Gems & Gemology

A bi-monthly periodical, without paid advertising, supported by subscriptions from Gemologists and other gem enthusiasts, aims to increase the gem merchant's knowledge and ability in order that he may protect more thoroughly his customers' best interests.

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In This Issue:

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EDITORIAL FORUM

We were pleased when the first paragraph of our July-August *Editorial Forum* was quoted by another trade journal. Then another paper printed the whole *Forum* and we considered ourselves very good indeed. It is a good feeling—to know that your work has been of sufficient merit to be repeated by competitors.

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But the *Northwestern Jeweler* went one better. They reprinted seven of our best articles in their August issue. For five of them they gave us credit—a terse "Gems & Gemology" at the end of the material.

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"CHINESE TURQUOISE" APPEARS*

A new material which is being used as a gem substitute has recently been detected in the laboratory of the Gemological Institute. This material is evidently a combination of soapstone, calcite, and quartz. The substance is easily carved because of the softness of the soapstone and calcite. It is scratched by fluorite, which is four in hardness, and less easily by calcite; a knife blade, even of very inferior steel, cuts into it readily. The hardness test is the quickest means of identifying this material. The two specimens which have been tested by the G.I.A. are light blue and dark blue respectively, and had undoubtedly been dyed. The natural material, it was found by scraping one of the specimens, is practically white with a soapy appearance. Both pieces were carved in the Oriental manner and mounted in thin, gold-plated silver rings. The dark blue was sold as "Lapis-Lazuli" and the lighter blue was represented as "Chinese Turquoise." It is logical to assume that specimens dyed other colors—particularly green, in imitation of jade—will eminate from the same source; therefore, gem and jewelry buyers are warned to be on the lookout for them.

No Seed Pearl Nuclei

Concerning the letter written by you about the possibility of real pearls being used as nuclei in cultured pearls:—I have never denied the possibility that such pearls may have been produced experimentally, but I maintain that if such products were to be marketed on a large scale they would be heralded by a great flourish of Japanese trumpets and loudly advertised as "exactly the same as natural pearls," etc., etc. Also, never among the thousands of cultured pearls tested here have any types occurred other than those containing the usual mother-of-pearl bead. In this connexion, I would add that in my opinion a classification of cultured pearls according to the thickness of the outer coating would not be very sound, as the finest quality cultured pearls are often those having a rather thin skin. (Not *very* thin, of course.)—Note by B. W. ANDERSON, *Diamond, Pearl and Precious Stone Trade Section, London Chamber of Commerce.*

Spectroscope Tests

A number of interesting results were found when a number of gems were tested in a spectroscope at California Institute of Technology, Pasadena. An especially noteworthy phenomenon was found in a synthetic greenish blue spinel by Robert Shipley, Jr., Laboratory Director of the Gemological Institute. The spinel showed definite bands indicating chromium in the stone; however, chromium has never before been reported as a cause of this particular color. A further test, in ultra-violet light, showed the stone to fluoresce with the same pale-red color which is characteristic of synthetic ruby—a gem known to be colored with chromium. The spectroscope tests revealed other unexpected facts. Several garnets of an unusual red-purple color, which were formerly tested and classified on the basis of their physical and optical properties as pyrope garnets were proved to be in reality the variety of garnet commonly called rhodolite.

*A.G.S. Research Service.

PEARL TESTS*

ROBERT SHIPLEY, JR.

The volume of recent discussion—in these pages and elsewhere—of the distinction between natural and cultivated pearls has caused a revival of the discussion of methods of pearl testing. The research staff of the G.I.A., working under the direction of Dr. René Engel of California Institute of Technology, and a Member of the Advisory Board of the G.I.A., has investigated several methods of determining cultivated and natural pearls. So far the greatest amount of attention has been given the Endoscope owned by Brock and Co. of Los Angeles. This machine throws an intense beam of light through a needle inscribed in the drill hole of a pearl. Upon the end of the needle which is in the pearl are two mirrors, back to back, and inclined at a 45° angle to the length of the needle. Light falling upon the first mirror is shot against the wall of the drill hole. The theory of the test is that in the case of a genuine pearl, concentric spherical layers cause the lights to reach the second mirror and be visible through the open end of the drill hole. The light which is not sent to the second mirror is reflected and refracted to every spot in the pearl, illuminating it with an even, diffused glow. If the testing pearl be cultivated, the light from the first mirror is carried off by the plane parallel layers of the mother-of-pearl center, and little or none reaches the second reflector. The light is carried between the layers in such a manner that the surface of the pearl shows a single distinct band or spot of light instead of even illumination.

The distinction made by this machine is by no means as sharp as the above discussion would indicate. For the majority of drilled pearls, the Endoscope furnished a quick and decisive test. A few pearls gave rather indecisive results which made their determination difficult. Also, the Endoscope is a very expensive instrument and is rather difficult of operation—nor will it function on any but drilled pearls.

Undrilled pearls are another matter. Obviously the Endoscope is useless for testing them. Two methods have been experimented with in the G.I.A. laboratory. The first and most promising is the use of a microscope in what is thought to be a manner never before attempted, the pearl illuminated by an intense light which will allow a study of its interior to be made. The second test is the appearance of the pearl in strong ultraviolet light. Cultivated pearls generally show an even fluorescence, green in color, to their very center. Genuine pearls, on the other hand, are prone to exhibit a dark or "dead" spot at their centers. However, this test is likewise too indefinite to be of value except as a check upon some more positive means of identification.

The experiments on pearl testing instruments are as yet scarcely begun. Enough work has been done to convince Dr. Engel and his fellow workers that no one of the instruments tested is capable of distinguishing in every case whether a pearl is natural or cultivated, but that a method of procedure—perhaps involving two or more instruments—can be discovered which will overcome this situation. The experimental work is being continued and it is hoped that a further, more definite report can be published at an early date.

*G.I.A. Research Service.

HOPE DIAMOND STILL IN EXISTENCE

G. FREDERICK SHEPHERD
Museum of Science and Industry, Chicago, Illinois

Contrary to wild rumors regarding the famous Hope Diamond, it is still extant and is the proud possession of Mrs. Edward B. McLean of Washington. This stone is said to be worth approximately $300,000. At the present time, Mrs. McLean is on an extended trip into Greenland and other points in the North Atlantic and, without fears or dread that her ship might be wrecked, is wearing this diamond in her necklace.

In a recent issue of the *Gemmologist,* Major J. F. Halford-Watkins reported that the Hope Diamond, which was supposed to have brought bad luck to its owners, had met its just fate in sinking with the *Titanic* in 1912. Stories have even percolated around that this diamond was the cause of the sinking. I suppose that whoever started this story thinks that some Oriental genii had an iceberg shoved into the path of the *Titanic* because the Hope Blue was on board!

It seems impossible to put an end to such ridiculous ideas as are held, that if the owner of some famous stone meets with a series of misfortunes, that stone is the cause of the ill luck. True, some of the past owners of the Hope Diamond had had some bad luck, but who hasn't? Perhaps people in the coming generations will be intelligent enough not to blame an opal or some stone reputed to bring bad luck, if the owners happen to meet with tragic ends.

In "The Magic and Science of Jewels and Stones," Isadore Kozminsky states that the Hope Diamond was sold by Mrs. McLean to Monsieur de Hautvi'le and he goes on to tell of all the tragic deaths that came to this family shortly after. I do not doubt the statements about the tragedies of de Hautvilles, but I am assured by first-hand information that he does not own the Hope Diamond and, therefore, this innocent stone cannot be the cause of their troubles. Mrs. McLean has owned this gem since 1912.

Several questions have been raised about this stone being at A Century of Progress. It has been, but only as a pendant to

a necklace worn by Mrs. McLean. On her visit to the Fair earlier this season she was wearing the genuine, original Hope Diamond which she is now said to be wearing on her extended trip. At the World's Fair the stone was seen by Mr. J. F. Sullivan of the Diamond Exhibits Corporation. Mr. Sullivan has been associated with the De Beers Company for 42 years and is considered a diamond expert. In an interview with Mr. Sullivan, he related the following account of his experience with the Blue Gem.

Mrs. McLean walked in the Diamond Exhibit, General Exhibits Building, went straight to Mr. Sullivan and said:

"Hello, South Africa, how are you?"

"Very well, Madam," Mr. Sullivan replied.

"Are you superstitious?" Mrs. McLean went on, with a smile.

"Not a bit," was the definite answer.

Mrs. McLean then took off her necklace and placed it in his hands.

"Here is the Hope Diamond," she said calmly.

Mr. Sullivan examined the gem closely for several minutes and says that without doubt it is a true diamond, steel blue in color, weighing about 40 carats.

Mr. Mercer, manager of the Diamond Exhibits Corporation, informed me that they offered Mrs. McLean nearly $10,000 for the privilege of exhibiting her diamond at A Century of Progress, but she refused with her characteristic smile. She has tried on several occasions to sell the stone, or to get a loan on it, but without success.

For two and a half centuries the glittering Hope Blue has been one of the world's famous precious stones. Its tragic history began in 1688, when it was stolen from a Hindu temple. It was, according to the superstitious, immediately invested with an Oriental curse which falls upon all who own it. Eventually it was sold to Louis XVI, who presented it to Marie Antoinette shortly before she was sent to the guillotine. Since then, bad luck has pursued its owners (so they say), until it came into the possession of Mrs. McLean. Her wearing it as constantly as she does certainly testifies to her disbelief in these wild claims as to its destined ill favor.

UNINTENTIONAL CODE VIOLATIONS*

The record of corundum and spinel determinations made at the G.I.A. laboratory indicates that two of the provisions of Article VIII, Rule 1 of the Code of Fair Competition for the Retail Jewelry Trade, are being violated rather frequently. The two paragraphs referred to are:

"(h) No retail jeweler shall use the word 'diamond,' 'emerald,' 'ruby,' 'sapphire,' or 'pearl' in selling, offering for sale, or advertising for sale any article or articles that are manufactured, produced or artificially cultured or cultivated as an imitation of, or substitute for, any real or natural diamond, emerald, ruby, sapphire, or pearl, as defined hereafter, without using a word or words conspicuously and clearly portraying that the article is manufactured, produced, or artificially cultured or cultivated, as the case may be.

"(i) No retail jeweler shall use the word 'real,' 'genuine,' 'natural,' or any other word of similar meaning, in any way in connection with, or as descriptive of, any article or articles that are manufactured, produced, or artificially cultured or cultivated, as an imitation of, or substitute for, any precious or semi-precious stones or pearls."

Over a representative period, 33 corundum and spinel gems were received from all parts of the United States for determination at the G.I.A. Laboratory. Most of these stones were doubtfully classified or were thought to be genuine. Gems definitely known to be synthetic are seldom sent to the Institute. The 33 stones were determined as follows:

Genuine	*Synthetic*
3 Rubies	9 Rubies
4 Blue Sapphire	5 Blue Sapphires
0 Alexandrite-like Sapphires	2 Alexandrite-like Sapphires
2 Fancy Sapphires	3 Fancy Sapphires
0 Blue Spinel	4 Blue Spinels
0 Yellow Spinel	1 Yellow Spinel
9 Genuine Stones	24 Synthetic Stones

As stated before, most of these stones were thought by the jewelers who sent them to be genuine. Some belonged to customers but a large proportion were in the jewelers' stocks. One ruby, of approximately 2¼ carats, had been bought at a price of almost $100.00 per carat. The two alexandrite-like sapphires had been bought in the Orient at fancy prices for genuine alexandrite. During the same period of determinations, one genuine chrysoberyl was tested by the G.I.A. The five synthetic spinels were without exception thought by their senders to be genuine zircons. During the period, but one genuine zircon was determined. Oddly enough, one of the genuine rubies and one of the genuine sapphires had been thought synthetic by their owners.

The import of this record of determinations is obvious. If more than two-thirds of the stones received at the Institute proved synthetic, the pro-

*A.G.S. Research Service.

portion in jewelers' stocks must be similar. And if a synthetic, even though ignorantly, is advertised or sold without the qualifying "synthetic," it is a direct violation of the Code and punishable by the loss of the Blue Eagle, and perhaps also by a heavy fine.

Moreover, even a gem expert could not have determined most of the 33 stones without a fine microscope. In all but two or three cases, magnifications of over 300x were necessary before a determination could be made. More than half of the gems were of good color and lacked the off-tint which betrays a synthetic to an experienced dealer. One padparadscha (orange sapphire) required several hours' work and 800 magnifications; it was finally proved to be genuine. On the other hand, a ruby which required even longer to work out, using the same magnification, was proved synthetic.

A reasonable number of determinations sent by A.G.S. students as well as those sent by students of the G.I.A. are performed in the Institute laboratory without charge. Therefore, the students of both organizations are urged to send doubtful gems classified as genuine ruby or sapphire, or as zircon or alexandrite, to the laboratory for a definite determination. To non-students a minimum fee of $3.00 will be charged, and will not be exceeded without first notifying the sender. Associate Members of the A.G.S. are entitled to a 33⅓% reduction in this fee, making the minimum $2.00.

Acquire Kunz Library of Gems

The extensive collection of works on precious stones, gems, and jewels formed by the late Dr. G. Frederick Kunz, of New York City, who for many years was associated with the U. S. Geological Survey, was bequeathed by him to his widow, Mrs. Opal Logan Kunz, of New York City, and to his daughter, Mrs. Hans Zinsser, of Boston, Mass. Through the good offices of Mr. Walter E. Reid, Mrs. Kunz and her daughter presented the collection to the Geological Survey Library with the understanding that any items not desired by that library were to be sold, their proceeds to revert to the estate. There were some items unsuited to the collection of the Geological Survey Library; the Library of Congress was given the first opportunity to examine the collection and have already purchased 270 volumes and pamphlets and have placed an order for 174 additional volumes and 3 maps, which have not yet been delivered. The volumes acquired include scientific books and periodicals and many works in limited editions and fine bindings. The most outstanding items are quite widely varied in subject material; they comprise three medieval manuscripts, the collection of works relating to Jeanne d'Arc, the rare Mercator Atlas, Amsterdam, 1623, etc.

The report above was obtained through the particular effort of Mr. Al C. Reade, head of the book order department of the Los Angeles Public Library. The G.I.A. has secured a catalogued list of books of the Kunz Library which are now in the Geological Survey Library. This list will be incorporated in the gemological bibliography which will soon appear in *Gems & Gemology*.

GEMOLOGICAL GLOSSARY

(Continued from Last Issue)

Carbon Spots. Opaque black specks or spots in diamonds.

Carborundum (kar"boe-run'dum). An artificial abrasive discovered in 1931. It is a crystallized carbide of silicon (Csi). It is the hardest known substance with the exception of the diamond, being harder than corundum but more brittle (between 9 and 10 in hardness).

Carbuncle (kar'bun-k'l). Any red garnet; or sometimes, incorrectly, a ruby, spinel, or other red gem—cut convex or cabochon; there is no such specific mineral.

Carnelian or cornelian (kar-nele'-yan). A variety of quartz belonging to the chalcedony group. Red to reddish brown. Rarely light yellow. The only difference between carnelian and sard is that of color; brownish shades being called sard. Often used for seals. See also Sard.

Carnelian-Onyx. Onyx with red and white bands. Simple onyx is black and white.

Cascalho (kas-kal'yoe). Diamond-bearing gravel of Brazil.

Casein (kae'see-in). A product produced by treating animal milk with acid. Molded and used to imitate ivory, tortoise-shell, amber, horn, ebony, agate, malachite, and other decorative materials.

Cashmere or Kashmir (kash'mere or kash"mere'). A territory in Northern India. (See Maps.) Also a grading of sapphires; those of finest cornflower blue color.

Cassiterite (ka-sit'er-ite). Tin-stone. Gem quality rare. It is the most important tin ore. Hardness 6-7; R.I. 1.99-2.09; Specific Gravity, 6.8-7.1. Red, grey, or yellow. Transparent to opaque.

Catalin. Product similar to bakelite.

"Catalina Sardonyx" (kat"a-lee'na). Catalinite.

Catalinite. Beach pebbles from Santa Catalina Island, California.

Cathode Rays (kath'ode). Rays projected from the cathode of a vacuum tube in which an electric discharge takes place. By impinging on solids the cathode rays generate Rontgen rays or X-rays.

Cat's-Eye. A term applied to gems which, when cut cabochon show a band of light, usually across inclusions of parallel fibres of asbestos; name derived from resemblance to the eye of a cat. (Is applied by many authorities to any stone with what in German is called a billowy, gleaming light effect.) See also Alexandrite Cat's-Eye, Chrysoberyl, Cymophane, Hawk's-Eye, "Hungarian" Cat's-Eye, "Occidental" Cat's-Eye, Oriental Cat's-Eye, Quartz Cat's-Eye, Tiger-Eye, and Tourmaline Cat's-Eye.

Cat's-Eye Opal. The rarest form of Harlequin exhibiting a chatoyant line over the center of the dome somewhat similar to the cat's-eye and usually of a bright green color. Seel also Harlequin Opal.

Cat's-Eye Sapphire. A term sometimes applied to sapphires with milky, floating light more properly called Girasol Sapphire.

Celestial Stone (se-les'chal). Turquoise.

Cellular (sel'ue-lar). Full of small openings—sponge-like.

Celluloid (sel'ue-loid). Manufactured product substituted for amber, jet, and ivory.

Centigrade (sen'ti-grade). A thermometer on the scale of which the distance between the two standard points, the freezing point and boiling point of water, is divided into one hundred equal parts or degrees.

Cer-agate. Chrome-yellow agate from Brazil.

Cerulene (se-rue'lene). Trade-name for a form of calcium carbonate colored green and blue by malachite and chessylite; found near Bimbowrie, South Australia, and used as a gem stone.

Ceylon Cat's-Eye (see-lon'). Chrysoberyl cat's-eye.

Ceylon Chrysolite. Yellowish-green or greenish-yellow tourmaline.

Ceylonese Zircon (see"lon-eze' or ese'). Fire-red cloudy zircon.

"Ceylon Hyacinth." Hessonite Garnet.

Ceylonite (see'lun-ite). Dark-green to black spinel. Opaque but sometimes used for ornamental wear.

"Ceylon Opal." A variety of feldspar-moonstone.

"Ceylon Peridot." Honey-yellow or yellowish-green tourmaline.

"Ceylon Ruby." Incorrectly applied to almandine garnet from Ceylon; also correctly a pale ruby.

Ceylon Sapphire. An American trade-name for pale blue sapphire (corundum).

Chalcedony (kal-sed'o-ni or kal'se-do-ni). The cryptocrystalline subspecies of quartz. Transparent to translucent, light colored, white, grey, red, brown, or blue, Luster waxy. See also Agate, Agatized Wood, Bloodstone, Carnelian, Carnelian Onyx, Chalcedony "Moonstone," Chrysocolla, Chrysoprase, Jasper, Mocha Stone, Moss Agate, Onyx, Plasma, Prase, Sard, and Sardonyx.

"Chalcedony Moonstone." See Oriental Chalcedony.

Chalcedonyx or Chalcedony Onyx (kal-sed'o-niks). Chalcedony with alternating stripes of grey and white.

Chalcedony Patches. White blemishes in rubies.

Chalchuite or chalchihuitl (chal'choo-ite or chal"chu-we't'l). Green turquoise found in Mexico.

Changeant. Changeable labradorite.

Chatoyancy (sha-toi'an-si). Property of displaying a cat's-eye.

Chessylite (ches'i-lite). A mineral. See Azurite.

Chesterlite (ches'ter-lite). Microcline feldspar from Chester County, Pa.

Chevee (che-vae'). A flat gem with a polished concave depression.

Chiastolite (kei-as'toe-lite). A variety of andalusite containing black carbonaceous inclusions. These usually have a definite arrangement resembling a cross. Used as a curio gem stone.

"Chinese Amber" (chei-neze' or nese'). Sometimes correctly applied to amber mined in Burma and marketed in China, but more often applied incorrectly to pressed amber.

Chinese Jade. Term correctly applied to jadeite.

Chip. A small piece of a crystal. A small irregularly shaped diamond. In diamond nomenclature any such piece weighing less than three-fourths of a carat.

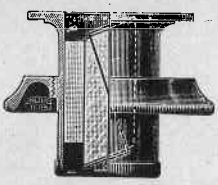
Chlorastrolite (klore-as'troe-lite). A variety of prehnite. When cut exhibits a chatoyant appearance.

(To Be Continued)

GEMOLOGICAL MICROSCOPY

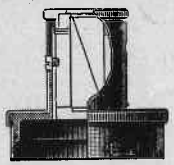
II. APPLICATIONS OF POLARIZED LIGHT

It is a well-known fact that ordinary light vibrates in the ether in all the possible directions at right angles to the direction of advance of the ray. In polarized light, the vibrations are at right angles to the direction of advance of the ray of light and in only a single plane. Polarized light finds very important applications in many tests of gems. There are several ways of securing light of this quality. A plate of dark-colored tourmaline absorbs one of the two polarized rays into which it breaks a single ray of ordinary light and passes the other ray almost completely polarized. Light reflected at the proper angle (57°) from a sheet of clear plate glass is likewise polarized. The most effective method of polarized light, and also the one which is most easily applied to an optical system, as for instance, a microscope, is the Nicol prism.



Polarizing attachment for Zeiss microscope.

The Nicol prism is simply a cleavage rhomb of calcite sawed from corner to corner and recemented. When a ray of light enters the calcite it is divided into two rays, each polarized in a plane at right angles to the other. Not only are the two rays separated as to their vibration direction but also one ray travels at an appreciably greater speed than does the other; the R.I. for one ray is approximately 1.66, whereas that of the faster ray is in the neighborhood of 1.49. When these two rays strike the dividing plane in the Nicol prism with its lining of cement, the ray with the higher R.I. is totally reflected, passes out the *side* of the prism, and is absorbed in the wall of the container. The other ray possesses a R.I. closely approximating that of the cement; therefore, it passes through readily. The ray which is allowed to pass straight through the Nicol prism is almost perfectly polarized.



Zeiss cap analyzer; drawing cut away to show Nichol prism.

The so-called petrographical or polarizing microscope is but little different from the compound microscope with substage condenser and rotating stage except that it is equipped with two Nicol prisms, one attached below the stage and known as a *polarizer;* the other, called the *analyzer,* is mounted in the body tube of the microscope somewhere above the objective, or is used as a cap over the eye-piece.

From a petrographic standpoint, inorganic materials may be divided into three classes. These are:

1. Isotropic; i. e., singly refractive.
2. Uniaxial, which includes all crystals of tetragonal and hexagonal systems, and
3. Biaxial which includes the crystals of the orthorhombic, monoclinic, and triclinic systems.

The isotropic substances include all amorphous materials and all crystals of the cubic (or isometric) system. They have no double reflection.

The uniaxial crystals have one direction in which there is single refraction, and in all other directions they are doubly refractive. The two distinct refractive indices are designed by the Greek letters ω (omega) and ϵ (epsilon).

Biaxial crystals have two directions of single refraction and three separate refractive indices designated by the Greek letters, α (alpha), β (beta), and γ (gamma).

The first application of the polarizing microscope to crystals which should be mastered by the student is the determination of pleochroism (dichroism and trichroism). This test is simply performed. The gem is mounted on the glass slide as explained in the previous article, slipped onto the stage of the microscope, and brought into focus. During this operation the analyzer or upper Nicol is removed. However, the polarizer or the Nicol prism mounted below the stage is retained in position.

Having secured a focus upon the gem, the operator rotates the stage. If the stone is colored and doubly refractive, as the stage is rotated it will change color in a greater or lesser degree. The reason for this change of color is that all doubly refractive crystals separate a single ray into two rays, each of which is polarized and each traveling at a different rate of speed. The different characteristics of these two rays cause them while passing through a colored substance to take different hues. The rotation of the stage turns the gem with respect to the polarizer, thereby allowing the polarized light to pass through it, vibrating first in one direction and then in the direction at right angles to the first with respect to the gem. The variation of these polarized rays passing through the crystal structure of the gem cause them to be different colored. Thus, for instance, a ruby viewed under these conditions will change from a strong yellow to a deep red which is almost violet as the stage rotates through 90°. With the polarizing microscope slight nuances in the differences between the dichroic colors, such as the very faint ones between the twin colors of zircons other than blue, are distinguished with greater ease and accuracy than is possible with the dichroscope. The beginner must be sure, however, that the stone itself changes color; rotation of the stage often varies the light through the gem in such a manner that it might be taken for dichroism.

(To Be Continued)

New Gem-Testing Microscope Reported*

Recently a German firm has announced a (so-called) microscope fitted for gem testing. Some scientists consider that a magnifying instrument of this type should not be called a microscope; it consists principally of a low power lens mounted above a stage to hold the stone. Immersion attachments are supplied for the stage and a strong light is built in below. For casual examination of a gem, the instrument would probably have merit, but for a definite determination, such as those described above, it would be entirely useless. For the accurate examination of diamonds or synthetics for imperfections, it is of not much more value than an aplanatic loupe.

*G.I.A. Confidential Service.