

# VENUS-A YOUTHFUL PLANET

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*The article "Venus - a Youthful Planet " was written in 1963 and was offered for publication in the Proceedings of the American Philosophical Society by Professor H. H. Hess, a member of that Society. The paper was discussed at the editorial board meeting of the Society and caused prolonged and emotional deliberations with the Board split between those favoring the publication and those opposed to it. For several months a decision could not be reached. For a time it was planned to open a new column in the Proceedings, entrust it to Professor E. G. Boring of Harvard, and have it printed there. But this plan was revoked and the decision was made, in order to safeguard the very existence of the Board, to delegate the decision on the article to three members of the society, not members of the Board. Their names were not disclosed but on January 20, 1964, Dr. George W. Corner, Executive Officer of the Society and the editor of the Proceedings, informed Dr. Hess that the decision had been made to reject the article.*

*Subsequently it was also rejected by the Bulletin of Atomic Scientists; in that magazine in April, 1964, an abusive article was published by a Mr. Howard Margolis, attacking Velikovsky and his work. The editor of the Bulletin, Dr. Eugene Rabinowitch, in a letter to Professor Alfred de Grazia, editor of the American Behavioral Scientist, offered Velikovsky an opportunity to reply with an article "not more abusive" than that of Margolis, or, instead, to have some of his views presented in the Bulletin by some scientist of repute. Then Professor H. H. Hess submitted the article " Venus - a Youthful Planet " to Dr. Rabinowitch. The latter returned it with the statement that he did not read Velikovsky's book, nor the article. The case is described in The Velikovsky Affair (University Books), a collection of articles originally printed in the special issue of the American Behavioral Scientist (September 1963), then reprinted with updating material, as a book, in the summer of 1966.*

*[Ultimately, the article "Venus - a Youthful Planet" was published in the April, 1967 issue of the Yale Scientific Magazine . It is reprinted here with a marked timeliness. - LMG]*

The nebular hypothesis of the origin of the planetary family (Swedenborg, Kant, Laplace), also in its modern form (Weiszacker), complies with the uniformitarian principle of Hutton, Lyell, and Darwin. On the other hand, the tidal hypothesis in its original version (a tidal disruption of the sun by a passing star -- Moulton, Chamberlain, Jeans, Jeffreys) and in its variant (the collision of the passing star with one member of a binary star system of which the sun is a surviving member -- Lyttleton, H. N. Russell) is clearly catastrophic. Yet, its originators claimed that the catastrophe was an exception to the rule of the otherwise valid principle of uniformity, according to which only those processes that are observable in our time could have taken place in the past.

This principle, however, is made to a veritable bed of Procrustes if "in our time" is reduced to what an observer can witness within the confines of his lifetime; with such a limitation, the existence of novae must be denied if none is seen at present or has been seen for some time. If we extend the principle of

uniformity to include those seen by observers in earlier centuries, like the nova in Cassiopeia observed by de Brahe in 1572 to 1574 or even the one which was recorded by Chinese astronomers in the year 1054, then, consistently, we are dependent also on the observations of the entire recorded history. The principle of uniformity is followed better if a cosmogonical theory is built not on an assumption of what could have happened during "half an hour" (Gamow) six or nine billion years ago, but on events observed in the last few thousand years and on projection by inference into a more remote past.

## ANCIENT RECORDS

The ancients -- on both sides of the Atlantic and Pacific oceans alike - referred to Venus as to a new member of the solar system. The violent events that occurred during the several stages that led to its settling down in its present orbit are described in manifold records, ranging all the way from sober astronomical minutes to vivid descriptions by witnesses of the events and to legends and myths.

Anyone who has visited Mexico or Guatemala cannot have escaped the omnipresent vestiges of the cult of Quetzalcohuatl or Kukulcan, the Morning-Evening Star of the Mayas, Olmecs, Toltecs, and Aztecs. From about the middle of the second millennium before the present era,\* we have cuneiform records of the motions of Venus (tablets of Ammizaduga) which are in complete disagreement with the presentday elements of orbital motion of the planet. These ancient minutes could not have been errors of a scribe, since the intervals are always given in two ways -- by indicating the dates on the calendar and by telling the exact number of days between the dates. Whereas at present Venus is invisible for about 2 months and 6 days at superior conjunction, according to the tablets, it was absent from the sky for as long as 9 months and 4 days.<sup>(1)</sup> A major change in Venus took place, as related by Varro, "the most learned of all the Romans," on the authority of Adrastus of Cyzicus and Dion of Naples, "famous mathematicians," in the reign of Ogyges: "It changed its color, size, form, course."<sup>(2)</sup>

[Footnote: \*According to Kugler. But see Lynn E. Rose, "Babylonian Observations of Venus," *Velikovsky Reconsidered* (N.Y., 1976), pp. 73-86. LMG]

In China, the astronomer Y-hang, in the year 721, related to the Emperor Hiuen-tsong that, according to earlier authorities in the time of Tsin the planet Venus used to move forty degrees to the south of the ecliptic; the course of the planet Venus changed in the days of Tsin.<sup>(3)</sup>

Originally, the people of Mesopotamia had a "four-planet system," and Venus was not included<sup>(4)</sup>; at a later period Venus was described by the Chaldeans as a "bright torch of heaven," also as a "diamond that illuminates like the sun" and "a stupendous prodigy in the sky"<sup>(5)</sup> that "fills the entire heaven."

The Chinese astronomical text from Soochow refers to the past when Venus, "moving across the sky, rivaled the sun in brightness."<sup>(6)</sup> The Hebrews have in Midrash Rabba to Numbers 21: "The brilliant light of Venus blazes from one end of the cosmos to the other end."

Alexander von Humboldt, who undertook an exploratory voyage to Latin America, wondered: "The star that smoked, *la estrella que humeava*, was *Sitlae choloha*, which the Spaniards call Venus. Now, I ask, what optical illusion could give Venus the appearance of a star throwing out smoke?" Bernardin de Sahagun, the main sixteenth century Spanish authority on Mexico, wrote that the Mexicans called a comet

"a star that smoked."<sup>(7)</sup> In Europe, too, "the ignorant mass of people consider Venus as a comet." wrote Horatio Grassi in 1619<sup>(8)</sup>

In the Talmud, in the Tractate Shabbat, it is said: "Fire is hanging down from the planet Venus": Venus "looks like fire with smoke" according to Atharva-Veda VI: the Chaldeans described the planet Venus as having "a beard," a technical expression still in use in modern astronomy.<sup>(9)</sup> The Arabs called Venus Zebbij, "one with hair," and the Mexicans used for the planet the appellation Tzontemocque, "the mane"; the Peruvians called it Chaska "wavy-haired."<sup>(10)</sup> The Babylonians gave Venus the appellation: "The great star that joins the great stars\* ... the planets Mercury Mars! Jupiter, and Saturn."<sup>(11)</sup>

[Footnote: \*Cf. Lynn L. Rose " 'Just Plainly Wrong': A critique Of Peter Huber." KRONOS IV:2 (Winter-1978) pp. 35-36. - LMG]

These are only a few of the references to the unusual appearance and motion of Venus collected in *Worlds in Collision*; and there, too, only a fraction of extant references to the violent birth and history of the planet is collated. It was described by many peoples of antiquity as having originated in eruption from Jupiter. The giant planet is more than 300 times as massive as Earth or Venus, which have comparable masses.

## MODERN ACCOUNTS

The origin of Venus from Jupiter is by itself no absurdity and actually is claimed among our contemporaries by Lyttleton. Analyzing the quantitative elements of the tidal theory, he came to the conclusion that the so-called terrestrial planets, Venus included, must have erupted from the giant planets, actually from Jupiter, by cleavage. "If a condensation slowly formed from interplanetary material to give a large planet at somewhere near Jupiter's present distance from the sun, the resulting body would rotate in a few hours because of the indestructible rotational momentum of the material drawn into it. With increasing size, its power to draw in material would increase, and its resulting speed of rotation would do so too, and eventually could render it unstable as a single mass because of centrifugal force. It can only get out of this embarrassing condition by breaking into two very unequal pieces ... "<sup>(12)</sup> But since, as time goes on, Jupiter contracts ever more and the speed of its rotation increases, disruption and the birth of a planet by cleavage need not be placed far into the past - the later the riper are the conditions for a disruption.

Whereas Lyttleton analyzed the origin of the terrestrial planets in the frame of the tidal theory, W. H. McCrea, at the same time (1960), analyzed the nebular theory and came to the conclusion that "the Roche limit for the estimated initial density of the planets so formed is at about Jupiter's orbit; thus the theory requires a differentiation between planets formed outside and inside this distance."<sup>(13)</sup> Because of the disruptive force that the gravitational mass of the Sun must have exercised on the planets in formation, no planet could have been formed inside the Jovian orbit. The analysis of McCrea is valid also for that variant of the tidal theory that has the disrupted gas and dust masses assembling in flocculi. He calculated that tens of thousands of years were sufficient for the Sun to acquire its shape and for the planets to settle in the plane of the ecliptic.

McCrea's demonstration that no planet could have originated inside the Jovian orbit and Lyttleton's claim that the terrestrial planets have originated from Jupiter by disruption are complementary. Since 1950, more than one critic of *Worlds in Collision* from among the astronomers has objected to the notion of Venus

having erupted from Jupiter and traveled on a cometary orbit with a trail of meteorites and gases. Comets are thought to be very unsubstantial bodies, a notion that can be traced to Aristotle, who believed them to be atmospheric apparitions like rainbows. N. T. Bobrovnikoff, Director of Perkins Observatory, studied the orbits of the comets of 1668, 1843, 1880, 1882, 1887, and concluded that they originated in "decomposition of one single body." (Actually the comet of 1882 fell apart into five comets before the observers.) "If put together all these comets would make something like the mass of the moon."<sup>(14)</sup>

S. K. Vsekhsviatsky, of Kiev Observatory, in a series of works claims that comets of short periods must be very recent bodies, their age being counted up to a few thousand years only, and they must have originated mainly from Jupiter, but also from other planets (Saturn, Mars, and Venus) by eruption. The loss in brilliancy of comets with every return, actual observations of their fragmentation, and complete disintegration and non-return, evidence their recentness; their orbits point to their origin from planets. When confronted with the counter-argument based upon the high escape velocity from Jupiter, Vsekhsviatsky retreated in his later publications insofar as he considers the major satellites of Jupiter the source of eruption of the so-called Jovian family of comets.<sup>(15)\*</sup>

[Footnote: \* See S.K. Vsekhsvyatskii, "The Origin and Evolution of the Comets and Other Small Bodies in the Solar System," KRONOS 11:2 (Nov.-1976), pp. 46-54. - LMG]

On the ground of ancient texts, it is claimed in *Worlds in Collision* (p. 373) that "the collision between major planets brought about the birth of comets. These comets moved across the orbits of other planets and collided with them. At least one of these comets in historical times became a planet -- Venus." In such near-collisions, eruptive forces could exceed escape velocities, and the red spot on Jupiter could conceivably be the locus of a major eruption.

For the thesis that Venus erupted from Jupiter in historical times and went through a series of stormy events before settling on an orbit, the natural sciences must possess independent evidence. Such events theoretically could have happened -- following the syncretized notions of McCrea, Lyttleton, and Vsekhsviatsky; but to show that they have happened, I have formulated the following claims as crucial tests of the concept:

(1) Venus must be very hot (*W. in C.*, "The Thermal Balance of Venus").

(2) Venus must be enveloped in hydrocarbon (and possibly carbohydrate) dust and gases (*W. in C.*, "The Gases of Venus").

(3) The motion of Venus has been disrupted in near collisions with other celestial bodies and in capture by the Sun (*W. in C.*, pp. 77-8, 85, 94, 141f., 259, 371), and therefore its rotation may well be retrograde.

### **CRUCIAL TEST (1): VENUS MUST BE HOT**

As to the first proposition, it has been known since the 1920's that the cloud surface of Venus is ca. -25°C cold, on the illuminated and the shadowed sides alike.<sup>(16)</sup> The radiometric data suggested a swiftly rotating planet with the shadowed side having no time to cool off during a very short night; but the spectroscopy detected no Doppler effect. The contradicting data gave birth to diverging estimates of the rotational

period of the planet. In *Worlds in Collision* I wrote: "In reality there is no conflict between the two methods of physical observation. The night side of Venus radiates heat because Venus is hot. The reflecting, absorbing, insulating, and conducting properties of the cloud layer of Venus modify the heating effect of the sun upon the body of the planet; but at the bottom of the problem lies this fact: Venus gives off heat."

After reiterating the short but stormy history of Venus from "its birth and expulsion under violent conditions, its existence as a comet on an ellipse which approached the sun closely; two encounters with the earth accompanied by discharges of potentials between these two bodies and with a thermal effect caused by conversion of momentum into heat; a number of contacts with Mars, and probably also with Jupiter. Since all this happened between the third and first millennia before the present era, the core of the planet Venus must still be hot" (p. 371). On its approach 34 centuries ago, Venus was "in a state of candescence" (p. 77).

In 1954 Kozyrev calculated the ground temperature of Venus as 30°C; he observed an emission spectrum from the night side of Venus, but ascribed it to lightnings in the upper cloud layer of the planet.<sup>(17)</sup>

Because of the high albedo of the cloud cover of Venus, its surface mean temperature was calculated by Firsoff in 1959 to be only 17°C, or 3° above the annual mean temperature of Earth.<sup>(18)</sup> But by 1961 Cornell H. Mayer, F. Drake, and their collaborators detected that the surface temperature of Venus, as evidenced by radio emission, is 600°F, or 315°C. Dr. F. Drake wrote: "We would have expected a temperature only slightly greater than that of the earth, whereas the actual temperature is several hundred degrees above the boiling point of water." Radioactivity could not be the cause: "Sources of internal heating will not produce an enhanced surface temperature, simply because the conductivity of the atmosphere itself is very high compared with any conductivity we can imagine for the outer portions of the planetary body, and would carry away heat conducted to the surface too quickly to allow significant rise in the surface temperature."<sup>(19)</sup> Cornell Mayer, however, relying on G. Kuiper's figure of only 170°F as the greenhouse effect of carbon dioxide, considered that "if the surface is really at 600 degrees" there may be "some source of surface heat in addition to solar radiation."<sup>(20)</sup>

Obviously, if the planet is billions of years old, it could not have preserved its original heat; also, any radioactive process that can produce such heat must be of a very rapid decay, and this again would not square with an age of the planet counted in billions of years. Therefore, hopes were expressed that the projected Mariner II probe would detect a considerably lower surface temperature, or that the source of the radio emission would prove to be in an ionosphere surrounding Venus.

But the Mariner II probe detected an even higher surface temperature of Venus, namely 800°F, over two hundred degrees higher than the temperature at which lead is molten. In 1954 the ashen light (the luminosity of the night side of Venus as seen through a telescope) was explained by the presence of an ice cover on the planet;<sup>(21)</sup> but at the detected temperature any ice is excluded and the ashen light seems more properly to be incandescence glowing through the envelope.

The figure -25°C for the cloud surface of Venus found in 1923-1928 by Pettit and Nicholson was re-examined by them in 1955 on the basis of their original records and changed to -38°C for the illuminated part of the disc and -33°C for the nocturnal part of it.<sup>(22)</sup> In 1956 Sinton and Strong measured -40°C for

both sides. If the measurements of these two pairs of researchers are given to comparison, they would suggest that in thirty years the temperature of the cloud surface fell by 2° C or more; this, too, would point toward the youthful age of the planet; careful renewed measurements at intervals of a decade or so are recommended here.

Another phenomenon requiring closer scrutiny is the fact that in agreement with Pettit and Nicholson the Mariner probe found the shadowed part of the disc warmer than its illuminated part.<sup>(23)</sup> If the difference is borne out by more probes, it may suggest that chemical processes occurring on Venus favor a concentration of a limited supply of oxygen on the shadowed side of the planet and petroleum fires there. Actually, in *W. in C.* ("The Thermal Balance of Venus") it is stated: "Moreover, if there is oxygen present on Venus, petroleum fires must be burning there."\*

[Footnote: \* *Pioneer- Venus Early Findings*: "Observations of what could be 'mysterious chemical fires' on Venus' surface." - LMG]

## **CRUCIAL TEST (2): VENUS HAS AN ENVELOPE OF HYDROCARBON DUST AND GASES.**

In *Worlds in Collision* I purported to establish "(1) that there were physical upheavals of a global character in historical times; (2) that these catastrophes were caused by extraterrestrial agents; and (3) that these agents can be identified" (from the Preface).

In addition to and in support of the historical evidence of such events (*Worlds in Collision, Ages in Chaos* [1952]), I collected in *Earth in Upheaval* (1955) the concurring geological and paleontological evidence as far as the first two points are concerned. Earth passed through the fabric of meteorites, dust, and gases. According to old written records, Hebrew, Babylonian, and Mexican, and also to the oral traditions of the primitive races in Indonesia, Siberia and other parts of the world, bituminous liquid poured from the sky in the midst of a global upheaval. "There descended from the sky a rain of bitumen and of a sticky substance" - so in Manuscript Quiche; the age ended in a "rain of fire" (Annals of Cuauhtitlan). "A stream of hot naphtha" over Egypt (Midrash Tanhuma and other sources),<sup>(24)</sup> "the rain of fire" of Akkadian texts, or "the fire water from the sky" that caused conflagration of several years' duration, of the oral tradition of the Voguls of Siberia -- illustrate what is said here by a few examples. In Mexican texts, as well as in those of the Assyrians and some others, Venus is named as the source of this outpouring. Thus Assurbanipal refers to Ishtar-Venus, "who is clothed with fire and bears aloft a crown of awful splendor, [and who] rained fire over Arabia."<sup>(25)</sup>

In the years that followed the Exodus, the world was enveloped in dense clouds ("Shadow of Death" of the Israelites wandering in the Desert, "Goetterdaemmerung" of the Nordic races); out of this envelope some honey-oil tasting substance precipitated (manna of the Hebrews, ambrosia of the Greeks, honey of the clouds of the Hindus, morning sweet dew -- the only sustenance in the years of gloom of the Scandinavian people).

If Venus poured bituminous stuff on Earth, we would do right to make the following three conclusions which I also offered in *W. in C.*:

(a) At least some of the deposit of oil must date back to only thousands of years, not millions as it was

generally assumed in 1950<sup>(26)</sup> (p. 54 ff.);

(b) Some of the meteorites must have hydrocarbons on them (p. 55);

(c) Venus must have hydrocarbons and carbohydrates in its clouds (pp. 369, 381).

As to (a), I was referred in 1952 by W. F. Libby, to whom I had submitted a request of radiocarbon testing of petroleum, to a paper by P. V. Smith<sup>(27)</sup>: The petroleum of the Mexican Gulf area was found to have been deposited sometime *during* the last 9,200 + 1,000 years, as this is its C14 age. Smith commented: "The most prevalent viewpoint, perhaps, has held that burial of the original complex organic matter by several millions of years were necessary conditions for its conversion into hydrocarbons ... One of the surprising results of this study has been the discovery of liquid hydrocarbons in recent sediments from the Gulf of Mexico."

As to (b): hydrocarbons were found on meteorites and the find was termed also "surprising" (Nininger)<sup>(28)</sup>; soon thereafter even vestiges of organic life were detected (by Nagy and collaborators). Thus the middle link of the three-link chain was discovered.\*

[Footnote: \* Also see *New Scientist* (17 Nov. 1977), pp. 402404; "Lifecloud," by Sir Fred Hoyle and Chandra Wickramasinghe in the February 1979 issue of *OMNI* (pp. 67ff.); *Second Look* (Feb. 1979). - LMG]

As to (c), I have selected it for a crucial test that, if right, would reasonably confirm the entire trend of deductions as summarized in the Preface to *W. in C.*, namely concerning global catastrophes in historical times, their extraterrestrial cause, and the identity of one of the main agents. Four years before the publication of *W. in C.* I applied to H. Shapley for a spectroscopic analysis of Venus' atmosphere as to the presence of hydrocarbons: he termed the surmise as "surprising" but advised me to consult R. Wildt and W. S. Adams. To both of them I wrote in the summer of 1946 requesting a re-examination of the spectrogram of the atmosphere of Venus for hydrocarbon dust and gases. [Also see the back cover. -- LMG] Wildt answered that the absorption spectrum of the atmosphere of Venus shows no evidence of hydrocarbons. Adams pointed out that the absorption bands of most petroleum molecules are in the far infrared, below the range of photographic detection, and that hydrocarbons known to absorb in the detectable range are not apparent in the spectrum of Venus.

Nevertheless, trusting in the correctness of the theory and its terminal deduction, I let the claim stay in the published version of *W. in C.* ("The Gases of Venus"): "On the basis of this research, I assume that Venus must be rich in petroleum gases. If and as long as Venus is too hot for liquefaction of petroleum, the hydrocarbons will circulate in gaseous form."

I also assumed that hydrocarbons on Venus were created "by means of electrical discharges" between the constituents of the Venetic atmosphere; and that these constituents were derived from the Jovian atmosphere rich in methane and ammonia. In 1960 A. T. Wilson succeeded, by means of electrical discharges, to combine methane and ammonia into heavy molecules of hydrocarbons;<sup>(29)</sup> and in 1962,<sup>(30)</sup> fortified by the published finds of hydrocarbons on meteorites,\* he claimed petroleum deposits on the Moon and extraterrestrial origin of the entire deposit of petroleum on Earth, a postulate that even in a

restricted form ("some of the deposits of oil") caused strong opposition in 1950.<sup>(31)</sup>

[Footnote: \* In the Dec. 17, 1960 issue of *Nature*, A.T. Wilson also stated that "... *organic material of high molecular weight has been found in meteorites. Do the clouds of Venus contain this material?*" (p. 1008, emphasis added). - LMG]

The Mariner II probe disclosed that Venus is encircled by an envelope possessing certain outstanding physical qualities: While the ground temperature of Venus is ca. 800°F hot, the envelope that begins 45 miles above the ground and is ten to fifteen miles thick, has a temperature of 200°F on the inside and -40° F on the outside. In order to be rather homogeneous at such divergent temperatures and serve as a heat barrier, the envelope must consist of compounds that can condense and polymerize at such temperatures; more exactly, it must be rich in CH radicals polymerized to heavy molecular compounds. These would be hydrocarbons, and on February 26, 1963, when the results of the Mariner II probe were published, hydrocarbons - gases and dust -- were announced as the contents of the envelope. Later, in a private communication, Lewis D. Kaplan of the Jet Propulsion Laboratory, the authority for that statement, corrected himself by claiming polymerized CH molecules, which could be hydrocarbons as well as carbohydrates.<sup>(32)</sup>

It is a comparatively simple task to identify in laboratory tests the diverse molecules with the required insulating qualities only; but ascribing the heat to a greenhouse effect of trapped solar radiation necessitates finding compounds that would combine a high opacity for heat radiation with transparency for visible light; in disagreement with pre-Mariner belief in abundance of CO<sub>2</sub> in the cloud envelope of Venus, it was found that it may be present in some quantity only below the envelope; water is rare; and thus a greenhouse effect due to those two compounds that permitted Kuiper to account for 170°F cannot account even for such temperature; all of which points to the true source of the heat of Venus: Venus is hot not because of a greenhouse effect but because of its internal heat.

### **CRUCIAL TEST (3): DISTURBED AXIAL ROTATION OF VENUS**

The third find resulting from Venus probes of the end of 1962 is that the planet rotates very slowly, and, what is most remarkable, clockwise, or in a retrograde direction. This fact was brought out in a definite way by R. Carpenter and B. Goldstein, of the Goldstone Radar Tracking Station, at the very time of Mariner's probe between October 1 and December 17, 1962. The nebular and tidal theories alike expect no such phenomenon: the mechanical considerations involved contradict such a result. The few satellites with retrograde revolution are regarded to be captured bodies; retrograde rotation could be explained if Venus were a body captured by the Sun; but this would signify an entirely different cosmogony, for this planet, at least. The announcement of the Goldstone Tracking Station's scientists caused comment at the meeting of the American Geophysical Union at Palo Alto, California, the last week of December 1962, that "Maybe Venus was created apart from the other planets, perhaps as a secondary solar explosion, or perhaps in a collision of planets."<sup>(33)</sup>

According to the story as revived in *W. in C.*, Venus was captured by the Sun; before that, between its eruption from Jupiter and settling on its present orbit, it was repeatedly disrupted in its motions (pp. 77-8, 85, 94, 156, 371).



The three finds - a very hot planet, its temperature contradicting all theoretical calculations and defying all explanation after being discovered; a 10 to 15 mile thick envelope consisting of heavy molecules rich in CH, whereas the claim of such composition of the cloud envelope on Venus was clearly negated on the basis of spectral studies as known in 1950; and the retrograde slow rotation in conflict with all until recently legitimate theories of planetary origin -- these three facts point to the youthful age of the planet Venus.

The human testimony and modern finds on Earth, on meteorites, and on Venus are in agreement. There remains, however, the question of how could Venus obtain a nearly circular orbit, actually the closest to a true circle of all planetary orbits -- and a few other questions as well. They were not out of the sight of the author of this paper, and they contributed to his insistence on the existence of electromagnetic interrelations between the celestial bodies and magnetic fields permeating the solar system, a subject that requires a separate treatment.

### POSTSCRIPT, 1967

Two discoveries made since this paper was written in 1963 need to be recorded. One of them concerns the problem of Venus' temperature. Measurements were made of the 11 cm. wavelength emission from Venus, at Green Bank Observatory and reported by K. I. Kellermann in the September 1966 issue of *Icarus*, and strongly suggest that the heat of the ground surface of Venus comes, not from the atmosphere above, but from the sub-surface.\*

[Footnote: \* It should be noted that Carl Sagan was an Associate Editor of *Icarus* at the time. Was he oblivious of Kellermann's findings? - *LMG*]

The other discovery was announced by P. Goldreich and S. J. Peale of the University of California, Los Angeles, and reported at the annual meeting of the American Geophysical Union on April 23, 1966. The surprising discovery dealt with the axial rotation of Venus, already known to be slow and retrograde. Every time Venus passes between the sun and the Earth, it turns the same face to the earth. Gravitationally, this phenomenon cannot be explained; even if Venus were lopsided, as some science writers have offered as the explanation, it would have been locked with the very same face toward the sun, whose gravitational pull on Venus is so much stronger than that of the earth; this "resonance" as the discoverers of the phenomenon termed it, if confirmed, is a sure piece of evidence of close contact in the past between Earth and Venus, evidence not erased by the passage of time, in this case the time measured in a mere few thousand years.\*

[Footnote: \*See Robert W. Bass, "Did Worlds Collide?", *Pensee* VIII (Summer-1974), p. 18; cp. Lynn E. Rose, "The Rotational Resonances of Mercury and Venus," *KRONOS* 11:1 (Aug., 1976), pp. 21ff . - *LMG*]

The short but stormy history of Venus is behind the phenomena discovered -- the excessively massive envelope enshrouding the planet, the envelope's contents of hydrocarbon dust and gases, the metal melting temperature of Venus, the retrograde rotation, and now also the resonance phenomenon. I maintain that Venus' temperature is slowly but unmistakably decreasing. A measurement from the ground surface of Venus cannot be performed with the methods now available with accuracy sufficient to detect the

phenomenon in a matter of a few years; but, with a bolometer or thermocouples, a drop, even if in only fractions of a degree, could be detected from the cloud surface of Venus; such measurements need to be repeated at each successive synodical period of Venus, of which there are five in eight terrestrial years. It is understood that only figures obtained by one and the same observatory and from the very same surface segments, preferably also all taken during a quiet period of the Sun, can be profitably compared. On this new test, I am once more prepared to rest my case.

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