Gems & Gemology

GEMS & GEMOLOGY is the quarterly official organ of the American Gem Society, and in it appear the Confidential Services of the Gemological Institute of America. In harmony with its position of maintaining an unbiased and uninfluenced position in the jewelry trade, no advertising is accepted. Any opinions expressed in signed articles are understood to be the views of the author and not of the publishers.

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In This Issue:

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EDITORIAL FORUM

This issue is the first under our new policy of publication as announced in *Gems & Gemology* for November-December, 1935. As we made clear at that time *Gems & Gemology* will now appear quarterly and articles in it will be chosen primarily for their value as reference material.

The adoption of this plan makes comments from our readers doubly important to us. We wish to give you a maximum number of articles which you consider valuable. We can do this much more efficiently if you are unsparing with your suggestions for articles which you would like to have for reference.

EXAMINATION RESULTS

Since the November-December, 1935 issue of *Gems & Gemology* examinations for various titles or for classifications have been completed by the following persons:

Certified Gemologist

California
Basil Felts, Banning.

Illinois
Paul Cohard, Peru.

Oregon
Alvin Knudtson, Roseburg.

Junior Gemologist

Massachusetts
John S. Kennard, Hodgson, Kennard & Co., Boston.

Rhode Island
A. Ronald Reed, Tilden-Thurber Corp., Providence.

REGISTERED JEWELER
AMERICAN GEM SOCIETY

Washington, D. C.
Eugene Violland, Galt & Bro., Inc.

Wisconsin
Alf. A. Fuchs, Milwaukee.

Graduate Member, A.G.S.

New Jersey
Jean R. Tack, Newark.
Jerome B. Wiss, Wiss Sons, Inc., Newark.

Ohio
A. A. McCarvel, Cleveland.

SYLVESTER P. CLAUSS

It is with a feeling of real loss that word of the death of Sylvester Clauss was received at the Gemological Institute.

Sylvester Clauss, of Mishawaka, Indiana, was the thirty-second student to enroll in the courses of the Gemological Institute. The faith that these early students showed in the work, by completing their studies before the value of the work had been proved, was a very important factor in the growth of the Institute.

Mr. Clauss completed the requirements of a *Junior Gemologist.*

The Ruby Mines of Burma†

Condensed from The American Consulate Report of Winfield H. Scott, Rangoon, Burma, completed May 22nd, 1935, loaned through the courtesy of the Metals and Non-Metals Division of the United States Bureau of Mines, Washington, D.C. A summary prepared by David H. Howell, Certified Gemologist of Pasadena, California.

Early History

The earliest recorded history of any occupation of the Burma Ruby districts is contained in Burmese legends of possible Chinese origin, corresponding to Marco Polo's "Sinbad the Sailor." The legend tells of a deep valley in old Cathay whose floor was covered with beautiful red stones of exceedingly great value. The natives living near this valley threw large pieces of meat down into the valley and many stones adhered to the meat, being eaten by vultures which were then killed by the natives and the stones thus recovered.

The Chinese were the first people to occupy the Burma Ruby region. Historians allege that a son of Kun-Lung, the founder of the Shan* dynasty, controlled the district directly adjacent to the ruby mining area during the 6th century, A.D.

No further references appear until the 15th century when one Nicolo de Conti (1420-44) followed by Sefano and di Varthena visited Pegu (Burma) in 1496 and the ruby is referred to in the reports of these expeditions. The reference is to, and is called, The Mogok Stone Tract, or Jewel Land. However, the earliest history is shrouded with mystery and East Indian lore and is unpenetrable, as far as mining and productions during these periods are concerned.

Swabwa, a prince, failed to meet certain royal demands of the Burmese King, and the King issued an edict in 1587 that the Stone Tract was thenceforth to be his personal estate. Officials were appointed to enforce his will and titles were awarded such as "Lords of the Mines of Rubies, Safires, and Spinels." During the reign of Alaungpaya (1752-81) the kingdom was divided into petty provinces under the rule of petty princes all of whom owed allegiance to the Burmese King. Burma at that time was referred to as the "Golden Country."

While the territory was under the direct supervision of the King, conditions were very bad. Excessive demands of the emperor for vast revenues from the district caused the ministers in charge to overwork the miners, and even to resort to slave labor. The district came to be regarded by the Burmese as a land of exile and penal servitude. Laboring conditions were most unhealthy and the death rate among laborers was extremely high. Things progressed from bad to worse until a rebellion broke out. The district became practically deserted. This naturally curtailed revenue and the district was finally declared, in 1863, free and open for all to work. However, all stones mined were

*The Shans — A southern Mongoloid race, numerous in number and of great importance in Asia. Originated in the Kin-lung Mountains and fused with the Chinese and upland people of Tibet. (Encyclopaedia Britannica.)

†G.I.A. Research Service.

subjected to royal supervision and none could be exported without government permits. The purchaser of the stones was required to pay an ad valorem tax before removing them from the district. A custom house was established at Kin to supervise and control the traffic. Here miners and travelers were examined for possible possession of illicit stones.

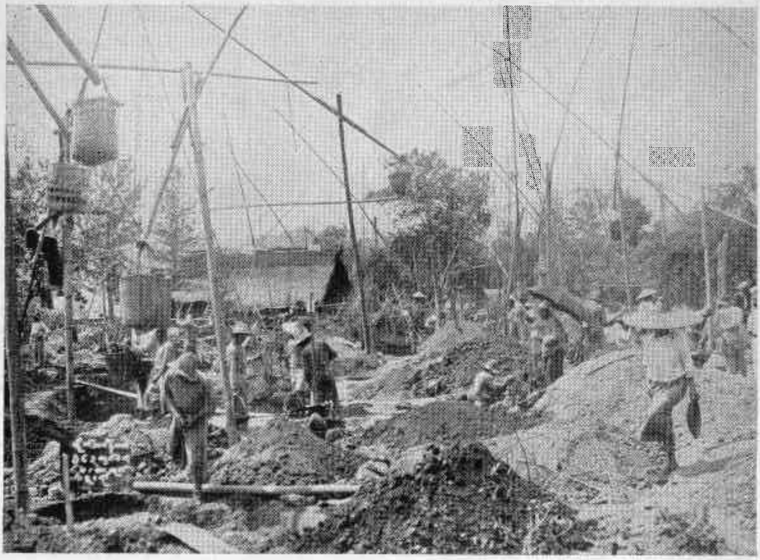
If the gems were not disposed of locally the owner was required to list them and have them evaluated and pay a 25% tax on this valuation. Those sold locally were taxed as follows: the purchaser paying a 10% ad valorem tax and the seller a 5% tax of the proceeds of the sale. If no sale transpired the owner was required to pay a 10% tax on the stone's valuation. They could then be sealed in a package and offered for sale at another time, or removed from the district. The penalty for theft was death and floggings were administered for illicit dealings and the stones were confiscated. However, due to the high taxes, many stones were smuggled and stolen and annually disposed of in Lower Burma and India.

The district came into the possession of the British after the Third Burmese War, on January 1, 1886. The pillage, murder and arson which prevailed up to this time ceased with the arrival of the British.

Concessions were awarded to a Mr. C. Streeter, a London jeweler, and the Burma Ruby Mines, Ltd. was formed with a capitalization of £3,000,000. The Corporation paid £30,000 annually for rent for the tracts and 30% of the profits. The concession granted the corporation the right to be the sole operators and to employ machinery in the mining operations. The native miners were allowed by the B.R.M.Ltd. to continue mining by their own methods, but they had to pay the Company a tax of 30% of the value of the stones which they recovered. The result of this policy was increased theft by the miners and smuggling became uncontrollable. Competition of mines and districts made it impossible for the Company to regulate prices. The miners revolted against the per cent policy and the Company abandoned this method. Henceforth, the miners were required to be licensed and these licenses cost 20 rupees per month. The result of the licensee's labor was to be his own property. The Company was required to pay the Burmese Government all royalties over 10% collected by them. Later the annual rental of the B.R.M.Ltd. was reduced to £15,000 and then later abolished entirely, the Government receiving 30% of the profits and royalties collected, less the still allowable 10% left the Company of the collected royalties.

Geology

The Mogok Stone Tract, the principal source of the best rubies, sapphires and spinels in Burma, covers about 600 square miles. Mogok is the principal town, where carving and polishing of the gems removed from the district are still carried on, as well as being the center of all mining activities. Mogok is 500 miles north of Rangoon, by road. It is reached by rail to Mandalay and then a nine-hour journey by steamer to Thabeitkyin, plus 59 miles by auto over a mountainous road, at



Active ruby mining operations in the Mogok area.

places attaining an altitude of over 6000 feet. The town itself is at an altitude of 3800 feet.

The important areas of the district are: the Mogok valley; around Katha, 6½ miles by road west of Mogok, an outpost and custom house during the days of the early Burmese Kings; Kyatpyin, 8½ miles west of Mogok; and there are also valuable mines at Sakangyi and Kin. Other important sources of rubies, sapphires and spinel are in the Sagyin Hills, 16 miles north of Mandalay, and the Nanyseil Stone Tract southeast of Tawmaw, the jade mining center.

According to J. Coggin Brown, the gneisses and associated rocks of the ruby mines consist of biotite gneiss, biotite-granulite and more rarely biotite schists. Hornblend is usually absent and garnet exceedingly common. Interfoliated with these intermediated types of rock are other rocks of more acidic nature, including very coarse pegmatites and graphic granites, aplites and granulites, granular quartzite and orthoclase epidote rocks. Often occurring with these in the Nyaungok district are rubellite (dark red tourmaline) and indicolite, often of fine gem quality. Other subordinate basic rock and ultrabasic rock, pyroxene gneisses and granulites with basic felspar related to anorthite, are found in which a partial or complete transformation into scapolite is sometimes traceable.

The ferro-magnesium silicates are represented by: Sahlite, diopside and aegirine, bronzite, hypersthene and rarely by hornblend, while garnets are frequent. The leading types of rock are: augite gneiss, enstatite gneiss, enstatite granulite, scapolite gneiss, pyroxenites, amphibolites and lapis-lazuli (Lazurite-diopside—and epidote rocks).

Many of these rocks contain crystals of calcite scattered through them. The crystalline limestone which contains the rubies, sapphires and spinels is most intimately associated with basic rocks and passage from one into the other is the most insensible kind. Some of these limestones are highly micaceous while others are calciphyres. Associated with the gems are many oxides, and silicates occur both original and secondary, and in addition there is much graphite and pyrrhotite.

Varieties of Gem-Stones Found

Rubies and sapphires are the so-called precious gems of most importance. Burma is the sole source of the supply of the Pigeon-Blood ruby. Ruby stars are also mined in the Mogok area. The Sapphires occur in all varieties and color from the rich translucent velvety blue to the poorest grades, including asteriated stones varying from gray-black to gray and greenish-blue. Other gem-stones found in the districts follow:

Spinel, zircon, garnet, lapis lazuli, aquamarine, apatite, chrysolite, chrysoberyl, iolite, phenacite, epidote, and quartz.

Moonstones are mined at Moonstone Mountain about five miles east of Mogok.

Native Mining Methods

There are three types of native mining methods: (1) by means of "twins", (2) "Hmyaws" and (3) "Lus."

A "twin" is any boring, pit or excavation. In general they are small, round pits of only sufficient diameter to permit a miner to descend by placing his feet in notches cut into the side walls for this purpose. They are not reinforced and are impracticable, being workable for only six months of the year on account of the rains. Two miners are capable of sinking a 50-foot "twin" in one day. They are sunk down into the "byone"—the term used to describe the gem-gravels, and then on down to the layer of decomposed limestone or bed rock called "ahkan." The usual depth of these "twins" is between 20 and 40 feet, but occasionally they have been sunk to 100 feet. Below the 40-foot depth, however, a parallel shaft is required for ventilation purposes. "Twins" of 100-foot depth are very rare. After reaching the "byone" horizontal passages or drifts are dug in all directions. Pits from four to five feet in diameter and reinforced are called "ko-bins." "Ins" or "In-byes" are larger excavations similarly reinforced and timbered. The latter two—"in-byes" and "ko-bins"—are rather uncommon and require quite a large personnel to work, as well as higher license fees. Also greater expense is entailed in the removal of accumulated underground water.

"Hymaws" are deep, open cuts in gently sloping hillsides or between hills, situated in a sloping valley. In these worknigs, the overburden and "byone" are washed down into tailing channels and the gems recovered there. The requisites for this type of working are good channels for tailings and an abundance of water supply. Sometimes the natives have made ingenious channels and tunnels to conduct water from great distances, even in one case having gone as far as 20 miles for the water. Water is stored and led to the workings for the operations by means of bamboo pipes.

(To be continued)

A NEW GEM VARIETY*

An unusual variety of tourmaline is making its appearance in the trade. Several dozen specimens of this variety have come to the attention of the Gemological Institute during the last year. The sales possibilities of the stone are attracting the attention of many dealers in gems. This variety is olive-green by daylight and brownish-red by artificial light, but the color change is by no means as constant as that of the alexandrite variety of chrysoberyl. These gems vary rather widely in color according to the conditions under which they are observed. This variety may appear quite green in diffused daylight, golden-yellow in direct sunlight, and fiery red under artificial light.

This variety of tourmaline was first seen by the writer when a twenty-two carat gem was received for determination in the laboratory of the *Gemological Institute.* The owner of the stone had imported it from Ceylon and had classified it as a zircon. Simple tests at once proved the stone not to be zircon. Additional tests were applied in the G.I.A. laboratory, and checked by Dr. Rene Engel of California Institute of Technology and Dr. Thos. Clements of the University of Southern California before the identity of the gem was definitely stated to be tourmaline.

During testing, the reason for the pronounced color change was discovered. The dichroism is extremely strong, the twin colors being yellowish-green and rich red-brown. The change from green by daylight to red-brown by artificial light can probably be referred to this dichroism. The cause of the appearance of a brownish-yellow hue in certain lights was determined by the spectroscope; this tourmaline variety transmits strongly the red-yellow-green portion of the spectrum, while blue is entirely absorbed.

The source of this gem is Ceylon. There the stones are found in stream-beds and other alluvial deposits, associated with sapphire, alexandrite and other colors of chrysoberyl, and spinel. The mines are near the southern end of the island of Ceylon, especially in the neighborhood of Rakwana and Ratnapura ("The City of Gems"). According to Hans Van Starrex of Matale, reddish-brown tourmalines are found fairly often in the washings, but less than ten per cent of them possess the marked color change necessary for their classification as specimens of this particular variety.

This variety is, however, found in quantities sufficient to prevent its becoming merely a collectors' stone. During the past year, several fine specimens have appeared in the American jewelry trade. The twenty-two carat gem mentioned above, recently has been sold by a California dealer to a prominent Los Angeles patron of the arts. The latter was so pleased with his purchase that he has now placed a standing order with the dealer for another tourmaline to match the one he owns.

This variety of tourmaline is an ideal man's stone, and its unusual change of color appeals to the majority of male customers. It is sufficiently hard and tough to be recommended as a comparatively durable stone. It has a definite place as a costume accessory for tailored women's wear.

*A.G.S. Research Service.

Obviously, the selection of a distinctive name for this gem-variety will create a more popular interest in it. As a rule, nomenclature would be simplified if the name of the color is simply used as a prefix, as, for instance, red-brown tourmaline. But it is not possible to call this variety by its color, since its color is changable. It is a phenomenal gem and, therefore, a new variety name has been suggested by several dealers. Specimens of this gem have been displayed at the meetings of most of the A.G.S. Guilds. Of the names so far suggested by the various Guilds, "Chameleonite" has been the most favored.

THE SPECIFIC GRAVITY OF LAPIS-LAZULI

The majority of tables in gemological textbooks list the specific gravity of lapis-lazuli at approximately 2.4. This is the value given by mineralogical authorities for pure lazurite which, however, is but one of several minerals which are almost invariably present in the lapis-lazuli of the jewelry trade. Due to the fact that calcite, with a specific gravity of 2.95, and pyrite, whose specific gravity is 5.0, are very frequently present in considerable amounts in lapis-lazuli, the specific gravity of the gem material is commonly higher than that of pure lazurite and lies between 2.6 and 2.8; although specimens as high as 2.9 are by no means rare.

The fact was first pointed out by B. W. Anderson, Director of the Diamond, Pearl and Precious Stone Laboratory of London, and was verified by tests in the laboratory of the G.I.A.

AN UNUSUAL SPINEL

Another interesting variation in properties was recently pointed out by Mr. Anderson at a meeting of the British Mineralogical Society. He reported the occurrence of blue-green spinels in packets coming from Ceylon which showed noticeably higher refractive index and specific gravity than those commonly listed for this gem mineral. This variation in properties was assumed to be due to the replacement of some of the magnesium, which is a constituent of spinel, by zinc; and spectrographic tests confirmed this. Blue-green Ceylonese spinels which fit Mr. Anderson's description had previously been tested in the Institute laboratory and found to show refractive indices averaging about 1.73 and specific gravities averaging about 3.65, both of which properties are slightly higher than the values (specific gravity 3.6, refractive index 1.715) commonly given for spinel.

NEW BALANCE FOR G.I.A. LABORATORY

Mr. George C. Brock, President of Brock & Company and chairman of the Board of Governors, G.I.A., has presented the laboratory with a fine Kohlbush balance. These scales have been converted for use for specific gravity determinations, and this work can now be done with considerably more accuracy than was possible heretofore in the Institute laboratory.

Sources of Ultra-violet Light

by

RICHARD L. BARRETT

Case School of Applied Science, Cleveland, Ohio

The phenomenon of fluorescence is at present arousing great enthusiasm among student gemologists, amateur mineralogists and other followers of science. It provides some very beautiful and spectacular effects and will be a sure way to attract the attention of a jeweler's customers and help to arouse their interest in the more scientific as well as the romantic side of gems. A display of fluorescent minerals will attract and hold the attention of every person who sees it and offers a natural approach to a talk on the beauties of gems.

This discussion begins with a brief explanation of what fluorescence is, and in the second part of this article Mr. Allbery will describe the construction of a fluorescent display. It is a well-known fact that light consists of radiant energy which is vibratory in character, and that one of the very important properties considered in describing light is its frequency, or the related property, its wave length. In the case of radio waves, which are similar in character to light except that their frequency of vibration is much less, we express the frequency in *kilocycles*. The dial of your radio set is marked off in kilocycles and the number of kilocycles means the number of thousands of vibrations per second undergone by the waves from the station to which you are tuned. We may also use the term *wave length*, which means the distance the waves will travel in one second divided by the number of vibrations per second. In describing light, we usually speak of the wave length, which we express in *Angstrom Units*, the Angstrom Unit being about one two-hundred-and-fifty-millionth of an inch. Ordinary light which is visible to our eyes, consists of wave lengths ranging between about 4000 Angstroms and about 8000 Angstroms. There are also other rays of different wave lengths which are not visible to our eyes. The infra-red rays, which are of longer wave lengths than visible light, are of no interest to us here, but the ultra-violet rays and the X-rays, which are of *shorter* wave length than visible light, are of importance in connection with fluorescence.

The color of an object as seen under ordinary conditions depends on its ability to absorb part of the light that strikes it. If the object is exposed to white light, which consists of a mixture of all wave lengths within the visible range, it may absorb part of these waves and reflect back the remainder. A red object is one which will absorb all light except red, red being the longer wave lengths in the neighborhood of 7000 Angstroms. A black object is one which absorbs all light regardless of color, a white object being one which reflects back all wave lengths, a yellow object one which absorbs all light except yellow (about 6000 Angstroms), which it reflects back, and so forth.

Ordinary objects are entirely invisible when they are viewed in light of wave lengths shorter than 4000 Angstroms (which we call ultra-violet) because they can only reflect back the same kind of light they receive, and this is invisible to our eyes. However, there are some substances which possess the peculiar property of converting the invisible ultra-violet light into the longer wave lengths which are visible, before radiating it out again. This phenomenon we call *fluorescence.* The effect ceases when the ultra-violet which causes it is shut off. Some substances possess the still more remarkable property of holding back part of the energy, and these continue to give off light for a time after the ultra-violet is shut off. This we call *phosphorescence.* In either case the effect produced is one of amazing beauty. The object appears to glow of its own accord as though it were on fire. Often the color of the light given off is very striking, the ruby for instance, giving off a fiery red color when it is exposed to a sufficiently strong source of ultra-violet light. Other substances give off a fluorescence quite different from their ordinary color, such as certain kinds of scapolite, which are white normally, but glow a brilliant yellow under the ultra-violet.

Our chief problem in making a fluorescent display is to provide a sufficiently strong source of ultra-violet and at the same time reduce to a minimum the visible light, since the latter only masks and obscures the fluorescent effect. This is not so easy to do, since most sources give off a mixture of ultra-violet and visible light. The sun, for instance, gives us the visible light by which we see, and at the same time the ultra-violet which produces sunburn. Probably the most generally useful source is the mercury vapor tube made from a special glass that cuts out most of the visible light while passing the ultra-violet. This has the disadvantage of being somewhat expensive. Carbon arcs using special type carbons are excellent, but require a special filter and are rather inconvenient to use. The beginner will get some very interesting results with the argon bulbs, which are cheap and easy to handle. Their limitation is that the intensity is rather low. In general, the stronger the source of ultra-violet, the more intense will be the fluorescent effect, provided the visible light is excluded by suitable filters.

In the second portion of this article Mr. Allbery describes the construction of a simple fluorescent display and lists a number of substances which may be displayed in it. It is a very fascinating hobby to search for new substances which are fluorescent.

The Jeweler's Fluorescent Display

by

CLAYTON G. ALLBERY

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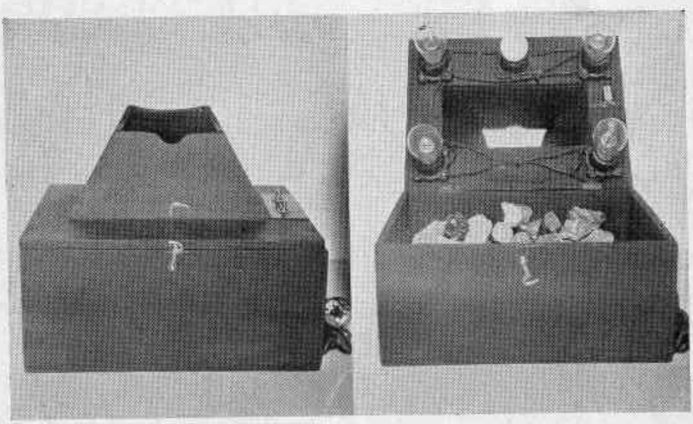
A quick and inexpensive way to rivet the attention of a jeweler's customer or prospect is to make use of the phenomenon of fluorescence. While fluorescence is one of the minor methods of identification in gemology, it is something that immediately attracts the interest of almost anyone. In this way, it gives the jeweler the opportunity to direct the conversation along whatever channel he desires and "breaks the ice" for a talk on the scientific, as well as the romantic side of gems in an unostentatious and natural manner. The *confidence* of the customer is virtually won "at a glance."

The box for a fluorescent display can be made as plain or elaborate as the amount of ingenuity, time and money one wishes to devote to it. The writer has made three such displays, each of which required but a negligible outlay of cash, as each was assembled from material on hand, and the price of the argon bulbs is but 60c apiece.

While the iron arc or Nico lamp creates beautiful displays for the jeweler, because of the vivid response of the ruby to these sources, still the argon bulb is considered in this article because it probably best serves the desired purpose of the jeweler in attracting the attention of the layman to a scientific subject. Other sources of ultra-violet light are costly in comparison.



Two views of a fluorescent display box made by R. C. Hoover of Akron, Ohio

It is not my purpose to give detailed instruction here for the construction of the set. Knowing the parts necessary and a few general suggestions and precautions, one may do very well using his own ingenuity. It is necessary to have from one to twelve or more argon bulbs and one or two ordinary Mazdas, sockets for same, two switches and a small supply of insulated wire.

For a box, one may use a cardboard one, a quite large tin can (square or rectangular), a wooden box or one made up from wallboard. Size will depend on number of bulbs to be accommodated. The tools necessary depend on whether working with cardboard, tin, wood, or wallboard.

One surface of the box must be hinged or otherwise fixed to open for the insertion of specimens, replacement of bulbs, etc. Another surface, front or top, must have a slit, or better, a built-up eyepiece to permit viewing the entire bottom of box, where the specimens will rest. As much light as possible must be kept from entering the box from outside sources.

One switch takes care of the Mazda circuit, the other of the argon. It is interesting to note at this point that the probable life of an argon bulb is 3000 hours; it then loses its value because of the bombardment of the glass of the bulb by the ultra-violet rays, which cause the inside of the glass to blacken so that the rays no longer pass through, although they are still generated or developed by the filaments (or plates) and gas. These lamps are rated at 2 watts, so cost of operation is negligible.

The writer believes the box has possibilities in a window display, using a flasher timed properly to turn the Mazdas on and off, leaving the argons on continuously. It would probably be more effective at night time, when outside sources of light were at a minimum. However, if the aperture to the box were placed snug against the window and the most responsive minerals used, the daytime effect might be just as good.

In lieu of a flasher, the argons only could be kept continuously lighted in the box, and duplicate specimens, numbered, be placed nearby in the window. The flasher would be more impressive. In either case, some explanatory signs should accompany the display. Another sign might explain that some diamonds exhibit the phenomenon of fluorescence under the X-ray.

Fluorescent minerals may be obtained from Ward's Natural Science Establishment, Inc., P. O. Box 24, Beechwood Station, Rochester, N.Y. A few are amber, calcite, fluorite, opal, willemite.

A few common substances that fluoresce are lubricating oil, castor oil, vaseline, a few drops of mercurochrome in water. Vaseline may be used with a brush or pen to apply to black cardboard for signs inside the box as a fluorescent paint or ink. The pale yellowish-green varieties of synthetic spinel—called "emerada" and "erinide"—show very striking fluorescence.

The price of the argon bulbs is 60c each, postpaid. These may be procured from any electrical dealer or from the American Gem Society.

BOOK REVIEWS

Review of *An Introduction to Earth History,* by Hervey Woodburn Shimer. Ginn and Co., Boston, 1925. $3.00.

This text was written by a professor at the Massachusetts Institute of Technology and reflects the thorough and accurate presentation which might be expected from a member of the faculty of that institution.

The book combines historical and physical geology. *An Introduction to Earth History* should prove an excellent reference book for geological students. The theories expressed are sound and are easily understood. The latest concepts of atomic structure and of relationship of matter are incorporated throughout.

Careful reading on the part of the student who has not previously studied geology is required for comprehension of this introduction to earth history, but one with a knowledge of the subject should find the text very valuable for reference.

Review of *The Earth and Its History,* by John Hodgdon Bradley, Jr. Ginn and Co., Boston, 1928. $2.60.

In this work the science of geology in general is covered with particular attention given to the historical and physical aspects. Economic geology is also briefly discussed.

Explanations are short, clear and not unduly repeated in the manner of some authors in order to emphasize them to the inattentive student. The text is presented simply and does not go into the various "pros and cons" concerning the theories but explains the necessary theoretical matter in a clear and generally interesting manner.

A chapter on the history of the advance of geological knowledge is unique and of considerable interest.

***Minerals and the Microscope,* by H. G. Smith. Thomas Murby & Co., London, 1914. Third Edition, 1933.**

This is a small, 124-page reference book which has been used with good results in connection with some of the laboratory instruction at the G.I.A. It is recommended to the gemologist who owns a microscope equipped for work with polarized light. Although much of the text is useless in gem-testing, as it refers particularly to prepared thin section, this book perhaps contains a larger proportion of gemologically pertinent information than any other which covers the same field.

Descriptions of testing procedure are short and expressed in such a manner that they can be used by the beginner as instructions for the use of the petrographic microscope. For those minerals which are described, most of the properties of value in identifying cut gems by the microscope are listed. However, the omission of any description of many important gem minerals—e.g., diamond, corundum, beryl, chrysoberyl, and spinel are not described—is a bad fault from a gemological standpoint.

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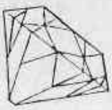
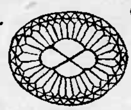
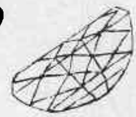
De Lapidibus Preciosis; also **De Subtilitate.** These contain accounts of the magical and medicinal properties of gems.

Catelle, (W. R.)

Precious Stones. A Book of Reference for Jewelers. Philadelphia and London. J. B. Lippincott Co., 1903.

(To be continued)

Important Diamonds of the World

Robert M. Shipley

THE FLORENTINE

The Florentine is one of the largest and most famous of diamonds. It was a cherished possession of one of Europe's most important families and subsequently an ornament in the crown of a European dynasty which dominated continental Europe.

For more than a century the Medici family of Florence were famous as the bankers of Europe, and to them came kings, governments and merchants for financial advice and assistance. They were equally prominent as patrons of the arts, and their name has gone down in history as the guiding spirits of the Renaissance. No one did more to reawaken art and learning in the western world than did the Medici. That they would possess a wealth of gems is to be expected, and when the family became extinct, its last survivor bequeathed to the new ruler of the Duchy of Tuscany, of which Florence was the capitol and of which her ancestors had long been sovereigns, gems of a value of $2,000,000. These did not include the crown jewels of Tuscany nor a very much smaller collection which became the property of the city of Florence and which now delights the eyes of visitors to the Pitti Palace in that city.

It seems entirely in character that such a family as the Medici would own one of the most important diamonds of the world, and that this diamond should have been both an artistic treasure and an investment, a quick asset in a possible hour of necessity. Easy to understand, also, is the fact that the wisdom of such a line of financial genii would have influenced them to keep almost secret the existence of such a possession. Tavernier, the French gem dealer, seems to have been their solitary confidant. The diamond was shown to him (in the seventeenth century) with no word as to when, or from whom, it came into the possession of the Medici. Tavernier visited the reigning Duke of Tuscany in 1657, and it was at that time that he must have examined this gem. Therefore, the early history of the Florentine remains a pleasant and mysterious puzzle yet to be unravelled. That it had previously brought pleasure to those other patrons of the arts, the Dukes of Burgundy and Ludovico Sforza, may still be proven, for that story persists.

However the later history of the Florentine is clearly defined, for with the passing of the last of the Medicis, the Duchy of Tuscany became a prize coveted by the larger nations of Europe the future possession of which was discussed at many international conferences. The final decision favored Austria, and it was arranged that Maria Theresa of Austria was to be married to Francis Stephen, Duke of Lorraine. The Duke would then trade his Duchy for the Duchy of Tuscany and Lorraine would be given to France. When the last male Medici, Giovanni Gastone, died this plan was consummated. Then in 1743, Anna Maria Medici died without heirs and the big diamond travelled to Austria. There it symbolized Austria's leadership in Europe and was placed in the Crown of the House of Austria when Francis Stephen was made Emperor of the Holy Roman Empire in 1745. Since that time it has remained an Austrian crown jewel to appear on various occasions in brooch, hat ornament, or other royal jewel. It is now in the Royal Palace at Vienna. Added to its former names—the *Florentine,* the *Tuscan,* and the *Grand Duke of Tuscany*—it has since been known at various times as the *Austrian* and the *Austrian Yellow.*

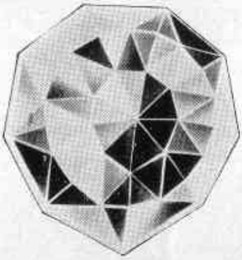
The last name is not entirely unsuitable since the Florentine is of a citron yellow (light greenish-yellow) color, exceptionally clear and free from flaws, and is remarkable for the fire (dispersion) flashing from its 126 facets. It is a mute testimony to the desirability of many facets on an exceptionally large diamond. Its weight is 137½ metric carats. Its style, which is accepted by most authorities as being typical of Indian cutting of the early eighteenth century, may be called a double rose pendeloque. It has nine flat sides about the girdle, which gives it somewhat the appearance of a nine-rayed star. The replicas represent it quite well. Tavernier, three hundred years ago, by using his method of calculation of large diamonds, figured its value to be $950,000. Later it was valued by the Austrians at $750,000.

We could not leave the Florentine without discussing the formerly long accepted story of its pre-Medici travels in Europe which have been doubted by Streeter and other careful investigators. The story goes that a diamond owned by the Duke of Burgundy was cut by Louis de Berquem at Bruges (now in Belgium), which was then a Burgundian possession. Berquem has been called "the inventor of diamond cutting" since in 1456 he first fashioned diamonds in symmetrical shapes with facets effectively co-related one to another.

Following the fashion set by earlier princes, Charles the Bold, of Burgundy, carried with him into battle all of his jewels. In a final war with the people of Berne and other Swiss communities, he lost many of these treasures in perhaps more than one battle, and after one of these disastrous engagements with the Swiss, Charles' career culminated in his death at Nancy in 1477, still wearing his few remaining jewels. After the Burgundian rout at one of these battles at Granson, the Florentine diamond is said to have been picked up by a Swiss soldier who, thinking it but a piece of glass, sold it to a priest for the price of a drink. Afterwards it may or may not have come into the possession of the government of Berne.

Having made a collection of some or perhaps all of the former Burgundian jewels which had been left strewn upon those battlefields, the government sold them to Jacob Fugger, a wealthy dealer of Nuremberg, for 47,000 florins. Among these jewels was a pendant containing one diamond in the form of a pyramid, five-eighths of an inch square at the base, with but four large facets, which Fugger sold to Henry VIII of England as mentioned in our story of the Sancy.

This stone sold to Fugger was, as we have seen, much smaller than either the Florentine or the Sancy, and it really is doubtful if there was a diamond of the size of either of those important stones in all of Europe in the year 1477. Although such stones were then known in India, and the Duchy of Burgundy maintained close trade relation with Venice through



THE FLORENTINE

A diamond with a long and peaceful history.

Weight, 137 carats

which an importation of such a stone would most probably have occurred, the Dukes of Burgundy were ostentatious and not of the nature that would be expected to conceal such a possession. It is a fact that they were known to own "the most talked-of diamonds in all Christendom," but this description could at the end of the 15th century have been filled by such diamonds as the pyramidal diamond afterwards sold to Henry VIII. Fugger sold a portion of the Burgundian jewels to the German Emperor Maximilian, and apparently because of the possible association between these stones and the Florentine, the latter has also been called the *Maximilian*, although it could never have belonged to that Emperor.

From its style of cutting it seems somewhat doubtful that Berquem did cut the Florentine, and that it ever came into the possession of Fugger, but a statement in the Catalogue of the Objects Contained in the Treasury of the Imperial House of Austria seems more possible of belief. This Catalogue sets forth that the Florentine was lost "at the battle of Morat on 22nd June, 1476——." It does, indeed, seem possible that the Florentine may have been a stone which had a subsequent history entirely different from those jewels sold to Fugger. It is elsewhere related that a wealthy Bernese merchant, Bartholemew May, purchased this stone for 5000 florins ($2000), plus a "present" to the mayor of Berne. May sold it at a small profit to a dealer of Genoa. From this Genoese, Ludovico Sforza, the Duke of Milan is said to have bought it for 10,000 florins and "when the treasures of Milan were distributed, Pope Julian II purchased it for 20,000 ducats ($45,000)." From this pope it might easily have passed into the possession of the Medici family, who had close relations with the church.

The Florentine will be always slightly touched with mystery because of these stories which constantly recur in early records; perhaps the Florentine actually did go into battle with the Duke of Burgundy before it became an investment item of the banker-dukes of Florence.

THE DIAMOND MARKET

The policy of The Diamond Corporation of gradually raising the price of rough diamonds and at the same time limiting their sale to less than the actual demand has evidently resulted in a very firm market for cut stones.

An impediment to a still stronger diamond market seems to be among the diamond cutters, who are competing by cutting their prices until they are making but very little profit for themselves. Cutters' organizations have been formed in Belgium and Holland but as yet they seem to have proved impotent in meeting this problem. If the cutters can manage to consolidate their organizations the result undoubtedly will be a further rise in the price of cut diamonds.

Another objection voiced by European cutters is that the uncontrolled price of bort is causing difficulty in the polished diamond market. This undoubtedly is felt chiefly in the market for very inferior stones and therefore probably has less effect on the American market than upon foreign ones.

The principal demand at the foreign cutting centers continues to be for small melee, and an increased demand for baguettes is beginning to be felt. The American buyers, it is reported, are chiefly interested in medium sized and large stones of fine quality. In fact, the demand for larger stones of fine quality has been very brisk for a number of months, and their price in America has increased.

LENDS DIAMONDS FOR EXAMINATIONS

The American Gem Society acknowledges the extremely valuable service rendered by J. R. Wood & Sons, wholesale jewelers of Brooklyn, N. Y., in lending a number of unmounted diamonds for use in the *Registered Jeweler* examinations. These stones are employed in the diamond grading examination which is now required of all candidates for the title *Registered Jeweler*. The co-operation of J. R. Wood is in line with their commendable policy of co-operating with the retail jeweler in his efforts to protect himself against unethical competition.

GEMOLOGICAL GLOSSARY

(Continued from last issue)

Galalith (Galilith) (gal'a-lith). A horn preparation obtained by the action of formaldehyde on casein. Skim milk is treated with caustic alkali carbonate and the casein is precipitated by the action of rennet, pressed and impregnated with formaldehyde and dried. It is variously colored and used as a substitute for ivory, amber, tortoise shell, coral, ebony, etc.

Gangue (gang, or ganj). The worthless stony or earthy vein substance associated with metallic ore.

Garnet (gar'net). A gem-stone. Cubic system. "The name covers a number of closely related minerals. Several chemically similar elements freely replace one another in the garnet group. As a result, the properties of the group are variable, and there are a number of garnet gems, quite different in appearance." (Kraus.) See also Almandite, Andradite, Grossularite, Pyrope, Rhodolite, Spessartite.

"Garnet Jade." See Grossularite Garnet.

Gas Inclosures. An inclusion of gas in a mineral. See also Inclusion.

Gas Pocket. A cavity formed by gas in an igneous rock. See also Amygdaloid.

Gedanite (jed'a-nite). A brittle, resinous substance sometimes classed as amber, found on the Baltic coast along with amber. Less valuable than pressed amber. Lacks tenacity, usually contains powdery inclusions, has a greasy luster and a glassy fracture, and its inability to take a high polish often betrays it. Because of its lack of toughness it can only be used for beads. It is so inferior that it is sometimes classed as a gum.

Gem. Cut and polished precious stone. Term sometimes applied to a specially fine specimen of its particular variety. A gem must possess: (1) Beauty, (2) Durability, (3) Rarity.

Gem-Color. The most desirable color for a stone of its particular variety. Perfection color.

Gem-Gravels. Gem-bearing gravels of present or former river or lake beds.

Gem Mineral. Minerals which are suitable for use as gems. See also Gem.

Gemology (jem-ol'oe-ji). Gemology is the science of those minerals and other substances possessing the necessary beauty and durability for wear as ornamental objects, and the history of their source, production, and use in civilized society. Gemology (American usage) was first used in *Jewelers' Circular*. See also Gemmology.

Gemmology (jem-ol'oe-ji). (Fr. Latin gemma—a gem.) First used in England. Same as Gemology.

"Geneva Ruby." A reconstructed ruby formerly made in Geneva, Switzerland.

Geo-chemistry. The science of the chemistry which treats with the materials of the earth.

Geode (jee'ode). Cavities in clay or other formations which have been incrusted with a wall of quartz or other mineral and which (later) separate as a hollow mass, the interior walls of which are usually studded with crystals. See also Amygdule.

Geyserite or Siliceous Sinter (gei'-zer-ite or gei'ser-ite). A porous variety of common opal deposited by geysers.

Girasol (jir'a-sol). A variety of opal. As an adjective, *girasol* may be used to describe any gem variety which shows a floating light resembling adularescence, as *girasol* sapphire.

Girdle. The outer edge or periphery of a cut stone; the portion of a cut stone which is grasped by the mounting.

Glass. An amorphous substance, ordinarily consisting of a mixture of silicates. Glass is usually manufactured by fusing silica, an alkali, and lead oxide or another metallic oxide. Fine glass (paste) imitation gems contain a large proportion of lead and may contain oxides of rarer elements, such as thallium. Some glass imitations are made according to very complex formulas. Natural glass also occurs; see Obsidian; see Moldavite.

Glass Agate. Obsidian.

Glassies. Diamond crystals which exhibit natural bright, transparent faces.

Glauconite (glo'koe-nite). See "Blue Earth."

Glaziers' Diamonds (glae'zher or glae'zi-er). Small diamonds or corners of diamond crystals, used for glass cutting.

Glazed Faience. Used to imitate opaque stones. See Faience.

Glazed Porcelain. Used to imitate opaque stones. See also Porcelain.

Glimmering (glim'er-ing). Affording imperfect reflection, apparently from points over the surface.

Glistening (glis'n'ing). Affording a general reflection from the surface.

Globular (glob'u-lar). Having spherical, or rounded form.

Glow-Stone. Chalcedony.

Gneiss (nise). A crystalline rock of metamorphic origin with its mineral content "bedded" so that the rock appears in crude, irregular layers of lamination; similar to granite in composition.

Goa (goe'a). A city in India through which the Portuguese imported diamonds during the 18th century.

Golconda (gol-kon'da). An ancient city in India, formerly a principal diamond market. Also, a term now applied to fine quality old Indian diamonds which rarely reappear in the market.

Gold. A metallic element; one of the noble or precious metals.

Gold Opal. Opal showing yellow light over large areas.

Golden Beryl. Clear, bright-yellow beryl.

Golden Stone. Greenish-yellow peridot.

Gold Quartz. Massive quartz enclosing gold.

Goldstone. A translucent or semi-translucent glass imitation in which copper filings have been fused. Sometimes sold incorrectly as "fire agate" or "aventurine."

Goniometer (go'ni-om'eter). An instrument for measuring angles. Several types are made; probably the most useful to the gemological is the horizontal single circle instrument which is used for measuring the index of refraction of crystals and gems, as well as for measuring angles of facets, etc. (Briggs.)

Gooseberry Stone. Brownish-green grossularite (garnet).

(To be continued)

A GEMOLOGICAL ENCYCLOPEDIA

(Continued from last issue)

HENRY E. BRIGGS, Ph.D.

Of false doublets we have two types. In one the upper portion of the gem is of the genuine stone which the doublet imitates and the other type has the upper portion of the stone of some hard stone such as quartz (rock crystal). The lower portions in both cases are of colored glass or paste. Occasionally the doublets have a top of some cheap stone of fair hardness and color similar to those of the gem which is being imitated, such as a ruby doublet with an almandite top, or an emerald doublet with a demantoid top. These false doublets are sometimes cemented and sometimes fused together. Of course, if the glass back has been fused onto the top, separation cannot be affected by soaking. They can easily be detected however by immersion in some fluid of fairly high index of refraction (near that of the stone top). This causes the crown to stand out in definition much better than will the glass pavilion. An easy method of detecting a false doublet consists of merely breathing on the stone, which will sometimes reveal the joining plane.

An extremely informative and valuable article on zircon by one of the largest American importers of zircons, who lived ten years in the Orient, in which the method of heating is discussed is printed in this issue of *Gems & Gemology.*

Triplets are very similar to doublets, except that a portion of the pavilion also is made of the genuine stone. In the case of a triplet we have only a small amount of colored glass lying in the plane of the girdle of the gem, the crown and pavilion of the gem being of genuine stone. The purpose of the colored glass is quite obviously to impart the desired color to the finished gem, while the crown and pavilion of genuine stone will give the desired hardness. Triplets are used mostly for imitating emeralds. Of late years, the sale of doublets and triplets has fallen off considerably on account of the low cost of synthetic stones colored to imitate other gems.

ALTERING OF GEMS

Gems and gem materials are often treated to alter their color and thus render them more readily salable. In the transparent and more valuable gems, the treatment usually consists of heat treatment or radiation with X-rays or gamma-rays. Heat treatment is applied to many gems, and with a certain amount of success. Topaz of a yellow tint or a yellowish-brown tint may be rendered pink by treatment with heat. The stones to be "pinked" are packed in asbestos or magnesia in an iron container and very slowly heated to a dull red heat, about 560 degrees Centigrade. They are then cooled very slowly and if the operation has been properly done, the stones will be found to have turned a fine pink color. If the stones are overheated, however, they will lose all color. The darker shades of smoky quartz or amethyst are converted into a citrine to amber tint by this same process and are then sold as topaz.

Zircons also, as mentioned before, are heat treated to render them either colorless or blue, as the case may be. Corundums with streaked color, and amethyst, which is spotted with dark spots of color, are often improved by heat treatment. Greenish beryl can often be rendered a beautiful shade of blue by this process.

X-rays and gamma-rays are often used to improve the color of diamonds. Yellowish stones may be rendered practically colorless with radiation. However, the color is apt to again return in time, especially if the stone is subjected to much heat. Diamonds can be ruined by radiation; carbon spots form and the diamonds take on a green tint if too long subjected to the action of these powerful agents. Quartz which has been treated to change its color will regain its original color if subjected to radiation, and faded amethyst will be in part restored. In some cases the treatment seems to hold fairly well, while in others it is not very satisfactory, depending on the heat and temperature changes to which the gem is subjected.

Pressure and Heat

Amber fragments which are of little value are rendered more valuable by heating and pressing into molds. Some times it is also colored at the same time. Since amber is amorphous, the detection of pressed amber presents its difficulties. However, pressed amber is usually not as transparent as the natural unaltered amber, and the colors are sometimes patchy. However, great care is taken to prevent this by using amber of one tint only. Pressed amber will lose its transparency somewhat with age.

Dyeing and Chemical Alteration

Agate, opal, jasper, chalcedony, turquoise, and other gems are often dyed. Even diamonds are sometimes given a coat of blue analine dye to neutralize their yellow tint. Of course, proper cleaning will show up this fraud, but yet many unsuspecting people have been swindled by this trick and even today we hear of the trick making its reappearance every now and then. Turquoise is often dyed to improve its color, but the fraud can usually be shown by rubbing the stone with ammonia. If it is natural turquoise the color will remain unaltered, but if it is dyed it will fade at once. Agate, jasper and chalcedony are very often dyed to improve their color. The rough is prepared by soaking it for a long period of time in a solution of honey and water or sacchrine and water. After the porous layers of the stone have absorbed all of the organic matter they can, the stones are subjected to an acid treatment. Also, solutions of metallic salts are used to color the agates and jaspers various colors. Opal is also dyed by the same methods. The opal's matrix usually is the part that is dyed, and that is usually dyed black or some other color which will emphasize the inclusions of precious opal. Opal is also treated with a view to increasing the brilliancy, but the author is inclined to believe from a series of experiments that these methods are more or less of a failure and that nothing further than proper curing of opal can be done to increase the beauty of the gem.

(To be continued)

ANOMALOUS DOUBLE REFRACTION

Anomalous double refraction is a very important property both in identifying gems and in judging the amount of strain present in a stone.

The fact that anomalous double refraction is caused by internal strain may be proved by an interesting experiment. A small piece of transparent celluloid or catalin may first be tested by the polariscope or polarizing microscope; unless it has been worked it should show but very little internal strain. Then either pass it through a roller or twist it severely with pincers. Upon again being tested in the polariscope, the specimen will show a greatly increased amount of internal strain.

Many gems which in ideal conditions are singly refractive show anomalous double refraction. This is especially true of garnets and synthetic spinel. Many diamonds also show the phenomenon. The presence of strong anomalous double refraction should serve as a warning to the jewelery repairman or stone setter, for it indicates the presence of considerable internal strain. Gems in which very strong anomalous double refraction is present are much more likely to be damaged as a result of heating or striking with a metal tool than are those stones in which little or no anomalous double refraction is seen.

The efficiency of diamond mounting may be checked through the use of polarized light. If a diamond unmounted shows little or no anomalous double refraction but shows a considerable amount after having been mounted, the mounting is proved to be tight and to be causing an undesirable strain.

Anomalous double refraction may also occur in doubly refractive gems. It is evidenced by a lack of complete extinction during the rotation of the polariscope stage or the cylinder of the hand polariscope. Instead of showing a sharp point of extinction, doubly refractive gems exhibiting this anomaly become but partly dark, showing patches of light and sometimes even of color. The German synthetic green beryl (emerald) which has been described in a previous issue shows very strong anomalous double refraction which aids in distinguishing it from genuine beryl.

In testing gems with the polariscope or polarizing microscope, it is imperative that anomalous double refraction never be confused with true double refraction. Also, true double refraction is sometimes considered anomalous owing to the form in which a gem is cut; this occurs when the cut gem transmits but a small amount of light even in ordinary light and when viewed through the polariscope the small amount of transmission is mistaken for anomalous double refraction.

A simple test with the polariscope has been found very effective in distinguishing true double refraction from anomalous double refraction. The stone is placed in position and the cylinder of the polariscope is rotated until the stone is as light as possible. The analyzer is then turned until the polarizers are no longer in a crossed position. If the double refraction in the gem being tested is anomalous, the stone becomes very much lighter when the analyzer is thus turned, but if the gem exhibits true double refraction, but very little change in the amount of light transmitted is noticeable.