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Local Peculiarities of Sapphires*

by

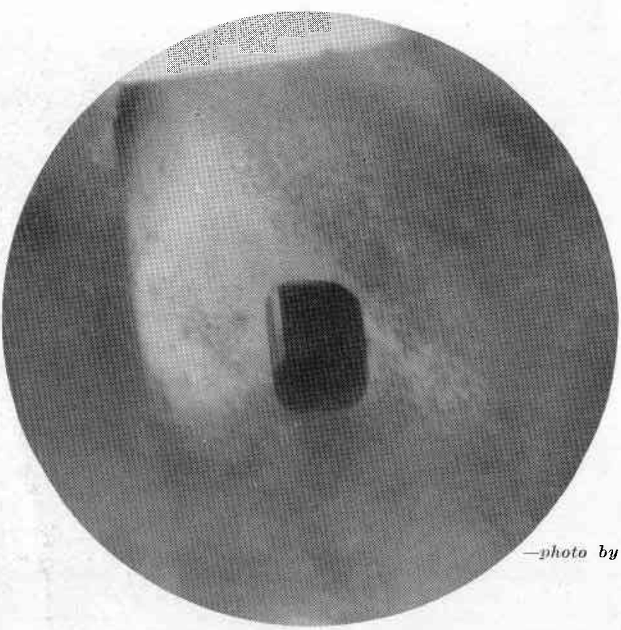
EDWARD GÜBELIN, Ph.D., C.G.

Lucerne, Switzerland

(Continued from last issue)

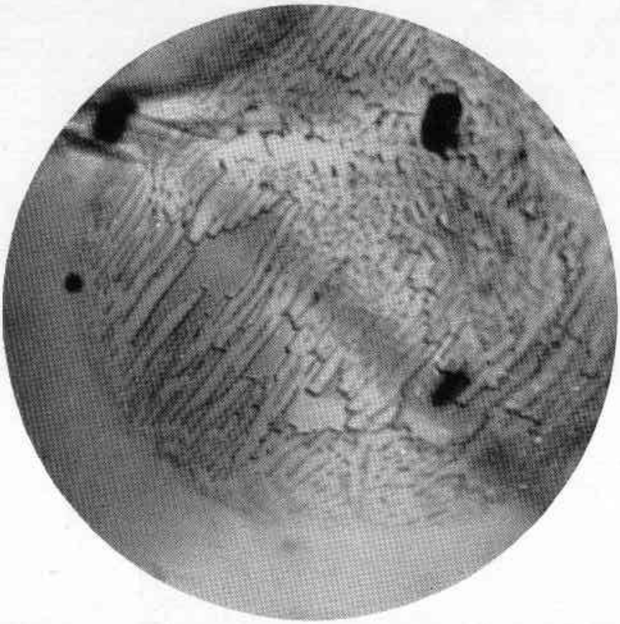
Coarser idiomorphic crystals of rutile are frequently met with. They show the crystal faces of the prisms as well as the combination of the prisms with the pyramids. This is illustrated by Fig. 5.

Cavities in the shape of irregularly curved pipes are seldom, but they do occur (Fig. 6). They are filled with liquid which sometimes contains a movable gas bubble designating the inclusion as a liquid one.



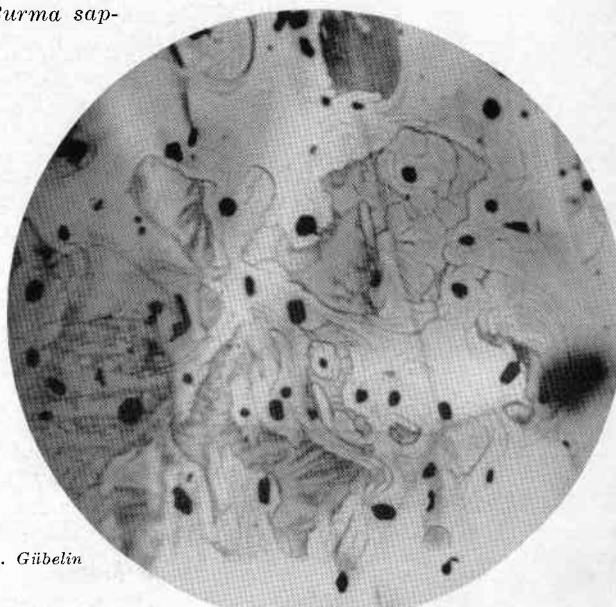
—photo by Dr. Gübelin

Figure 5
Large rutile crystal in a Burma sapphire. 100x.



—*photo by Dr. Gübelin*

Figure 6
Liquid-filled cavities in Burma sapphire. 100x.



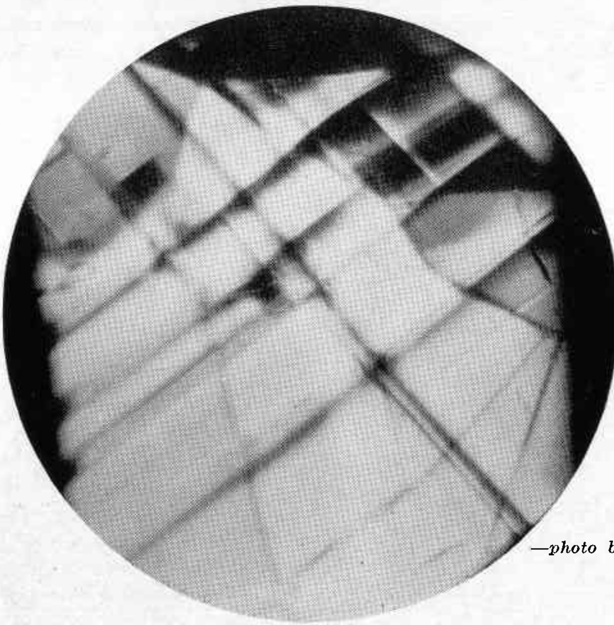
—*photo by Dr. Gübelin*

Figure 7
Irregular liquid and resorbed solid inclusions in Siam sapphire. 75x.

Their refractive index is not much lower than that of the sapphire, which makes them almost invisible.

In contradistinction to Burma and to Ceylon sapphires, those from Siam never contain rutiles of either habit. The principal characteristic features in Siam sapphires are large, curious systems of flat and somewhat "loop-like" liquid inclusions reminiscent of splashes. They are always observed in conjunction with opaque more or less hexagonal crystals seeming to be in a state of resorption (Fig. 7). Liquid cavities as well as these crystals, which in many cases are negative ones, are filled with a brown substance of iron compounds. The negative crystals have assumed the habit of corundum, and despite their somewhat vague contours they are easily distinguishable from zircons, garnets, and spinels. It often happens that within the liquid inclusion a most interesting recrystallization has taken place, forming crystals of yet unknown nature in precisely hexagonal arrangements.

Twinning laminae with particularly "chequered" design as shown by Fig. 8 are often present, always and surely denoting the stone as a sapphire from Siam.



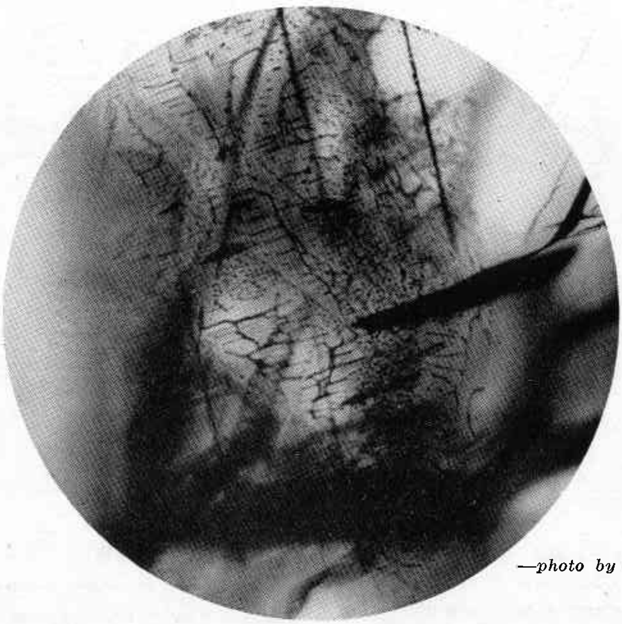
—photo by Dr. Gübelin

Figure 8
Siam sapphire, showing a slightly "chequered" structure of twinning laminae. 30x.

No such inclusions are ever found in sapphires from other sources. Moreover, numerous liquid inclusions which are oriented in rows forming script- or arabesque-like systems are frequently noted in sapphires from

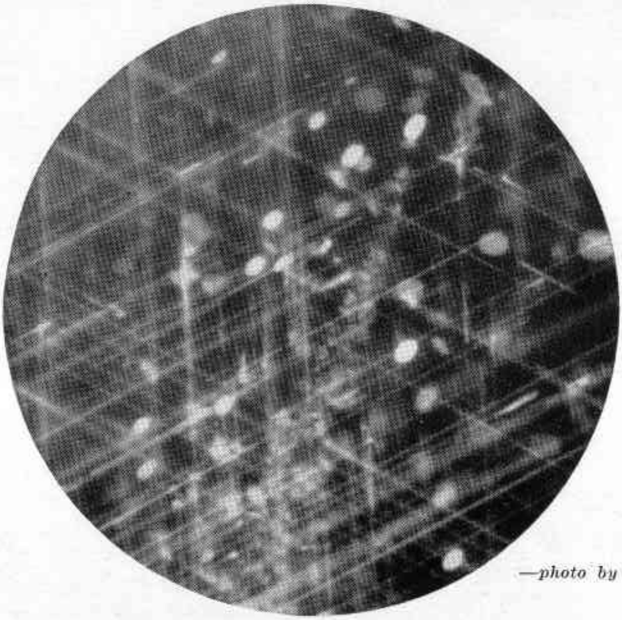
Siam and they are certainly worth mentioning (Fig. 9).

Ceylon sapphires are characterized by an enormous variety of inclusions and by a more disorderly distribution of them, except for the rutile needles. The latter ones, which were one of the first microscopic features to be perceived with relation to local peculiarities[4], give the Ceylon sapphires, as will be noticed by Fig. 10, the marked contrast to sapphires from Burma[5]. *Long* and slender rutile needles or, succeeding them, liquid-filled tubes usually running through the stone's whole body in their entire length intersect at 60°, respectively 120°, that is lying along the prism faces of (1120)[5]. They are always much longer and generally of brighter color than those in Burma corundums and, in addition, this is typical: *they are spaced at greater intervals and sparse.*



—photo by Dr. Gübelin

Figure 9
Rows of script- and arabesque-like liquid inclusions in a Siam sapphire. 75x.



—*photo by Dr. Gübelin*

Figure 10

Long and widely spaced rutile needles in a Ceylon sapphire. The round spots are reflections from small fissures. 75x. Dark-field illumination of the Diamondscope.

[1]E. Gübelin, Characteristics of Ceylon Rubies, *Gems & Gemology*, Winter, 1940, p. 121.

[2]E. Gübelin, Differences Between Burma and Siam Rubies, *Gems & Gemology*, Spring, 1940, p. 69.

[3]K. Schlossmacher, Unterschiede zwischen Synthetisch und Echt, *Das Fachblatt*, Jan., 1941, p. 284.

[4]G. von Tschermak, Mineralog. Mitteilungen, 1878.

[5]Lasaulx, Annal. de la Soc. Belge de Microscopie, 1885.

(To Be Continued)

Statistical Data and Remarks about Some Brazilian Diamonds[1]

by
ESMERALDINO REIS
of the Service of Classification of Precious Stones of the House of Moeda

From the gross of 460,869.15 quilates metricos [2] (a measure) of diamonds, which, coming from the interior, during the period of January to December, 1940, were presented to the SCAPPM for entry, one can make a selection in the following form:

Diamonds up to— 5.00 qms (exclusive)		qms	456,520.34
Diamonds from— 5.00 to 20.00	278 stones	qms	2,480.64
Diamonds above— 20.00 to 50.00	30 stones	qms	878.57
Diamonds above— 50.00 to 100.00	1 stone	qms	51.85
Diamonds above— 100.00	3 stones	qms	937.75
			460,869.15

The statistics below show that the diamonds exported from this country in the period (year 1940) correspond to the same classification above:

Diamonds up to— 5.00 qms		qms	240,005.67
Diamonds from— 5.00 to 20.00	367 stones	qms	3,184.90
Diamonds above— 20.00 to 50.00	27 stones	qms	812.44
Diamonds above— 50.00 to 100.00	7 stones		446.55
Diamonds above— 100.00	4 stones		1,226.80
		Total of qms	245,676.36

The numerical difference between the diamonds exported and those entered in the market is explained by the fact that there are entries from the year before, 1939, and they were exported only in 1940. These figures reveal, in relation to former years, an upward trend (an increase) in spite of the fact that they are based not on the material and reports of the SCAPP in Bahia, but exclusively on the movements of the SCAPPCM in Rio de Janeiro. However, this amount of this valuable raw material represents a considerable monetary value, in our opinion, although it is not the scope of this modest research work of mine to give economic data.

There seems not to be any regulation for the study of examples of interesting characteristics (I refer to diamonds as well as to semi-precious stones) from the point of view of morphology—the realization of these studies is, it seems, difficult or impossible—it would be necessary to break down the existing reserve of our diamond experts, or to be illogical and speculative in carrying out commercial transactions based on assumptions. This said, one must understand the observations in this article and the classifications under this point of view.

On the other hand, the SCAPPCM has the technical apparatus for these purposes, for the service and control from the fiscal, economic point of view, and we are in the beginning of the necessary reforms of regulations, to be brought into effect soon. Therefore, as elements are in the making in due course of time, I shall limit myself to descriptions somewhat on the surface of the morphological aspect of some interesting examples.

(1) Translation of an article from the periodical Mineracao e Metalurgia, Rio de Janeiro Marco—Abril, 1941.
(2) Translator's Note: quilates metricos is probably a carat.

In the period to which I refer—1940—there were among the diamonds which I inspected and examined, five which for their characteristics deserve to be mentioned. The biggest one presented for examination to the SCAPPCM was the Coromandel, for its curious morphological aspect—a somewhat irregular shape, suggesting that it will lose a great part of its volume when cut. The octahedral "habitus" was defined by 5 face edges and two points and it can be assumed that it had been broken.

In the natural faces, edges, one can observe figures of corrosion and of attempts of cleaning, polishing, which lead one to believe that they are recent. Its exceptional size, weighing 400.65 carats, puts it in the twentieth place in the world scale of great diamonds, and in the third of our own scale, according to detailed studies on the part of the famous Professor Dr. Reinaldo Saldanha da Gama, aided by eminent professors and the technical expert designated by the SCAPPCM, the author of these lines. The results of these studies will be made public through the Academy of Science, by its famous member (Prof. da Gama). Most of the other stones I could observe for their curious characteristics, either gems or industrial diamonds, came from the Minas Geraes.

For color, one is outstanding, which was mined in Tiros (Estado de Minas Geraes), of pink color and absolutely pure, with a weight of 14.90 carats.

The originality of this diamond lies in its "bela" and its exceptional color. Later I was informed that it has been cut into emerald form. The resulting gem acquired extraordinary beauty and quite higher value. (However, the irregular form prejudicated its final value.)

From Piumi, in the Serras da Canastra region, we received a stone of 28.22 carats, clean, pure and absolutely colorless, unusual because this particular region rarely furnishes stones of great weight and especially pure ones. Mostly the stones of this district carry interior imperfections.

Here, too, an octahedral habitus is observed, rather deformed, but with two parallel faces and of triangular form. The deformation decreased the value. After cutting, however, the price quotation was high. According to the information I received, the classification, commercially, was "extra absolutely white."

Another stone, of curious morphological aspect, was a diamond from Coromandel, of distinct brown color, weighing 52.41 carats. This item, very interesting as a gem on account of its dark color, will probably be better for the industry. Small diamonds were incrusted in one of the faces of the mother crystal, growing parallel. This phenomenon can hardly be explained, because the surface of the diamond presented itself totally "erodida" turning opaque, and not permitting detailed observations. Of this stone I have no information regarding its origin, scope and commercial value.

Finally, two other stones of originality can be mentioned, but I was unable to obtain photographic documentation and could just notice their principal characteristics.

The bigger one was covered with a greenish color of not great depth, typical for the diamonds coming from Bahia. Sometimes it seemed to have a chestnut-brown shimmer. The prin-

(Continued on Page 58)

BOOK REVIEWS

Gem Testing for Jewellers. **B. W. Anderson.**

Mr. Anderson's position and experience certainly makes him one of the leading authorities on the subject covered by his new book, "Gem Testing for Jewellers." He has given us here a short book which contains much of interest to Certified Gemologists and Registered Jewelers. It deals solely with the identification of gems; the first few chapters describe the various gem-testing instruments and their use. The other chapters take up various groups of gems, based largely on color, and explain the methods of distinguishing them. It is unfortunate that our Diamondscope is not in use in England, as a chapter on it would be of great interest to us. For magnification the only instruments dealt with are the loupe and the microscope, the use of the latter is not gone into in detail. Likewise, the Shipley polariscope is evidently not used by our English cousins; they rely on the dichroscope, refractometer and loupe to determine whether a gem is singly or doubly refractive.

Considerable emphasis is placed on the spectroscope, which in a large laboratory must be a very helpful instrument in many cases. In this country we have felt that only an expensive, large-size spectroscope would be of much assistance and, that in view of our other instruments, would only be of use in a limited number of cases so that the purchase of such an instrument would hardly be justified. Mr. Anderson, however, apparently uses a small, less expensive model with good results. Perhaps we should do likewise. Another instrument to which much more weight is given by him than is given in this country is the Chelsea Filter, in use in many North American jewelers' laboratories. This is, of course, a relatively inexpensive instrument and one that can be quickly and easily used. The writer has never used one, having a feeling that in some cases the results might be misleading, but Mr. Anderson is convincing about its value in many cases. He is also a believer in heavy liquids as a rapid means of establishing the density of gems. We might well employ this method more extensively than we do. Our Eastern Laboratory, being fortunate enough to have a Berman Density Balance, has not used liquids to any extent.

Much can be learned by reading Mr. Anderson's accounts of the use of the refractometer and dichroscope. He urges the use of monochromatic light with the refractometer in order to get sharp lines and to determine the birefringence of doubly refractive minerals. The importance of this has not been sufficiently stressed in this country. Many little tricks in using the instruments and in identifying certain species are described that are new to most of us and also invaluable.

The grouping of the gems under various colors, he admits, is open to some criticism, but what other obvious grouping is there that is at once evident to jewelers. Robert Shipley, Jr., in his laboratory course at Los Angeles, has always used it, and our course states that it is the first property to take into consideration. It does, however, cause much duplication in the tables as many gems can occur in several colors and often inexperienced persons are misled, relying too much on color. This, of course, is true of jewelers who have not studied gemology, and the title of Mr. Anderson's book indicates that he is writing it for such jewelers. Mr. Anderson describes the more common gems in the second part of the book under the different colors, and explains the tests for separating one from the other. A most valuable feature of this section is a short table with each group giving the properties of each species and including a few rarer stones which might be encountered but which are not gone into in the text. Thus, if we have a green gem, here are given practically all the green gems and their properties in a compact table that will save much time and confusion over looking one up in the large general tables. In the case of many individual gems, there is some one property which particularly identifies it. Such instances are emphasized and are extremely helpful, and in many cases will be entirely new to our gemological students.

All in all, Mr. Anderson has done a splendid piece of work in this little book. He has kept strictly to the subject outlined in the title, bringing together material scattered through text books and adding to it the results of many years' practical experience in testing gems in his laboratory in London. It covers the subject that is of greatest interest to us without going into unnecessary detail. I recommend it highly to all our members if, and when, it becomes available in this country.
—Edward Wigglesworth, Ph.D., C.G.,
Director Eastern Laboratory, G.I.A.

Note: Will be obtainable from G.I.A. Book Department.

Statistical Data and Remarks About Some Brazilian Diamonds

(Continued from Page 56)

cipal interest lies in a small diamond incrusted in its interior, or regular depth, unlike the matrix crystal, with a rhombo-dodecahedral habitus, while the matrix possessed an octahedral habitus. This stone, of a yellowish color, has less interest as a gem than as for industrial purposes.

The other item was formed of two individuals of different tones, of which one of brownish color was incrusted in the other, colorless. Both were of octahedral habitus, in spite of deformations. The incrusted one, when completed presentable, had lost about 50% of its value. However, the separation was carried out successfully.

DIAMOND GLOSSARY

(Continued from last issue)

Eclogite. A garnet-pyroxene rock found in the diamond "pipes," thought by some scientists to be the original matrix of the diamond.

Economy Stones. Term used by a number of U. S. retailers for a diamond of about crystal color and slightly imperfect. See Crystal.

"Edge up." Observation of a diamond by light passing through it, to the eye, along the plane of the girdle.

Eight Cut. See Single Cut.

Electrical Conduction. Diamond becomes positively electrified by friction on paper, wood and various other substances, but retains the charge for less than half an hour. "As a rule the better the crystallization and the quality the lower the conductivity," Sutton.

Electrode. Either terminal of an electric source; either of the conductors by which the current enters and leaves an electrolyte. See also Cathode.

Element. One of a limited number of distinct varieties of matter which, singly or in combination, compose every material substance; and which cannot be decomposed chemically into more simple substances.

Empress Eugenie Diamond. An oval-shaped diamond brilliant of 51 carats. It was first set as the center of a hair ornament belonging to the Empress Catherine II of Russia. This ruler presented it to her favorite, Potemkin. From a grand-niece of Potemkin, Emperor Napoleon III of France purchased the stone for a gift on the occasion of his wedding to his bride, the Empress Eugenie. After the fall of the Empire it was sold to Gaekwar of Baroda, India, for $75,000.

English Dresden Diamond. Found in Brazil in 1857. E. H. Dresden of London purchased it in rough, cut and sold it for $200,000 to an East Indian. It was later resold to the Gaekwar of Baroda. It weighed 119.5 carats in the rough and 76.5 carats when cut.

English Square Cut Brilliant. See Square Cut.

English Star Cut Brilliant. See Star Cut.

Epaulet. A five-sided form of the step-cut; its girdle outline resembles an epaulet.

Eruptive Minerals. Those of volcanic origin in geological formations. Sometimes synonym of igneous rock.

Estrellada. A diamond-bearing deposit of Brazil.

Estrella do Minas. See Star of Minas.

Estrella do Sud. See Star of the South.

Etched Figures. A marking, usually minute pits, produced by a solvent on a crystal surface; the form varies with the species and solvent, but conforms to the symmetry of the crystal, hence revealing its molecular structure.

Etching. See Etched Figures.

Eugenie, Empress. See Empress Eugenie Diamond.

European Cut. A term formerly used, without geographical significance, to refer to certain type of brilliant cut, the most ideal form of which possessed (in relation to the plane of the girdle) 41° angles with the bezel facets and 38½° angles with the pavilion facets, resulting in a higher crown and a smaller table. This type was more brilliant than the so-called American cut when observed along a line perpendicular to the plane of the table but less brilliant when observed along directions which varied considerably from that perpendicular.

Excelsior Diamond. Found in 1893 in the Jagersfontein Mine, South Africa, it weighed 995.5 metric carats. Of exquisite color, it was cut into 21 stones ranging from a fraction of a carat to 70 carats each. Ten of these weighed 10 carats or over. One of the largest, weighing 18 carats, was shown in the House of Jewels at New York World's Fair by the DeBeers Consolidated Mines. In the rough the Excelsior was the second largest diamond.

Exotic Fragments. Foreign rock reef found in diamond pipes which is unlike floating reef.

Extra Color. Term used in color classification of diamonds at the source for the second finest grade of diamond; equivalent, Jager. See Jager.

Extra Fancy gem blue. Term used by some jobbers for top crystal.

Eye Clean. Misleading term used in describing diamond qualities. Prohibited by American Gem Society and Federal Trade Commission.

Eye Loupe. See Loupe.

Eye Perfect. Misleading term used in describing diamond qualities. Prohibited by American Gem Society and Federal Trade Commission.

Face. (1) A term used in brillianteering for the entire group of facets which can be placed on a diamond in one setting of the dop; (2) In crystallography, a plane surface characteristic of a gem mineral.

Facet. One of the small smooth or polished planes placed upon a cut stone or gem.

Facet Cut or Faceted Cut. A type of cut gem bounded by plane faces as distinguished from cabochon cut or other unfaceted cut.

Faceting. The operation of placing facets on a diamond or other gem; also slightly changing the angle of a facet.

Faceting Tool. A device for holding gem stones on which facets are to be formed by pressure against the face of a rotating abrasive lap.

"Face up well." Applied to diamond which has a more or less undesirable body color, but which is strongly masked by reflections from the facet on its crown or by flashes of blue spectrum color, tending to improve its color.

"False-colored" Diamonds. Trade term formerly used for diamonds which fluoresce in ordinary daylight.

"False Diamond." Quartz crystal.

Fancies. (1) Any diamond of noticeable color other than those trade grades which are called white, light brown, light yellow or yellowish. (2) Diamonds with any noticeable depth of hue. Red, blue and deep pure green are rarest; orange, violet, strong yellow and yellowish greens are more common. Strong greenish yellow is called canary. Browns of fine transparency occur frequently.

Fancy Diamonds. See Fancies.

Fan-shape Cut. A form of diamond or other cut gem resembling a partly opened fan, or a segment of a half circle.

Fashioning. Includes operations of cleaving, sawing, "rounding up," cutting facets, polishing, etc.

Fault. Anything within or on the surface of a stone which affects its value or beauty. Also, a break in earth's crust, along which movement has occurred.

Faultless. As generally used, implies about the same as the classification flawless. See Flawless.

Faulty Structure. Zones of improper crystallization and internal cleavages and fractures may all be considered faulty structure. Result of disturbances during the growth of the crystal, or of later separation between the atoms of which it is composed, or replacement by atoms of another chemical compound. See Flaws. See Inclusions.

Favas (Brazilian for beans). Term used to describe grains of gem minerals found in placer deposits. Also to refer to the deposits themselves.

Feather. A term commonly applied to almost any irregular semi-transparent fault within any stone. More specifically to those internal fractures which appear white.

"Fine Color." Comparative freedom from any tint or hue except yellowish or brownish.

Fine light brown. Probably synonymous with Very light brown. See Very light brown.

Fine Silver Cape. A diamond color grade usually used to describe same color grade of diamond as Top Silver Cape. See Top Silver Cape.

Fine Water. See Water.

Finest Water. See Water.

Finger Printing (of Diamonds). Name applied by Frank Heitzler of Boston to his process which photographs microscopically, and in perspective, the imperfections in diamonds and other gems.

"Fingers." See Dop Marks.

Fine Cleavage. Fragments of diamonds fit for cutting after cleavage. Refers also to flawed or odd-shaped stones requiring cleavage.

Finish. Term referring to certain details of "make" such as the placing and polishing of the girdle, culet and facets. See "Make."

Fire. Term applied to the appearance of dispersion in gems, more especially in the diamond. Also sometimes incorrectly applied, from a gemological standpoint, to play of color in opal.

First Bye. Finest quality of by-water or Bye. See Bye.

First Cape. See Top (or Silver) Cape.

First Color. Term used in color classification of diamonds at the South African source for the third finest grade of diamond, equivalent, Wesselton. See Wesselton.

First Pique. A trade classification denoting the comparative degree of imperfection. First pique is the class which contains fewest, smallest and least important imperfections.

First Water. See Water.

Fish-eye. A trade term referring to a brilliant cut diamond, the center of which appears dead at all distances from the eye. Diamond cutters sometimes confine them to a brilliant in which a dark ring is observable in center of stone, being the reflection of the girdle on the interior of the pavilion facets due to the fashioning of the gem with a too shallow pavilion. See also Thin or Spread Stones.

Fissure. Separation along cleavage plane which slightly penetrates the surface of a diamond.

Flat Ends. Thin cleavages from diamonds.

Flat Stones. Crystals more or less tabular.

Flats. Thin flat portions of diamond crystal, more specifically, flat octahedral forms. May include maacles.

Flawless. Term suggested for use in grading of comparative perfection to take place of much-abused term Perfect. Recommended by A.G.S., Oct., 1937, for use by its members, but not required. "A diamond which is free from all internal and external blemishes or faults of every description under skilled observation in normal, natural or artificial light with a 10-power loupe, corrected for chromatic and spherical aberration. This shall be a standard of the American Gem Society." See also Perfect Diamond.

Flawlessness. See Flawless.

Flaws. A general term used to refer to any inclusion or any fracture or cleavage separation within a diamond or on its surface, such as "feathers," "carbon," fissures, knots, etc. More specifically may refer only to internal structural faults.

"Fleur de Peche." See rose colored.

Flinders Diamond. Perhaps a variety of topaz from Tasmania.

Floating-reef. Inclusions of the surrounding reef in the blue or yellow ground of the diamond pipes. See Reef.

Floors. Flat areas of ground on which the diamond-bearing rock of the South African mines is weathered.

Florentine Diamond (known also as the Tuscan, the Grand Duke of Tuscany, the Austrian and the Austrian Yellow). An Indian diamond. Weight in the rough unknown. Cut 137.5 m.c. Citron yellow and remarkable for fire flashing from its 126 facets. Reputed value $750,000. Present location unknown, formerly in Pitti Palace, Florence, Italy, and later in the Royal Castle in Vienna and probably remained there until Hitler's invasion of Austria.

Fluorescence. The emission of visible light rays of certain colors by a substance when excited by the invisible ultra violet light waves of daylight or by certain electrical discharges. Some diamonds fluoresce strongly. Most common fluorescence blue or green.

Foil. A thin leaf of metal silvered and burnished and afterwards coated with transparent colors; employed to give color or brilliancy to glass or inexpensive gem stones. Used on back of colorless glass or gem stones to imitate the brilliance of diamonds. Diamonds are sometimes backed with a black varnish composed of lamp black and oil of mastic.

Foil Back. See Foil.

Foss (fos). A sort of meandering furrow on the surface of a rough diamond.

Fosse. See Foss.

Four-point Diamond. (1) A diamond which weighs four one-hundredths of a carat. (2) A rough diamond or portion of a rough diamond on which a table is to be placed parallel to a possible face of the cube.

Fracture. Breakage of a mineral along any direction other than a cleavage plane. Fractured surfaces are not perfectly flat and are sometimes very irregular.

(To be continued)

A GEMOLOGICAL ENCYCLOPEDIA

(Continued from Fall, 1942, Issue)

By HENRY E. BRIGGS, Ph.D.

THOMPSONITE

Mottled thompsonite pebbles from the Lake Superior region are often cut into gem stones and are very attractive when well marked. The colors usually cut as gems are yellow, pinkish, greens and whites. The markings are often very peculiar and take the form of concentric rings of color frequently resembling the human eye. This unusual appearance is caused by the radial fibrous structure of the mineral. The crystallization is orthorhombic and it is found in compact masses and pebbles. The hardness is 5 to 5½ and the specific gravity 2.3 to 2.4. It is translucent to opaque and the mean index of refraction is 1.51. It is biaxial and optically positive. In composition it is a hydrated silicate of calcium sodium and aluminum, $2(Ca,Na_2)Al_2(SiO_4)_2$ $2H_2O$.

ZOISITE

Zoisite is a member of the epidote group and is orthorhombic in crystallization. Its hardness is 6 to 6½ and specific gravity 3.25 to 3.37. The mean index of refraction is 1.70 and it is biaxial with a positive optical character. It occurs in grey, yellowish-grey and yellowish-brown, greenish-grey, apple-green and also in a variety called Thulite, which is rose-red. It takes a high polish and makes attractive cabochons, pendants, beads, etc. Important localities are Norway and Italy. Pleochroism is strong in zoisite.

CHROMITE

Chromite is a black opaque iron chromium ore, which is sometimes cut into gem stones when it resembles jet. However, chromite has a high specific gravity as compared with jet, being 4.3 to 4.6. In hardness it is 5½. The mineral has a beautiful metallic luster. In crystallization it is cubic and also occurs in massive form. The streak is pale brown and the composition is $(Fe,Cr)[(Cr,Fe)O_2]_2$. Important localities are Turkey, New Zealand and Maryland. It also occurs in Pennsylvania.

CHRYSOCOLLA

Chrysocolla is a hydrated copper silicate and is sometimes used as a gem stone. Its hardness is 2 to 4 and its specific gravity 2.0 to 2.2. The luster is vitreous to greasy or dull and it is translucent to opaque. The mean index of refraction is 1.498. It occurs in shades of blue and green, also in brown and black. The principal localities are Ural Mountains, Arizona and Lake Superior region.

SERPENTINE

Precious serpentine, Bowenite, Williamsite, and Verd Antique are the varieties of serpentine used as ornamental stones or gem stones. It is monoclinic in crystallization, but is never found in crystals. The hardness is 2½ to 4 and the specific gravity 2.5 to 2.8. It occurs in shades of green, yellow, brown, reddish and black. Often times it is blotched or multicolored, and such pieces are perhaps the most attractive. The luster is waxy to dull. It is translucent to opaque. The mean index of refraction varies from 1.50 to 1.55. It is biaxial and optically negative. In composition serpentine is a hydrated magnesium silicate, $H_4Mg_3Si_2O_9$. Iron and nickel often replace part of the magnesium and tend to give the mineral a green color. Precious serpentine is massive, translucent and of uniform greenish or yellowish-green color. It is found in gem quality in Norway. Bowenite is a fine granular variety of green color somewhat similar to that of jade, found in Rhode Island. Williamsite is a blackish variety, little used as a gem. Verd Antique, frequently sawed and polished in large slabs and used as ornamental covering for store fronts, lobbies, etc., is a massive mottled green variety, often occurring with other minerals. Gem quality found in Vermont and France.

DIOPTASE

Dioptase commonly occurs in prismatic crystals and in crystalline groups or masses. The crystallization is tri-rhombohedral and the hardness 5. The specific gravity is 3.28 to 3.35. The luster is vitreous and the mean index of refraction is 1.67. Dioptase is of emerald-green color. It is uniaxial and optically positive. It occurs in French Congo in Africa and also in Arizona.

FLUORITE

Fluorite occurs in well-formed cubic crystals with a well-developed octahedral cleavage. It is soft, being only 4 in hardness, and the gravity is 3.0 to 3.2. It occurs in many beautiful light or very light tones of various hues, including blues, greens, pink, yellows, red, orange, violet, brown, etc. It is transparent to opaque and is often fluorescent or phosphorescent. It is interesting to place a piece of fluorite upon a hot stove top in a darkened room and see it fluoresce. All fluorite will not react to heat, although most samples will. The index of refraction is 1.434 and the dispersion is very low, .006. It is calcium fluride, CaF_2. Fluorite is too soft and has too perfect a cleavage to be durable, but is often used as an ornamental stone or as a gem set for brooches, etc., where the wear is not great. Principal localities are England, New Jersey, Arizona, California, Kentucky and Illinois.

SEPIOLITE (Meerschaum)

Sepiolite is known in commerce as meerschaum and is soft and very easily worked into intricate shapes. It is used mainly in the making of pipes and holders for cigars and cigarettes. Occasionally, though, we see it carved into ornaments and also cut into beads. The hardness is 2 to 2½ and the specific gravity 1 to 2. It is very porous and may float upon water, especially salt water. Thus it derived its name meerschaum, which is a German word literally meaning "sea foam." It is biaxial and optically negative. The mean index of refraction is 1.55. The color ranges from white to greyish and yellow, the luster is dull but is vitreous to waxy when polished. It is a hydrated silicate of magnesium, $H_4Mf_2Si_3O_{10}$. Meerschaum is mined in Asia Minor and also in the United States in South Carolina, Utah, New Mexico and California. *(To be continued)*