throw of the building. The temple is built of giant blocks of sandy limestone, and is stripped of all adornment; its very date is uncertain. But such passing attention as we---not Egyptologists and engaged on other work---were able to give it, indicates that it is not later than the Middle Kingdom: I would myself suggest that that it was originally built in Old Kingdom times, and continued in use up till the Middle Kingdom, my reasons being based on the presence in its immediate vicinity, concentrated in regular "workshops" of limestone and alabaster debris, of great quantities of crescentic, hollow flint grinders, which are known to date from protodynastic to Old Kingdom times; and fragments of contemporary, spouted vases. That the place, however, was also occupied in the XI-XII dynasties is certain. Not only are shaft-graves of that age within a stone's throw---we collected a scarab, and elements of a wooden funerary boat from old spoil heaps and ravaged fillings---but we discovered during the first season a small cemetery of 41 graves of this age at the base of the lowest scarp.

Now, in addition, a fragment of inscribed, polished basalt from the temple area seals the evidence for the later date. But this basalt is a fine-textured stone, unlike our coarse grained local material, and seems unlikely, curiously enough, to have the same source. The probabilities of our road origin, therefore, seem to lie with the Romans; but the subject is well worth following up in further study and greater leisure. (pp. 338-340)

MSS-003 STONE CIRCLES? THE SUN, AND THE STARS

Wis, A. L.; Nature, 46:126-127, June 9, 1892.

Articles by Mr. Norman Lockyer and Mr. Penrose [MSH-001], recently published in Nature, have dealt with the positions of ancient Egyptian and Greek temples with relation to the rising sun, and to the pole star, or some star or stars in its vicinity. For some years past I have endeavored to show, in papers read before the British Association and other Societies, that our stone circles had a relation to the rising sun, indicated usually by an outlying stone or by a notable hill-top in the direction in which the sunrise would be seen from the circle, and I have in some cases found similar indications towards the north, which may have referred to the pole or other northern star or stars. A paper containing many details as to these cases will shortly appear in the Journal of the Royal Archaeological Institute.

There are six circles on Bodmin Moors, which at first sight appear to have no relation to each other, but which, if the 6-inch Ordnance map is to be relied upon, would seem to have been arranged on a definite plan (see accompanying plan).

The Stannon and Fernacre Circles are in line 1 (true) north of east with the highest point of Brown Willy, the highest hill in Cornwall; and the Stripple Stones and Fernacre Circles are in line with the summits of Garrow and Rough Tor, at right angles with the other line---namely, 1° west of (true) north. A line from the Trippet Stones Circle to the summit of Rough Tor would also pass through the centre of one of the Leaze Circles (about 12° east from true north). Other hills are in the direction of the rising sun. The Trippet Stones are 11-1/2° south of west from the Stripple Stones, 10° east of south from the Stannon Circle, and about 13° west of south from the Fernacre Circle. The respective bearings of the other circles have already been given, and all are true (not magnetic) according to the 6-inch Ordnance map.

More remarkable, perhaps, than the position of these circles are their distances from each other, which, on the level map, are almost exactly as 3, 7-1/2, 2, and 8, for the sides of the irregular four-sided figure, of which four of the circles form the corners, while the diagonals are of the same length within a hundred feet, the differences being much less than the 1 per-cent, which Mr. Flinders Petrie has found to be the average error of ancient British and even Assyrian workmanship. The builders of these circles may be supposed to have aimed in their measurements at even numbers of some unit, and the unit which gives the best results appears to be a Royal Persian or Egyptian cubit of 25.1 inches (not at all the unit one would expect). The actual measurements, as nearly as I can get them from the 6-inch Ordnance map, are:-

	Feet.	Cubits of 25.1 inches.
Stannon Circle to Fernacre Circle	6275	equals 3000
Fernacre Circle to Stripple Stones (Practically 7500 cubits)	15730	equals 7520
Stripple Stones to Trippet Stones (Practically 2000 cubits)	4180	equals 1998.4
Trippet Stones to Stannon Circle (Perhaps meant for 8125 cubits)	16575	equals 7924
<u>Diagonals</u>		
Fernacre Circle to Trippet Stones	16950	equals 8103
Stannon Circle to Stripple Stones (Perhaps meant for 8125 cubits)	16850	equals 8055

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It must not be forgotten that these measurements are taken from the level map, while the ground between the circles is very irregular, but it seems more probable that the builders of these circles made allowance for the irregularities of the ground than that the distances, as shown by the map, are merely the result of accident.

If, however, the 25.1 inch cubit were the unit of measurement for the distances between the circles, it ought to appear in the measurements of the circles themselves---and it does; for the diameter of the Trippet Stones Circle is exactly fifty of such cubits, and the diameters of the Fernacre and Stripple Stones Circles are (as nearly as I can judge in their ruinous condition) seventy of such cubits.

The Egyptians appear to have constructed separate buildings for the observation of the sun and of the stars, but if the circle builders used the same circles for both purposes, placing them so that when standing in them they could see the sunrise over a fixed point on one hill, and a certain star rise over a fixed point on another hill in another direction, their system was much more economical, though perhaps less exact than that of the more civilized Egyptians.

The most significant point above is, of course, the likelihood of large-scale order to the arrangement of the circles.

MSS-004 NOTES ON ANCIENT BRITISH MONUMENTS. I.

Lockyer, Norman: Nature, 77:56:59, November 21, 1907.

Since the publication of my book "Stonehenge" some months ago I have received so much valuable information, so many suggestions and promises of work, that I feel it will be convenient if I refer to some of the points which have been thus raised. They refer to many sides of the inquiry, and indicate how very many questions susceptible of local study are raised by the idea of the possible astronomical use of the monuments.

It is only right, however, that I should state in limine that the reviews of the book have been almost entirely condemnatory. I am consoled, however, by the fact that there is evidence that the volume had not been read, and that the reviewers have taken so little trouble to inform themselves that they confound the changes brought about in the places of stars by the precession of the equinoxes with those produced in the case of the sun in consequence of the gradual lessening of the obliquity of the ecliptic.

Ignoring all the new observations the statement of which was the object of the book, they condemn what they are pleased to call my theory, as if a theory were anything but an attempt---even if only a feeble one---to group facts together so that they may be properly understood, and rigid tests applied to it by further work. It is a supreme satisfaction to me to know that further work is going on. Societies for the "Astronomical Study of Ancient Monuments" have been started in Cornwall and Wales, and local inquiries of great value are being made. I am glad to say that these efforts are being sympathetically aided by the existing archaeological societies, which, I think, have much to gain by the constant companionship of the spade and theodolite. I also have spent some holiday time in Cornwall, Wales, and Aberdeenshire, adding a special study of cromlechs to the inquiry. What I have previously written concerning the May-

year is greatly strengthened by the fact that most of the cromlechs I have examined were constructed so that the sunrise in May or November could be watched from the priests' quarters inside the cromlech through the narrow opening necessary for their protection. I shall give the details of these observations later.

The Inter-relation of Monuments. In my "Notes on Stonehenge" (*Nature*, vol. lxxi., p. 391) I referred to some remarkable relations between Stonehenge and the surrounding localities which had been communicated to me by Colonel Johnston, the late director-general of the Ordnance Survey. These are rendered manifest by the accompanying diagrams which I reproduce.

Fig. 1 shows that Stonehenge is (1) on the same straight line which contains Sidbury, Grovely Castle and Castle Ditches; (2) at the apex of an equilateral triangle of exactly six miles in the side; (3) that Salisbury, i.e. Solisbury Cathedral, from its name an old solar temple, was on the same straight line which contained Stonehenge and Old Sarum.

Fig. 2 shows that the oldest cross-roads on Salisbury Plain exactly occupy the centre of the triangle referred to.

Such relations as the above, but on a smaller scale, are often to be noticed, in some cases between monuments, in others between monuments and decided natural features on the sky line as seen from them.

I give some examples from Cornwall.

At Trevethy is one of the most famous cromlechs in that county, and it has not been restored, so that we need not hesitate to measure it to try to determine its meaning. Close by, at St. Cleer, is a renowned holy well, and a little further away King Doniert's stone.

The accompanying photographic reduction of the Ordnance map shows the strict relation of these monuments. The entrance of the cromlech is directed towards the November sunrise, az. S. 63° E.; looking in the opposite direction

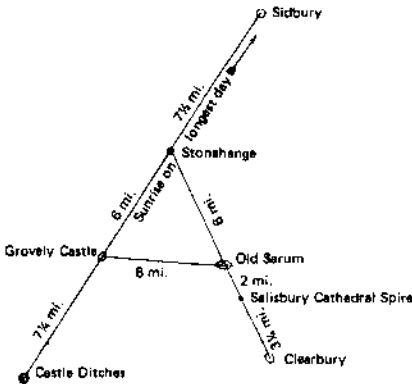


Fig. 1

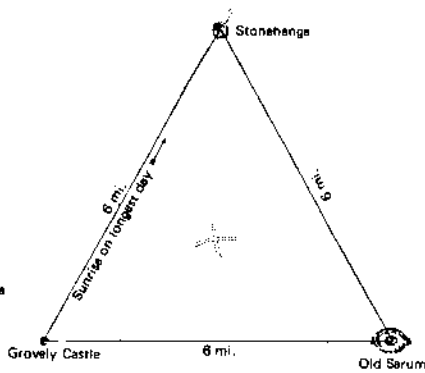


Fig. 2

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it commands the May sunset. I shall refer to this later. As seen from the holy well the cromlech marks the azimuth of the May sunrise. The monolith, King Doniert's stone, is true west from the cromlech, and so marks the equinoctial sunsets.

In the Bodmin district are two famous circles, the Stripple stones and Trippet stones, some half-mile apart.

The following table shows the relation of the latter to the former, and also to the surrounding hill-tops, as I believe was first noticed by Mr. A. L. Lewis. We indeed learn why the circle was erected on the precise spot it occupies.

Trippet Stones, Blisland, lat. 50° 33' N.

	Az.	Hill	Dec.	Star	Date
To Stripple Stones	N. 81° 30' E.	2°	N. 6° 42'	Pleiades	1720 B. C.
To Rough Tor	N. 15° E.	1-1/2°	N. 39° 1'	Arcturus	1700 B. C.
To Brown Willy	N. 31° E.	1-1/2°	N. 34° 5'	Capella	1420 B. C.
To Hawks Tor	N. 63° E.	2-1/2°	N. 18° 34'	May Sun	May 14
To Barrow	S. 63° E.	1-1/2°	S. 19° 31'	Nov. Sun	Nov. 21

My wife and I visited the Trippet stones in April, 1907, in the company of Mr. Horton Bolitho and Mr. Collings. A hail-storm made observations difficult, and this may explain the departure of the May and November days from the normal. The coincidence of the dates of the possible observations of Arcturus and Capella suggests that we have then the true date of the erecting of the circle, Brown Willy being subsequently used with Capella when the old alignment of Arcturus on Rough Tor became useless in consequence of the precessional movement.

I shall have more to say on the inter-relation of monuments and double and multiple circles on a future occasion.

Ancient Connection between Stonehenge and Grovely. Figs. 1 and 2 suffice to show the old association between Stonehenge and Grovely. Canon Wordsworth, in a paper on "Grovely Customs," communicated to the annual meeting of the Wiltshire Archaeological Society held in July, 1906, at Wilton, has brought together some additional particulars touching this association.

Some of the new information refers to the gathering of wood in the valleys near Stonehenge; this, I think, may be accepted as strengthening the evidence that the plain at Stonehenge was not wooded, contrary to the opinions of many that the monument was built in a sacred grove of oaks. My argument against this view was that if the monuments had any astronomical use at Stonehenge, Dartmoor, or elsewhere, they would not have been erected among trees, which would have spoiled the observations which were always made on the horizon.

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MSS-005 CAPTAIN DEVOIR'S ARCHAEOLOGICAL RESEARCHES IN BRITTANY

Anonymous; Nature, 79:51, November 12, 1908.

Some months ago Sir Norman Lockyer directed attention in Nature (vol. lxxvii., p. 56) to several interesting cases of inter-relation among the stone monuments of Britain. Captain Devoir, a distinguished officer of the French Navy and an accomplished surveyor, has sent us some plans he has recently prepared of a similar inter-relation he has found in Brittany, and among them one in the Canton of Ploudalmezeau. The plan, which he has permitted us to reproduce, shows how all the alignments there are directed to the solstices, or the May-year sun, and that they are continuous over a large stretch of country. (Drawing too poor to reproduce)

MST-006 THE "SPANISH DIGGINGS"

Gilder, Robert F.; Putnam's Monthly, 2:277-284, June 1907.

Rawhide Buttes, a miniature mountain range of eastern Wyoming, the summits of which are from six to eight thousand feet above the sea, rising abruptly out of the tertiary strata of the Great Central Plains, stand as a guard to a great archaeological treasure-house, locally known as the "Spanish Diggings" and claimed by explorers who have visited that section to be, as one of them has expressed it, "the greatest field for scientific research yet discovered in America."

Here are located scores of prehistoric quarries, whence an unknown people secured the greater part of the material from which they manufactured the implements used in the chase, domestic life and war. Vast untouched fossil beds cover the landscape, while the entire region is thickly strewn with stone lodge circles and stop-sites among which are to be found flint implements by the thousand, many being new to collectors.

The Rawhide Mountains are among the most eastern spurs of the Rockies. The core of the uplift consists of granite, schists and quartzite of the Algonkian age, which is very old, flanked by beds of younger rocks mostly quite level and not upturned as are the rocks of the core. Encircling the granite core is found palaeogenic rock of the carboniferous age. Like all the carboniferous beds of the remote West they are barren of coal.

On the west bank of the Rawhide range the exposures of carboniferous rocks are so extensive as to cover an expanse thirty miles long by fifteen wide. West of the carboniferous come several extensive patches of mesozoic rock, mostly of cretaceous age, in which latter occur remarkable beds of variously colored quartzite, jasper, flint and moss agate, and here are located the "Spanish Diggings."

When prospectors and cattlemen first saw these quarries the supposition was that the Spaniards of at least two centuries ago had there looked for gold and other precious metal, tearing away great masses of rock and hurling it down the steep declivities of the plains hills. No one considered for a moment that the American Indians or their ancestors were capable of such an amount of toil as had been expended. The workings were therefore given the name of Spanish Diggings, and locally that name will cling to them, in all probability, forever.

My first visit to the Spanish Diggings was made with Mr. William R. Lighton in the summer of 1905. Upon arrival at the first of the series which face Lighton Creek, twenty miles west of the Rawhide Mountains, we at once saw that the supposed ancient Spanish mines were in reality vast primitive quarries. The first of the quarries lies near the crest of a steep hill nearly five hundred feet above the plain. The slope was covered with spalls of frosted-off talus, or slide rock, as it is commonly called. Near the summit, where quartzite was exposed, the primitive artisan had conducted his labor. He had taken advantage of the edge of the cliff, where quarrying was comparatively easy, and had worked along the natural fissures, which had been widened more or less from year to year by the expansive force of freezing water making cracks large enough for driving in stone wedges. A vast amount of chips was scattered in and about the quarry. Down the slope the spalls, too, had been worked over into small circular pits, where the refuse rock had been carried to the edge and deposited. Throughout the entire workings there were hundreds of wagon-loads of roughened-out quarry blocks shaped into some semblance of the implements for which they were intended. Back from the works on the summit of the hill

we found a score or more of boulders around which were innumerable chips, plainly indicating that the aboriginal artisan had used the rocks for seat and anvil while he flaked his implements into the desired shape.

Near these small shop-sites were many fine projectile points, scrapers, drills and punches, while lying on the refuse were hammer-stones of trap, the latter being badly shattered. On the plains below, scattered along the course of the creek, were the stone circles of a very large village. Behind these circles were the individual shop-sites, and the whole village was littered with chips and blocks which had been taken from the quarry on the hill above. A description of one quarry answers well for any others where similar material was secured. When the quarryman sought the more flinty quartzite less exposed to the elements, he dug in from above, discarding large amounts of material apparently as good as that obtained. In the limestones there are numerous fine flint nodules, which appear to have been in great demand, and an immense amount of energy seems to have been expended in getting them. In places the flint chips cover acres of ground as thick as the chips around a farmer's wood-pile.

In quarrying, the workmen did much as modern quarrymen do. That is, they worked along the lines of natural breaks. The bedding planes are horizontal, and if the rocks have weathered or frosted much they part easily along these natural cleavage planes. In addition there are numerous vertical planes of cleavage, the result of sediment shrinking or drying. This enabled a primitive people not equipped with steel tools to quarry on a scale which is almost beyond belief.

Every hill in the vicinity of Lighton Creek shows prehistoric quarries, although there are many natural talus slopes which, to untrained explorers, might be mistaken for quarries. Such an array of beautifully colored quartzites, jaspers, agates and moss agates is probably not known elsewhere. In texture they are fine and dense, and break with deep conchoidal fractures. In color they range from white to lavender, and lilac or violet to purple, from pink to deep red, and from yellow to blackish-brown. There is every grade, tint and shade to suit the savage taste.

These dense quartzites are resistant rocks and stand as caps on some hills and as overhanging ledges on others. In a certain locality the quarry may be in dense quartzite, banded white and blood-red; and, naturally, the implements made from it have a fine savage beauty. The next quarry may be in white, fine-grained quartzite and the next in purple, no two being alike. One quarry produces a brilliant yellow jasper. The material from each quarry is so characteristic that the chips and the implements made from its rock are readily traceable to their source, though distant many miles. In places the sandstone breaks into thin slabs along the bedding planes, hence it was easily worked and used for metates. In a like manner the schists were used for a similar purpose. Nearly all the mauls and wedges found, being more or less fragmentary, were of granite or trap. Moss agates of a great variety of colors were quarried, and chips and implements are to be found for miles around. The moss in these agates is black oxide of manganese crystallized in dendritic form.

Nature was kind to these primitive quarrymen, for the streams and numerous tributaries, being on an elevated plateau about five thousand feet high, have dissected the rocks in all directions, leaving bold faces exposed everywhere.

I was again accompanied by Mr. Lighton on my second trip to the "Spanish Diggings," in the summer of 1906. To the southwest of the series of quarries visited on our first trip we discovered more than a dozen very large ones, many of them covering a hundred acres of ground. On this trip I found, still sticking from a natural fissure in quartzite on the highest hill in the neighbor-

hood, a three-cornered granite wedge---the first of its kind discovered. Prior to finding this quarry implement we were puzzled not a little regarding the manner in which the rock had been worked out. Lying by the wedge was a stone maul showing excessive use. The spalls broken out were piled with considerable care in half-circular forms on the side of the pits which faced the plains below, seemed a precautionary measure of the workman by which he shut off the prying eyes of an enemy while at work in the pit. This quarry was accessible only from the west. On looking up from the plains a faint trail can still be seen leading upward to the quarry. It winds about huge boulders and along narrow ledges where a slip means a fall of two hundred feet or more. At the summit, breaking out of the hill's cap, are the quarry pits. There was nothing to indicate that white men had ever visited the place before me, the whole scene giving evidence of having been hurriedly abandoned. The entire summit of the hill behind the pits was strewn to a depth of several inches with shop refuse---large and small chips, flakes and rejectage.

As early as 1895 one of these quarries was visited by Mr. E. S. Riggs of the geological department of the Field Columbian Museum, Chicago. It had been previously visited, in 1893, by Mr. Sidney Bartlett of Cheyenne, who wrote a description of it for the San Francisco Examiner. Mr. Bartlett revisited the quarry in 1899, accompanied by Judge Eastman of Chicago. Dr. Dorsey was able to give the spot but a superficial examination (as stated in a letter written in December, 1905, at which time he felt that the whole matter should be reinvestigated). Upon his return to Chicago he had written the first scientific paper on the subject, and, in fact, the only one which has yet appeared concerning the quarry in question, or any other of the Spanish Diggings series. His trip was made under the guidance of Mr. J. L. Stein of Whalen Canyon, who has lived in eastern Wyoming more than a quarter of a century. Mr. Dorsey's paper is well illustrated. It appeared in the annual report of the Anthropological section of the Field Museum and was incorporated in the annual report of the American Bureau of Ethnology, Smithsonian Institution. It appears under the title of "An Aboriginal Quartzite Quarry in Eastern Wyoming," publication No. 51, Field Museum Contributions.

Concerning the Spanish Diggings quarries, Mr. Stein, the experienced miner who acted as guide to Dr. Dorsey, says that the work is so extensive that it would take modern miners or quarrymen a long time to accomplish it. He believes it unlikely that three thousand men could accomplish so much in a year, using the latest explosives and machinery, instead of the stone wedges and hammer-stones handled by the primitive quarrymen. Several of these quarries show great age---how great can only be conjectured. Lichens of the slowest growth and smoothly-worn fractured surfaces tell the geologist that it has taken thousands of years of wind and water to weather smooth the originally roughened surfaces of these artificially fractured rocks. The more protected surfaces are in much the same rough condition they were in when first broken from the parent cliff. Hammer-stones of trap and granite found in many of the quarries where agate was secured by the primitive quarrymen bear evidence of great antiquity. Many were found last summer which showed disintegration, while the lichens covering fractured surfaces were unusually heavy. A quarry of this description is located between the head of Willow Creek and Manville. Here are fully forty acres of circular pits, several of which are from seven to ten feet deep, worked down through the agate cap of a plains butte. Repeated blows with a blacksmith's hammer were required to fracture a spall six inches square, and it seemed incredible that the vast work could have been accomplished by primitive people armed with stone tools.

The region wherein the larger number of quarries is located is one of desola-

tion. The monotony of the plains, it is true, is broken by many flat-topped buttes and rocky hills. Though the brilliant sunshine of a mile-high altitude harmonizes the color of the sagebrush and grease-wood with the yellow and purple of the plains, a sense of loneliness fills one almost to oppression. From the line of hills where most of the Spanish Diggings are located the plains unfold without variation. Not a living thing---bird or beast---breaks inanimate nature's sway, save the "whirr" of the rattlesnake---which one hears oftener than he desires---or the sight of a bunch of antelope, ambling across some barren stretch---always well out of gunshot.

But as the sun lowers and its horizontal rays illumine the banded quartzite quarries, or strike into flaming gold the yellow jasper or fractured agate ledges, the scene changes into a fairyland of marvellous beauty. Laramie Peak sets its strong blue outline against the deepening orange of the western sky, forty-five miles away. As the day deepens into evening the plains and foothills---first violet and then dark purple---contrast strongly with the brilliant colors of the quarry rocks, and what an hour before was almost a desert waste is now transformed into a spectacle of glorious tints toned by a master hand into a luminous color scheme perhaps unrivalled on the face of the globe.

At a distance of ten miles or more the climbing shadows of the western mountain ranges, transparent, but still low in tone, contrast strongly with the illuminated faces of the quarries. Orange is turned to rose-orange, deep red to orange-vermilion, purple to rose-violet; one banded white and red quartzite quarry face runs from a cream-white to light vermilion, with dashes of harmonizing violet. Ready with palette and canvas I have stood beholding this vision many a time, but feeling so impotent even to approximate such marvellous color schemes that the sun has dropped behind the Laramie range before I realized that night had come.

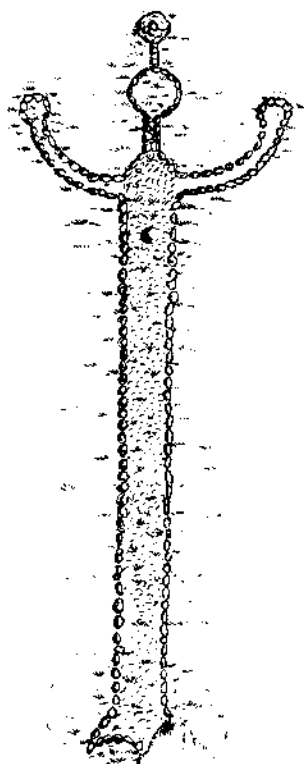
In the late summer of 1906 the Spanish Diggings were visited by an exploring expedition from the University of Nebraska in charge of Prof. Erwin Hinckley Barbour, Curator of the University Museum and State Geologist of Nebraska. Prof. Barbour was accompanied by Dr. M. H. Everett of Lincoln, a well-known archaeologist. The party spent two weeks in the vicinity of the quarries and made a careful geological and archaeological survey of the entire region, securing two thousand implements in seven stages of manufacture, from the rough quarry block to the finished implement.

While clambering up the almost insurmountable slope of a rocky hill they discovered a remarkable figure. Laid out upon the hill, where it was less precipitous than above or below, they found a gigantic representation of a human figure made of spalls. It credely depicted a man or woman, with both arms upraised. It was fifty-five feet long and about eight feet wide, the body looking not unlike a stone walk. The spalls forming the figure had been obtained near by, and had been carefully selected and assorted in regard to conformity as well as size. The rocks forming the figure were covered with lichens of slow growth and everything indicated that it had been made ages ago. Twenty miles east of the Diggings, on the summit of a plains butte, I found the figure of a serpent made of stones piled in much the same manner as in the case of the human figure at the quarries, and giving evidence of equally ancient origin. Scattered about the foothills to-day are thousands of small piles of stone. Under the impression that they were coverings of the dead of former inhabitants, many of them have been explored, but in only one instance was there indication of a sepulture.

The whole Spanish Diggings country is still virtually unexplored. Even in its desolation it has attractive features, though rattlesnakes innumerable share possession with lynx and gray wolves. Few cowboys ever get as far west as the Diggings excepting during the roundups, and visitors are very scarce.

On the banks of every creek in the entire section can be found shop- and village-sites, many of the former covering a full hundred acres, where an almost incredible amount of material taken from the quarries is scattered broadcast.

Geologically and archaeologically the region is one of unusual interest, and scientific research there will be richly rewarded.



"THE MAN OF THE MOUNTAINS"

MST-007 TUNNELS, MINES

MST-007 [THE DENE-HOLES]

Anonymous; Nature, 76:134, June 6, 1907.

Those mysterious prehistoric excavations---the dene-holes---are found in great numbers in the neighbourhood of Bexley, some five miles from Woolwich, and in smaller numbers near Grays, in Essex, and numerous other localities in east, south-east, south, and south-west of England. Some recent explorations have unearthed a few more interesting evidences of their antiquity, and thrown a little more light on the problem of their origin. In sinking a shaft at Gravesend lately, the workmen discovered the nether cavity of a dene-hole, which had been almost entirely filled in by subsidences. The shaft was quite filled up, but the bee-hive chamber at the bottom is now being cleared of rubbish, and in the sand and earth a number of partially worked axe-heads of flint have been found, together with the bones and skull of an animal, probably a wolf, which are now being identified. The walls are covered with pick-marks, which seem to have been made with an instrument of either wood or bone, possibly a pick made of an antler.

MST-008 [DENE HOLES]

Anonymous; Nature, 77:230, January 9, 1908.

The discovery of a large group of dene-holes in the woods between Woolwich and Erith, close to the ruins of Lessness Abbey, was announced in the Times of January 3. Two of these holes have already been explored, the position having been marked in each case by a shallow cup-like depression on the surface overgrown with verdure. Excavation in the centre of the hollow exposed the shaft, which is rather more than 3 feet in diameter, and circular in transverse section. After descending for about 50 feet through loam, the shaft enters chalk, and having penetrated this for 4 feet or 5 feet expands into chambers about 18 feet in height. In the sides of the shafts are holes, evidently for supporting a rude kind of ladder for descent. A conical mound of earth, about 10 feet high, occupies the floor at the bottom of the shaft. Each cave has six chambers grouped radially around the central shaft, so as to form in plan a rough double trefoil, recalling the pattern familiar to explorers of dene-holes elsewhere.

MST-009 [ORIGIN OF THE DENE HOLES]

Anonymous; Nature, 81:313, September 9, 1909.

Considerable progress towards the settlement of the ever-recurring controversy regarding the origin and date of the so-called dene-holes has been made in a paper contributed to the January-June number of the Journal of the Royal Anthropological Institute by the Rev. J. W. Hayes. This contribution is somewhat lacking in lucidity and logical arrangement, but the writer has pursued the investigation in a common-sense way, and has collected a mass of facts necessary to the settlement of the problem. It is essential to know the various qualities of chalk, and the uses to which it was put in ancient and modern times. The export of the material began in pre-Roman time, and the character of it

varied. It was essential for the purposes of home and foreign trade that it should be excavated in solid blocks, and the occurrence of strata of this quality accounts for the grouping of a number of pits in the same neighbourhood. It was and is raised in buckets or baskets, and difficulties of carriage suggested the construction of fresh shafts in close proximity to each other. These considerations seem to dispose of the objection that excavation for the material was only one of the objects of the construction of the dene-holes as we find them. One of the strongest reasons against the theory that they were used as granaries or hiding places lies in the fact that they contain cores of sand, which could not have arisen from attrition of the sides of the pits or from collapse of the mouths of the excavations. These cones could only have resulted from the deposit in the worked-out pits of debris from those of later construction. Mr. Hayes has collected a mass of reports from persons engaged in the chalk trade in recent times which show the methods by which the material is excavated and utilised. These raise a strong presumption that the same considerations which now influence the workers prevailed also in the British and Roman periods.

MST-010 ARCHAEOLOGY OF DENEHOLES

Anonymous; *Nature*, 175:107-108, January 15, 1955.

The "Proceedings" for 1954 of the Croydon Natural History and Scientific Society contains interesting articles on deneholes and on Croydon itself. Deneholes are excavations in underlying chalk reached by vertical shafts through the overload. They often consist of a number of chambers, and the excavations were carefully and scientifically done. The vertical shafts---sometimes 30-40 ft. deep---can be dangerous and so have frequently been plugged. It sometimes happens that the plugs themselves collapse into the underlying cave, as has recently occurred at Waddon. This gave an opportunity for investigation before the plug had to be reinstated. The age of the deneholes seems to be pre-Roman, and they are probably of the Iron Age. Many explanations have been given as to why they were made; but none is satisfactory. Underground granaries or stores have been suggested, or pits for obtaining chalk for agriculture; but, if the latter explanation be the correct one, why have they been so carefully made? Drainage sumps, places of worship, underground dwellings and secret refuges, or burial places have all been suggested from time to time. It would seem clear, however, that some connexion must exist between these artificial caves and the earth-houses of northern Scotland. But unfortunately we do not really know why these latter were made, either.

MST-011 TUNNELS, MINES

MST-011 ANCIENT SHAFTS AT IPSWICH

Anonymous; Nature, 137:220, February 8, 1936.

Messrs. Bolton's brickfield at Ipswich, already well known to archaeologists as a valuable source of evidence bearing on the cultures of the Old Stone Age, recently has been the site of another remarkable discovery, unique in the annals of British archaeology, but not yet explained with certainty. Three shafts of a remarkable character and of a previously unknown type have been exposed, of which two have been partially cleared by Mr. J. Reid Moir. Of these, the first, according to a report in The Times of January 29, was cylindrical in shape, and approximately three feet ten inches in external diameter, with walls of puddled clay nine inches thick. It was followed through the London clay into the Eocene sands; but neither here nor in the second shaft did excavation reach the bottom. Work in the second shaft had to be abandoned at a depth of seventy feet owing to the presence of water. This shaft was larger than the first, being some six feet in diameter, and more complex in its filling, at least down to a depth of eighteen feet. It had as a central core a pillar of puddled clay, with two walls of white clay between it and the outer wall. In both shafts at a considerable depth the clay walls coalesced to form a species of basin or false bottom, sealing the lower part of each shaft. Finds of archaeological significance were scanty. Fragments of Roman brick, two pieces of silver sheeting, such as might have formed part of the cover of a casket, and a fragment of polished marble, which might have been part of the casket itself, when taken in conjunction with the proximity of a Roman burial ground and the later Roman Castle Hill villa, have afforded a basis for the suggestion that these may be Roman burial shafts, such as the Puits funéraires of France, or the late Roman shafts leading to burial chambers of Cyprus.

MSW-001 THE "GREAT WALL OF PERU"

Shippee, Robert; Smithsonian Institution Annual Report, 1932, Government Printing Office, Washington, pp. 461-473, 1933; and Geographical Review, 25:1-29, 1932. (Reprinted by permission from the American Geographical Society)

Unfortunately, the many aerial photographs accompanying the article originally published in the Geographical Review are not available for reproduction here. These photos reveal better than words the tremendous engineering feat of the "great wall."

The appearance of "Peru from the Air," was followed by many requests for a continuation of the studies contained therein. In no field have the rewards of aerial survey been greater than in archeology, and the demand has been increasing for "more maps and more air photographs," as Crawford has phrased it. To meet this demand and the demands of geography were two of the chief objectives of the Shippee-Johnson Peruvian expedition of 1931. The expedition planned to record the most important ancient sites of Peru by oblique and vertical photographs and mosaic maps. We had little expectation of making really new discoveries in a country where exploration has already revealed so much. We were quite unprepared for the "Great Wall," as it has been popularly termed.

The Great Wall. While we were still operating from the base that we had established at Trujillo for the mapping of the well-known ruins of Chan-Chan, we made a flight with the photographic plane inland as far as the Marañon River and, on the return, circled southward around Mount Huascaran and then followed the valley of the Santa River to the coast. Our course was over the edge of the foothills bordering the narrow upper valley of the river on the north. Johnson, co-leader and photographer of the expedition, watching for photographic subjects, noticed what appeared to be a wall flowing up and down over the ridges beneath the plane, wondered for a moment as to the purpose of such a structure, decided that it was worth recording, and made a number of photographs of it. We hoped to be able to return later to make a more complete record of the wall but were not certain that we should have time to do so. The photographs, printed a few weeks later in our Lima laboratory, led to so much discussion, however, that just before our departure we arranged to make a special trip to relocate and examine the wall from both the air and the ground.

Johnson and I, with our Peruvian observer, Captain Ceballos, flew to Chimbote in the photographic ship and established a temporary base there. Chimbote lies on one of the largest bays of the Peruvian coast, a few miles south of the Santa Valley, of which it is now the principal port. The little town in the lee of three tall, barren sand hills can boast of two things only---a natural harbor that would make the most ideal naval, aviation, or submarine base imaginable and a level, hard landing field that is used by the Peruvian commercial air lines.

The natives of Chimbote assured us that they knew about the wall, that they had heard of it from their ancestors, and that it was pre-Incaic. They could tell nothing, however, of its purpose or its history and, indeed, gave little real evidence that they had ever heard of it.

From Chimbote the flight to the mouth of the Santa River was a matter of a few minutes only. Turning inland from there we picked up the wall about 5 or 6 miles from the coast at the ruins of a small village. At that end the wall divides into two sections for a short distance. It may have once extended to the shore line; but, if it did, it has been broken down, and the stones have either been removed for other building purposes or covered by the drifting sand.

From the ruined village, itself all but lost under the sand, the wall leads

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away up the north side of the river, first across the level, sandy plain of the river delta and then, as the valley narrows, over the edge of the foothills bordering the valley. As the foothill ridges become sharper and steeper, the wall rises and dips and in places is turned slightly from its generally straight course. Its distance from the river is in general about a mile and a half, although in one place at least it dips down close to the edge of the river bed. In places it blends so well with the background as to be almost indistinguishable.

It was impossible to make an accurate check on the distance we followed the wall, for the air was so unusually rough that, as we approached the Andes, we had to circle and climb for more and more altitude; but we followed it for at least 40 miles and possibly more. Then we lost it. We had already passed over several short breaks, but this time we failed to pick it up again. The light, which was poor when we started---for the flight was made in August, a winter month, when the coastal valleys are nearly always overcast and often filled solid with fog---was getting rapidly worse; so we headed back for Chimbote, taking only a few minutes out to get more close-ups of the forts on both sides of the wall.

It so happened that none of our first photographs showed any of these forts. But, on this second flight we noticed at irregular intervals on both sides of the wall, but at short distances from it, a series of small forts---some circular and some rectangular---most of which were more or less inset in the top of small hills so as to be quite invisible from the valley floor. Those on the south side, and they were larger, were located in the hills on the south side of the Santa River opposite the wall. We believe that we located and photographed all of these forts---a total of 14. The largest one appeared to be about 300 feet by 200 feet, with walls about 15 feet high and perhaps 5 feet thick, and was of piled-stone construction. A few of the others were of the same construction, but most of them appeared to be of adobe.

At Chimbote we at once began preparation for a trip to the wall overland. From a rough sketch made while in the air we figured that we could reach at least the western end of the wall by automobile. There is a bridge over the Santa near its mouth, and, once on the other side, it would be simply a question of how far the car could plow through the sand. The next morning we loaded our equipment into an old Ford and started off on a trip that was to take five hours of bumping over crude roads, slithering down muddy cow paths, and pushing through deep sand. Steering our course by a method of "dead reckoning" especially devised for the occasion, we at last reached the sand-covered ruins of the little village at the end of the wall. It was just by chance that we did not miss them entirely. From the air we had been able to make out the plan of the streets and the walls of the separate houses. From the ground we saw nothing but a few sand-covered ridges.

Just beyond these ridges, which were crumbled adobe walls buried beneath centuries of drifted sand, we saw the wall stretching away to the horizon. We followed along it for several miles. Then the valley began to narrow and the cross ridges to dip more sharply down to it. The Ford could go no farther. We struggled on afoot for another mile, lugging the cameras and stopping at intervals for still and motion pictures showing construction details and the character of the terrain on which the wall stands.

The wall, as far as we followed it, now averages about 7 feet in height. It is built of broken rocks set together with adobe cement, and, where it has not been greatly disturbed, its outer surface is so well chinked with small rocks that it would be practically impossible to scale it without ladders. In occasional places, as seen from the air, the wall must still be 20 or 30 feet high where it

crosses gullies. We found it impossible to make anything like accurate measurements. The rocks that have slipped from the top with the beating of the winds and the occasional rains spread away for a considerable distance on either side of the wall and aid the drifted sand in obscuring its base. We estimated that, in its original state, it was about 12 or 15 feet thick at the base and was built to taper upward to an average height of 12 or 15 feet.

Origin of the Wall. We were unable to come to any conclusion concerning the origin of the wall. As Dr. A. L. Kroeber remarks, that will require careful examination by an archeologist familiar with different types of construction and able to interpret potsherds or other fragments that may be found in association with the wall. If we had had time to carry our ground explorations farther and to investigate the forts, we might have found more definite indications as to its history; but we had already spent eight and a half months in Peru instead of the five months originally planned.

Further exploration to determine how far the wall extends into the Andes would be especially worth while. We estimate that when we finally lost sight of the wall we were in the neighborhood of Corongo. Wiener mentions strongly fortified hills in the Corongo region. We have, therefore, the possibility of a defensive wall joining the fortifications of the Corongo region with those at the mouth of the Santa River.

Clearly the wall with its double line of forts was erected as a defensive barrier. If it is true that the fortified hilltops at Paramonga, some 50 miles farther south, mark the southern limits of the domain of the Great Chimu, there are many guesses that can be made as to the origin and purpose of the wall. It may be an inter-tribal defense that antedates the consolidation of the Chimu kingdom. Or it may be a secondary line of defense erected by the Chimu against the Inca invader. If the latter is the case it may explain why, as tradition says, the Inca abandoned his invasions of the Chimu kingdom from the south along the coast and finally conquered it by advancing his armies through the Andes and laying direct siege to Chan-Chan, the Chimu capital.

The suggestion has been advanced by Dr. R. L. Olson, of the University of California, that the wall may represent one of a series of defense structures built by the Chimu as they extended their territory to the north and south. While engaged in field work in this part of Peru two years ago Doctor Olson noted a number of walls in the Chao Valley, about 20 miles north of the Santa Valley, mostly fragmentary and running for short distances only. He describes a larger wall cutting across the pampa between Trujillo and Chicama that was built presumably for the defense of Chan-Chan.

Prof. Marshall H. Saville suggests that the wall may have been erected by the Chimu or pre-Chimu occupants of the Santa Valley to prevent the neighboring tribes on the north, or possible invaders from the north, from gaining access to the river where, by damming or otherwise diverting the stream, they could cut off the water supply from the great aqueducts, still largely in fairly good repair, that irrigated the densely peopled Santa delta. In connection with this suggestion may be cited Montesinos's account that the Inca finally conquered the Great Chimu by cutting off his water supply. It may have been the supply to the Santa Valley that was cut off by the Inca, since Montesinos does not state which valley it was in which the Chimu finally capitulated, while Garcilasso de la Vega says that it was the Santa Valley, although he makes no mention of the cutting off of the water supply.

Dr. Julio C. Tello, director of the archeological museum of the University of San Marcos and a leading authority on the Inca and pre-Inca civilizations, states in reply to a letter addressed to him by the American Geographical Society

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that not only had he never heard of the wall until it was reported by the Shippee-Johnson expedition but that he has been unable to find anyone among the owners of the large haciendas in the Santa Valley who knows anything of it. Doctor Tello reports that he has discovered several walls similar to the Great Wall of the Santa Valley in valleys south of Lima, although none of them is more than a few kilometers in length. He also mentions the wall between Trujillo and Chicama described by Doctor Olson, but offers no suggestions as to the possible purpose of this or others of what he describes as the "mysterious walls of Peru."

It is still hard for us to believe that we have actually made a new discovery of such evident importance in a region whose ruins have been for more than 75 years the subject of frequent and careful explorations by a long list of noted archeologists, many of whom have made their reputations there. From the air, the wall and its forts are so striking a feature of the landscape that it is difficult to understand how they could have so long escaped notice from the ground. That this is the case seems less astonishing, however, when one considers that, even though the wall were noticed at its western end where it crosses the delta of the Santa River, it would appear only as one more wall in a region filled not only with the ruins of elaborate fortifications---fortified hills and defensive walls of various sorts---but also with the remains of cities, towns, and extensive irrigation works. Only when one looks down upon the wall from the air and thus is able to see long sections of it can one realize that it is a feature quite distinct from the short sections of wall characteristic of the Santa delta. This broad view presented to observer and camera is what makes the airplane so important an instrument in modern exploration. The aerial observer is afforded, and the aerial camera records frequently in a single exposure, a synthesis of details whose relationships might otherwise never be discovered.

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MSW-002 THE 'WORKS OF THE OLD MEN' IN ARABIA

Maitland, Flight-Lieutenant; Antiquity, 1:196-203, 1927.

The walls and hut circles which are known to the Bedouins as "the works of the old men" lie about 120 miles to the east of the Dead Sea, in a southern extension of the Jebel Druze range through which the Cairo-Baghdad air mail passes, in the neighbourhood of landing grounds F, G, and H.

The Jebel Druze is a desolate range of mountains rising to from 2000 to 3000 feet above sea level. It consists of steep-sided flat-topped mountains of black basalt, the wadis and flat country between being covered with sand thickly besprinkled with huge black basalt boulders. Here and there the winter rains have formed lakes of sand which during the winter are morasses and during the summer hard flat glaring expanses of white sand, many as much as three miles long.

The valleys support a sparse growth of tough and gnarled camelthorn and scrub; sufficient grazing for camels but for little else. Except for short spells during the winter, when there are occasional heavy downpours of rain, the nearest water is now at Kasr Azrak, some fifty miles to the westward towards Amman.

A better idea of the country will perhaps be obtained if it is described as seen from the point of view of the air passenger leaving Ziza for Baghdad. On leaving Ziza the country is rolling downlands rising to the east, to the Jebel

Mugher. Traces of irrigation can plainly be seen below with many a ruin of ancient town and city, a sign of peaceful days long since past. In clusters over the downs are the grazing flocks of sheep, goats and camels of the Bedouin, with here and there a group of their black tents.

As Ziza is left behind, signs of irrigation cease, the country becomes more rugged, and black boulders and reddish earth gradually predominate. This is the ancient frontier of the desert; and Kasr Kharana, Kasr Amra and Kasr Azrak shew that the raiding Bedouin was as real a menace to the Romans and Byzantines as they are to the cultivator to-day. Kasr Azrak lies in a valley into which converge the winter rains of the mountains to the East; so it possesses pools of clear water throughout the year, and marshes in which wild boar, and duck and geese in season, are plentiful. This is the last water which is obtainable until the wells of El Jid and Rutbah are reached in Iraq, 230 miles to the eastward. A little to the eastward of the glittering dried salt flats of Azrak a number of winding tracks can be seen running across the route roughly north-west to south-east. This is the camel route down the Wadi Sirhan to central Arabia, from the Hauran to El Jauf, Hail and finally Er Riadh of Ibn Saud of the Wahabis. It is to this ancient route that Kasr Azrak owed much of its importance, and for that matter still does; to the Bedouin Azrak, the Blue Castle is a meeting place of considerable importance---by day only be it understood. After dusk the Bedouin has far too great a respect for the Afrits of the old Rouni cohorts, which frequent the strongholds which they once held, ever to wish to spend a night near Kasr Azrak or Kharana.

Ibn Saud's men bent on laying desolate all that is not Wahabi, parties of adventurous Bedouin out to lift a few camels from the Beni Sukhr, Turkish officers on their way down to the Hedjaz, the Beni Sukhr on their seasonal move for grazing, and now and then an aeroplane with a defective engine or armoured car on desert reconnaissance or shooting party out for duck---all are attracted by the water of Azrak and nearly all hope not to meet their fellow guests.

However, we will hope that our engines do not give trouble and that we do not have to taste the waters of Azrak and be tasted by their equally famous mosquitos.

Shortly after leaving Azrak, the country becomes rugged and desolate; black boulders everywhere glisten against the white sand or reddish grey earth; and little conical flat-topped hills are seen on either side, whilst ahead occasional "mud" flats can be seen gleaming amongst the darker mountains.

As the mountains are approached, the plough track, the original guide for flying through this desolation from Amman to Ramadi in Iraq, becomes more tortuous, twisting and turning round little isolated precipitous mountains set amongst a chaos of black rocks. This is the "lava" country whose sharp coal-like rocks present an effectual barrier to motor-car and camel alike. The Bedouin when moving from one mud flat to another in search of grazing must keep to the narrow sandy track which winds between the boulders in the valley bottoms, and the car can only use tracks which have been laboriously cleared. These mountains are only visited by occasional parties of Druze tribesmen from the mountains to the north, whose tough little ponies cover the most impossible country at astounding speed.

It is here that we first begin to notice little collections of stone circles and long lines of stones which in bad light can easily be mistaken for the plough track which we are following. In many cases the hut-circles cluster near the tops of steep-sided hills and from them two or three walls radiate down into the valley. In some cases the circles form a double wall of stones and the radiating lines of stones converge into the inner enclosure. There is now no permanent water supply to be found, but no doubt small winter crops of corn could be grown

MSW-002 WALLS, DITCHES

if the Bedouin did not despise such useful work. As has been said, the mountainous country is only occasionally visited by Druze tribesmen while the Bedouin only penetrates to the Wadis and mud flats amongst the hills. The mountain range forms a barrier between the Beni Sukhr tribe of Transjordan and the Ruwalla, who move with the seasons from the fringes of French Syria to the gravel plains of the desert to the southward and to the east of the Jebel Druze. There is little or no east and west traffic through the mountains here except for the air mail, armoured cars of the Royal Air Force and occasionally the Nairn mail motor cars, which follow the air mail route when the better route by Damascus is unsafe. This route has not been used in ancient times; if it had been, the clearing of boulders necessary for such a route would be easily noticed from the air. The hundred miles of almost waterless gravel plain to the Eastward was no doubt too great an obstacle to cross.

The camps should be divided into two types:-

(a) those in purely defensive positions from the point of view of a general defensive scheme.

(b) those which are isolated and were used possibly as cattle strongholds.

Thus all along the southern edge the hills are defended by 'rose shaped' enclosures connected together by a series of single walls, sometimes with other odd walls running out at unaccountable angles. The vast majority of such walls were, I think, defensive against man; and in many cases are in country up which cattle could not climb, except at occasional easier slopes. Sometimes they do not even appear to have a defensive value, but then it must be remembered one cannot get a very good idea of the lie of the land from the air. The enclosures are, I think, mostly single-walled, and few, if any, have 'fan walls.'

Those of the second type occur in the scattered hills in the gap, which have many double-walled camps with 'fan-walls' extending out into the wadi bottom around them.

The walls of the camps follow the line of the hill and are often most irregular in shape---separate little circles within the main defence walls are quite common.

I should guess that many of the enclosures were about 300 yards and that the double walls would be about 12 yards apart, but of course it is very hard to say from the air unless one took special care to note it.

One double peak which I can remember well had a complicated system of fortifications. Each top had a camp, the saddle connecting them had communicating walls, and half way down the hill was a third wall which went round the whole.

Many of both the walls and circles are very complicated and difficult to understand, but those with 'fan walls' appear to be of more obvious use. Frequently these walls are seen radiating from a group of hut-circles on hill top or hill side, and running for some two or three miles in a straight line. They are particularly conspicuous from the air, and in bad light the straight line of the wall at times resembles the plough furrow track which the air mail follows. The possible use of these walls was the subject of many discussions amongst air-mail pilots but the general opinion was that they were used to assist in driving cattle grazing in the valleys into the defended camps at the approach of hostile forces. This seems a probable use for them, as many actually lead into the inner ring of double-walled camps and extend down across valleys, so that a few horsemen could rapidly drive the herds up into the camp. The actual height of the walls is difficult to determine from the air, though judging by their shadows, they are not very high, probably no more than two or three feet;---they consist of boulders dragged into line. The photographs were taken at random and do not shew a good example of these radiating walls.

The circles and walls give the impression that they were used by a race of

people who were at least partially settled, with herds and small crops, who feared the inhabitants of the richer land to the west-ward, and therefore fortified steep hills and the southern edge of the 'gap' into which the stronger people at intervals penetrated.

Whether there are other walls and circles in the mountains off the air mail route, I am not in a position to say. Doughty mentions seeing hut-circles, but not walls, in the continuation of the same mountain ranges, some hundred miles to the south, and says that the Arabs attribute them to the Nasrany or Christian, by which they imply that they are pre-Islam; they certainly have the appearance of being of great antiquity.

MSW-003 EARLY MAN IN NORTH ARABIA

Field, Henry; Natural History, 29:32-44, 1929.

Strange ruins which, from their form have been called "kites" by Group Captain Rees, are very numerous between Azrak and landing-ground "H." These "kites" are composed of walls with a round tower at intervals, and with long walls called "tails" which extend for miles across the country. There are many different kinds of "kites," but one of the simplest forms is shown in the following diagram. (Diagram not reproduced.)

Since these "tails" are sometimes eighteen miles in length, it does not seem plausible to suggest that they could have been fortresses of any kind, but rather traps for catching gazelle or some other animals. Group Captain Rees suggests that some of these "kites" whose "tail" opens upon a mud-flat some hundred yards away from the "head" were used as fortresses. To explain the dividing wall which sometimes runs down the center of the "tail" of the "kite" he suggests that domesticated animals were kept on one side of the wall and that rudimentary forms of agriculture were practiced on the other. Presuming that the mud-flat was at that time a small lake, it would have been possible to guard the wide area at the extreme end of the "tail" with one or two men, who could not fail to hear the approach of the enemy over water. At the first signal of alarm the animals would be driven into the "head" of the "kite," and the last wall hurriedly built up. In this position they would be safe from attack from any side. It is interesting to note that the walls connecting the towers are built on a curve with the highest part of the wall nearest to each of the towers. This would tend to make the attackers rush for the lowest part or center of the wall, and in their efforts to break through they could be attacked from the sides, as well as from the front. This is one of the principles of close fighting today. The machine guns are placed on the flanks, and every effort is made to make the enemy "bunch" at one place.

Flint implements are always found in these "kites," and these will have to be studied in detail. It is often very hard to follow or even to find these stone walls upon the ground, but air photographs help to overcome this difficulty. There are many types of "kites," ranging from the simple form described above to the most complex, which is only discernible from the air. (pp. 39-41)

MSW-004 WALLS, DITCHES

MSW-004 [REMARKABLE CART RUTS]

Anonymous; Nature, 101:290, June 13, 1918.

Capt. E. G. Fenton discusses in the May issue of Man the remarkable cart-ruts found in Malta. It has been formerly assumed that they date from prehistoric times, and that they probably belong to the Neolithic period. There is no sign of a groove cut by horses' feet between the ruts, and the suggestion has been made that they are the result of human power in the shape of a number of men drawing waggons, and that the Neolithic civilisation was brought to a close by a period of desiccation, such as that discussed by Ellsworth Huntington in "The Pulse of Asia," the dawn of our Mediterranean historical period being heralded by the increase of moisture. Capt. Fenton, on the whole, believes that they date from the early part of the Iron age, at a time when the Mediterranean was moister and the island was capable of supporting a larger population than under present conditions. The suggestion that these climatic changes can be equated with events in Egyptian history is interesting, but the evidence is scarcely sufficient to support any definite conclusion. Prof. Boyd Dawkins, in the June issue of Man, asserts that the ruts are "due to the weathering of the rock under voporal conditions. They are merely the ordinary joints, widened and eroded by the rainwater containing carbon dioxide, familiar to geologists in all limestone plateaux, and to be seen over very wide regions in Southern France."

MSW-005 THE MALTESE CART-RUTS

Anonymous; Nature, 121:297, February 25, 1928.

In Man for February, Miss M. A. Murray discusses, with a number of illustrations, the possible origin and purpose of the so-called cart-ruts of Malta. These cart-ruts are disappearing, but a series of air photographs, to be the basis of a complete map, is now being prepared by Prof. Zammit and Commodore Clark Hall. As regards their origin, it is clear that they are not the well-known natural parallel fissures which occur in limestone, for they curve, and are equidistant throughout their length, the gauge being a little greater than that of a Maltese cart. The depth is not great, being about a foot. The Greeks appear to have cut similar ruts to facilitate the passage of carts over rough ground, but the curves for passing do not occur in Malta. There is a network of the ruts all over the island, and short lengths are frequent in connexion with megalithic monuments. This is an indication of age, which is also supported by the fact that they were made when the configuration of the island was different. One at St. George's Bay was evidently made across a gulley now covered by the sea, as it appears on both sides of the bay. Tracks also lead to the edge of cliffs, where they end abruptly. A tradition says that the tracks were made for a boat which went on wheels. It is possible that they are part of a road system which was superseded by the Roman roads.

MSW-006 THE CART TRACKS OF MALTA

Anonymous; Nature, 121:599, April 14, 1928.

Following closely on Miss Murray's communication to Man (see Nature, Feb. 25, p. 297), Prof. Zammit has published in Antiquity for March a study of the

cart-tracks of Malta, illustrated by a number of excellent air photographs. His conclusions as to the origin, purpose, and date of these ruts or deep grooves on the limestone, which are of such frequent occurrence in the island, are the result of a long and exhaustive examination. There can be little doubt that they were made by a wheeled vehicle---strong, heavy carts with wooden wheels without metal tyres. The sharp curves preclude the idea of a sledge with runners. They are triangular in section, and can easily be distinguished from the grooves, rectangular in section, made by the modern metal-tyred wheel. Further, it must be concluded that human power was used for traction, as the ancient ways show no sign of being cut up in the way in which modern tracks have been cut up by the hooves of animals. It is also probable that the tracks were started by human labour and deepened later by use. There are definite signs that they were first carefully laid. In only one case does a pair of tracks appear to enter the sea, namely, at the Bay of St. George at Birzebuggia, where they probably appear on the other side of the bay now covered with silt and field soil. There is nothing to suggest the existence of these tracks when the island was connected with the continent, quite independently of the fact that the islands could not have been inhabited by an industrial population at the end of the Ice Age. Nor are they so late as the Roman occupation. Further, they are earlier than the rock-cut tombs of the Phoenician occupation, one of which cuts right across one of the cart tracks. As they do not go near the megalithic monuments they were not used for carting stone for these buildings. They were used by the energetic neolithic population for carting earth for their terrace cultivation made necessary by the bare character of the high lands and for carrying water to the ships of a busy maritime traffic in harbours near which were no springs.

MSW-007 ANCIENT WORKS IN FLORIDA

Anonymous; Knowledge, 2:271, 1882.

The Travers Herald describes the finding of an ancient work in digging a canal between Lakes Eustis and Dora, to open up the more southern lakes of the great lake region of Florida. The first excavations revealed the existence of a clearly-defined wall lying in a line toward the south-west, from where it was first struck. The wall was composed of a dark brown sandstone, very much crumbled in places, but more distinct, more clearly defined, and the stone more solid, as the digging increased in depth. The wall was evidently the eastern side of an ancient home or fortification, as the slope of the outer wall was to the west. About eight feet from the slope of the eastern wall a mound of sand was struck, embedded in the muck formation above and around it. This sand mound was dug into only a few inches, as the depth of the water demanded but a slight increased depth of the channel at that point; but enough was discovered to warrant the belief that here on the north-western shore of Lake Dora is submerged a city or town or fortification older by centuries than anything yet discovered in this portion of Florida. Small, curiously shaped blocks of sandstone, some of them showing traces of fire, pieces of pottery, and utensils made of a mottled flint were thrown out by the men while working waist deep in water. One spearhead of mottled flint, five and a half inches long by one and a quarter inches wide, nicely finished, was taken from the top of the sand mound, and about four feet below the water level of the lake.

MSW-008 WALLS, DITCHES

MSW-008 LYONESSE

Crawford, O. G. S.; Antiquity, 1:4-15, 1927.

Once upon a time (so tradition says) a region of extreme fertility lay between the Scilly Islands and Cornwall. This land was called Lyonesse; and where now roll the waters of the Atlantic there once stood prosperous towns and no less than a hundred and forty churches. The rocks called the Seven Stones, seven miles west of Land's End, are said to mark the site of a large city. This country was overwhelmed by the sea, and the sole survivor, one Trevilian, escaped destruction only by mounting a swift horse and fleeing to the mainland.

Such, stripped to the bone, is the famous legend of Lyonesse. Had it any real basis in fact, or is it merely an invention of the "dreamy Celt"? There are good reasons for believing that the substance of the legend is true, that within prehistoric times there did actually exist land which is now covered by the sea, and that it has been gradually overwhelmed. In one respect only does the modern critic disagree with tradition. He believes that Lyonesse was the Scilly Islands themselves, not a completely vanished region between them and Cornwall; and that what is now an archipelago of islands was a single large island, surrounded perhaps by a few rocky islets.

The evidence, both archaeological and historical, is very strong. It was my good fortune to be staying in St. Mary's last year, at the time of the spring tides. One day I crossed in a boat to the uninhabited island of Samson; and from the highest point I observed, stretching across the uncovered sandflats between Samson and Tresco, a long straight line of stones. I had not time to descend and make a closer investigation; but when thinking the matter over on my return, I regretted it; for I could think of no natural explanation of the stones. Further, it seemed probable that this was indeed one of those walls described in 1753 by old Borlase. "The flats," he says, "which stretch from one island to another, are plain evidences of a former union subsisting between many now distinct islands. The flats between Tresca, Brehar and Samson are quite dry at a spring tide, and men easily pass dry-shod from one island to another, over sand-banks (where, on the shifting of the sands, walls and ruins are frequently discovered) on which at full sea, there are 10 to 12 feet of water." The day following next but one after my first visit to Samson was the day of lowest spring tides (16 March 1926) and it seemed a chance not to be missed. Accordingly I chartered the boat again, and accompanied by Mr. Alexander Gibson with his camera, landed again on Samson. Our programme was to photograph the line of stones first from the high ground of Samson, then at closer quarters on the sands; and afterwards to walk across to Tresco and thence to the island of Bryher. Such a "submarine" walk is only possible at low spring tides.

We found, on walking out across the sands, that the line of stones was undoubtedly the remains of a wall of human construction. It consisted of a number of boulders and stones of about the size and shape of a milestone, some of them still standing upright. All round on either side of the wall were scattered the smaller stones which once filled the spaces between the larger uprights. Elsewhere the sands were almost bare. The fact that some of these stones still remained standing proved conclusively that the thing was artificial, but indeed its general appearance left no doubt whatever in our minds with regard to this.

It was one of those thrilling moments which occasionally occur in the life of an archaeologist. Here before us was tangible proof that the land had sunk since prehistoric times; for no one makes walls like this below high water mark. While Mr. Gibson was taking photographs, I wandered about on the sands and picked up a few flint flakes. Most of these were lying on the tide-scoured sand

below the ordinary low water mark. Their edges, originally sharp, have been smoothed by the action of the sand and water, so that they have the appearance of gravel-rolled flints. They are quite white and the surface is matte. A few are illustrated here.

The wall was about 250 yards long, and ended at a bare, rocky eminence called Black Ledge. On the further (north-eastern) side of this rock, a line of stones was visible, half covered by the sea even at this exceptionally low tide. I waded out to it in the hope of being able to discover whether it was another of these walls; but the water was over my knees and the tide was on the point of turning, so that I could not satisfy myself on this point. * We duly reached Tresco---though neither of us dry-shod!---but the tide was now rising and we were too late by about ten minutes to continue on foot across to Bryher. My reason for wishing to visit that island was that on the 25-inch map there are marked some apparently very perfect examples of prehistoric stone walls. We were not disappointed. We found them on the bleak hill which forms the northern part of the island. They were precisely similar in character to the submerged wall we had just visited.

Such prehistoric walls occur on all the larger islands, and on some of the smaller ones which are not now inhabited. A peculiar feature is that at frequent intervals along them occur small round cairns of stones. I observed these on St. Mary's, on Gugh, and on Samson, as well as on Bryher, where the cairns are marked on the 25-inch map. They are said to occur also on similar walls on the moors of Cromar, in Aberdeenshire. The walls themselves are clearly field-walls. Even to-day the field-walls of the Scilly Islands are made in exactly the same way. I happened to see one being built. Large upright stones are set up some few yards apart, and the space between is filled with smaller stones. The materials are obtained, whenever possible, from the area to be enclosed. The task of building these "stone hedges," as they are called, is not so simple as it might appear to be; considerable skill is required, and no doubt the inherited experience of generations has been handed down by tradition from prehistoric times.

The stone hedges of abandoned fields are to be seen on the moorlands everywhere in Great Britain. They are common in Wales, where, too, the old methods of construction are still employed. There, a wide double row of upright stones is set up, and the space between---often as much as six feet---is gradually filled in with smaller stones picked from the field itself. When the wall is left to fall into ruin, this core of smaller stones spreads out on either side of the uprights, and they too gradually collapse, till only a few are left standing. In some parts of Wiltshire, where the downs are covered with sarsen stones, these were set up round the prehistoric field. Many such are to be seen in the lynchets of Celtic fields on the Marlborough downs. The Celtic fields on the hills round Bath were enclosed by dry walls, set with a few large bonding uprights (called "grounders" in Cornwall); but owing to the flat cleavage of oolitic limestone, the construction was much easier, and the walls consisted, for the most part, of quite small stones, as they do to-day.

An interesting account of the construction of these boulder-hedges in Cornwall is given by Hunt in his fascinating Popular Romances of the West of England. Some echo of prehistoric times lingered even in the last century. Tom, the Giant, was a great hedger, when in the mood for work; "then, if he found any of

* Since writing this, Mr. Alexander Gibson reports that he has been told of similar submerged walls between the west coast of Samson and White Island, and off the west shore of Tresco.

his neighbours 'hedging,' he would turn to and roll in all the largest rocks from over the fields, for 'grounders.'"

From another legend we learn how Tom came to the castle of another giant. "This place was hedged in with great rocks . . . they call them the Giant's Hedges to the present day." He was returning from market, fortified by three or four gallons of beer, and in a somewhat truculent mood, it would seem, for he determined to fight the giant. He opened the gate and drove his two oxen and the waggon through. He drove for a mile without seeing anything except the fat cattle of all sorts in the fields. At last he came to a pair of gates in a high wall, which was close to and surrounding the giant's castle. There was no passing round these, as there were deep ditches on either side of these gates. In due course he met the giant and killed him, succeeding to his wife and cattle and all his possessions. Have we not here a faithful description of a typical prehistoric hill-fort surrounded by its fields and pasture grounds?

But to return to the Scillies. The boulder-hedge on Samson flats is plainly just such a hedge as those I have described. It cannot possibly have been made when the land stood at its present level, for it is completely submerged except at ordinary low tide. The question may be asked---How comes it to have been preserved? Why has it not been destroyed by the sea waves? The answer is, I think, supplied by the Geological Memoir on the Scilly Isles; but I must first explain that Samson flats lie within the inland sea of Scilly, where the huge Atlantic rollers never come. Erosion, therefore, is less violent here than round the outer shores of the archipelago. The bed of the shallow inland sea is uniformly sandy; and it is suggested by the author of the Geological Memoir that the presence of all this sand needs some explanation. He considers that it was originally formed by the action of wind---that the sand flats are, in fact, submerged sand dunes. It seems therefore probable that the prehistoric walls were buried in sand before submergence; and that this mantle of sand protected them from destruction by the waves. The tidal scour has now removed the sand, but it has little erosive power against the heavy boulders of which the walls were made.

The history of Samson Flats seems to have been as follows:---originally the whole archipelago stood at a higher level than at present, consisting of one or more large islands with an outer fringe of reefs and islets. The area now occupied by the inland sea was a level plain covered with a thick layer of glacial deposit, resting upon the granite rock and forming a region of relative fertility. This would have been the most "habitable" part of the region, because of the greater depth of soil, and because it was sheltered on all sides by higher ground. Here lived the prehistoric builders of the submerged walls. Here were their huts and the pasture grounds of their flocks and herds, separated by the walls whose remains have so strangely been preserved beneath the sea.

But all the time the Atlantic was steadily pounding the outer islets into sand, and the wind carrying this sand inland from the west, to fall on the lee side of what is now Samson. At last the whole of the inland plain was buried. Then the land sunk---it may have been slowly sinking all the time---and the shores assumed something like their present outline.

But not quite their present outline; for everywhere to-day, even round the calmer shores of the inland sea, wave-erosion is proceeding. The soft blanket of glacial deposit---a gritty clay or gravel---is being eaten into bays; sand dunes are forming again; and the habitable area is being yet further reduced. The smaller islets are rapidly losing their glacial mantle, and with it go the grass and flowers. Even the larger islands will one day be split up into barren reefs by the waves; for when once glacial soil is gone, the most flowery isle will be as desolate as Mincarlo.

That England stood at a higher level in prehistoric times has, of course, long been known. Everywhere along the coast may be found remains of submerged forests exposed at low tide. Flint implements have frequently been found among the roots of the trees; and in Essex Mr. Hazzledine Warren found a skeleton buried below high water mark. With true insight Mr. Warren called this the "Lyonesse" surface, although the facts here brought forward for the first time were then quite unsuspected. Such a forest may still be seen in Mount's Bay, between Penzance and St. Michael's Mount; it is certain that the land stood at a higher level when it flourished here. At low tide flint flakes of human manufacture have been picked up in it; and a piece of wood, humanly fashioned, has been found in Marazion marsh at least 12 feet below mean sea level. Human remains, including human skulls and bronze implements, have been found in the submerged beds of the valleys. All these facts prove subsidence; they have been fully dealt with by the late Mr. Clement Reid in his book on Submerged Forests.

A similar subsidence has taken place in Brittany, and in the Channel Islands during prehistoric times. In Jersey there is a fine submerged forest in St. Brelade's Bay, and it is even said that prehistoric burial cists or chambers occur below high water mark. Unfortunately the precise archaeological period to which these remains belong is still uncertain.

The evidence from Brittany is much clearer. What could be more startling than the half submerged Stone Circle on the island of Er Lanic. Could more sensational evidence of subsidence be found anywhere? Some of the stones are standing upright still after all these years; but some, which had fallen, have been set up again in their original holes.

That the Scilly Islands were once a single large island---or one big one with a few islets or reefs---may therefore be taken as proven; and it may further be said that part at least of this submergence took place within prehistoric times. It was part of the same movement as that which affected the coasts of Cornwall and Brittany. How long it is since the Scilly Islands were split up is a difficult matter to determine. That they were still a single island as late as the third century of the Christian Era is suggested by the fact that Solinus, writing about 240 A. D. speaks of them in the singular---*Siluram insulam*. The only other ancient writer who mentions Scilly by name---Sulpicius Severus, 400 A. D.---also refers to it in the singular. It would be dangerous to rely too much upon this evidence, but it is at any rate not in conflict with the evidence from other sources.

Probably my readers have been hoping to learn the date of the wall or boulder-hedge on Samson Flats. How old is it? Alas, at present it is impossible to say. All that one can say is, that up to the present, there is no evidence that either the Scilly Isles or Cornwall were inhabited at all before the Bronze Age, and that the wall may have been made therefore at any time from the Bronze Age to the beginning of the present era. (It is hardly likely to be later). It may, of course, be older, for, let it be observed, I do not say that Cornwall and the Scilly Isles were uninhabited before the Bronze Age, but that there is no evidence that they were inhabited, and that is a very different thing. The only proof that they were inhabited before the Bronze Age would be the discovery of pottery or other remains which can be proved to belong to an older period; and those remains have yet to be recorded. Stone implements were made and used throughout the Bronze and Iron Ages, and the absence of metal on an excavated site proves nothing. The West of England abounds in prehistoric remains, but it has yet to produce an archaeologist of the first rank. The scientific study of these remains has not yet begun, though Lukis and Borlase were both excellent archaeologists in their day.

The Legend of Lyonesse may, then, be true; but is it a direct traditional inheritance of the submergence? I think not. It is more likely that it has arisen in later times, through the acute observation of fishermen and other unlettered folk. It is a common mistake to suppose that an "uneducated" person is less intelligent or less accurate in observation than one who has acquired book-knowledge. It would probably be more true to say that he is more intelligent and a better observer, because his mind is clearer. That certainly holds good so far as my limited experience of "primitive" people goes. Provided they are quite unspoilt by book-learning, their observations are generally trustworthy and their deductions sound, up to a point. In this instance, it seems to me probable that the legend arose somewhat after this fashion. Fishermen and others observed these walls (they still observe them and have told me of the existence of others that I have not yet been able to go and see). They recognize that they are of human making, and that they could not have been made when the land stood at its present level. They infer, quite correctly, that the land must have sunk. So far the inference is correct, and the process of reasoning could not be improved upon by the most eminent "highbrow." But the science of geology is a closed book to them; they do not realize the infinite slowness of Nature, and they bring in a cataclysm to account for the submergence. Our ancestors did the same elsewhere, and they were accounted wise men in their day; but their outlook was arbitrarily confined, and their conclusions therefore were erroneous. It was not---at least it need not have been---a cataclysm which submerged Lyonesse; such a cataclysm, involving a drop of so many feet, would be unique in history. It would have been accompanied by an earthquake that would have shattered every building and monument in Europe. No, it is unnecessary to assume any violent disturbance; for the ordinary movement of the crust will account quite well for the facts.

Thus, too, it was incorrect to infer---if the real authors of the legend ever did, which I doubt---that any land ever wholly disappeared between Land's End and the Scillies. If the preceding argument is correct, the Seven Stones must once have been a habitable island, now reduced to a bare skeleton by subsidence and the erosion of its glacial covering. But it is unlikely---though perhaps not impossible---that the islands were once connected with the mainland. Inference here passes into the realm of speculation.

We meet with a precisely similar case of folk legend in the heart of England; and it probably arose from similar observations of fact imaginatively interpreted. In Shropshire are many meres or small lakes. On the shores of some of them there were prehistoric lake-dwellings; and in one, at Ellesmere, the causeway leading to the settlement (now submerged) has been met with. Of these meres many folk tales are told, recalling times when the site was occupied by a palace, town, or church; and it is said that the bells of the church still lie there, and have even been seen and heard. What is this but a fisherman's inference from the observation of a causeway, "old crocks," wooden piles and such like, encountered while fishing? (It must be remembered that only since the universal use of china for domestic purposes has the villager ceased to recognize potsherds as evidence of occupation; for the broken pots of 200 years ago were not vastly unlike those of prehistoric times, and he knew what these were when he saw them).

Every ancient site doubtless once had its legend to account for its origin. Some doubtless contain an echo of times past, however faint; and others may have arisen from crude rationalization. The Legend of Lyonesse undoubtedly contains a vestige of antiquity, though the land may have sunk with infinite slowness, and Trevilian have hastened in vain.

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