# Gems & Gemology

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# Local Peculiarities of Sapphires*

*by*

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The problem of classification of gem stones in accordance with their sources of origin has always challenged my special interest and has prompted me to carry on extensive research work in this matter. As a result I could not fail to be attracted to the multiplicity of physical, chemical and microscopic properties of the oriental sapphires varying according to the stone's birthplace. In spite of the fact that opinions have been expressed to the effect that the differences in gemological properties were insufficient and that, therefore, no accurate and convincing method could be achieved; I would like to attempt to prove, in the following paper, the existence of such distinctly discriminating properties which permit a definite identification.

To arrive at anything like exact and consistent results it seemed of great importance that the origin of a given stone be ascertained above any doubt. The stones, therefore, which served as a basis of my investigation were procured from chosen dealers only, who traded directly with the respective regions. Some even had their own residential agents in the mining districts. The study of blue sapphires from Ceylon was additionally assisted by their comparison to fancy sapphires whose home was definitely known to have been Ceylon.

Before presenting the more valuable facts of the microscopic study of the inclusions in blue sapphires from the different oriental deposits, a few words describing the discerning physical and chemical characteristics may be said.

Though, of course, any of the four well-known localities of Cashmere, Burma, Siam and Ceylon may produce various shades and tones of blue hues, there are typical color qualities which, as a rule, make it possible to the naked eye to differentiate a stone's source of origin. The fine "Royal Blue" is as characteristic for Burma sapphires as is the inky, satiny aspect of stones from Siam, and the velvety, thick cornflower-blue seems to have reached the top of its softened appearance nowhere else so entirely as in the far-off mines of Cashmere. Brilliant, light purplish-blue and pale gray-blue sapphires may at least indicate a hint at their genesis in the gem-pregnant soil of Ceylon. You noticed I said "a hint," and I mean it, because color does not signify everything, but it is a faint "supposition" permitting to classify the origin of the gem stone under examination.

*G.I.A. Research Service.

It has been scientifically proved, by means of emission spectra, that the various tones in the color of rubies from different sources are due to a variation in the colloidal admixture of the coloring elements; and this same method, being more sensitive than the chemical analysis, was applied in determining sapphires from various localities. The stones were ignited in the arc of two spectrographic electrodes consisting of pure carbon (top spectrum), and the emission spectra produced were photographed within the brackets of 2100 A° to 4000 A°. The accompanying illustration (Fig. 1) shows the spectra provoked by a Ceylon sapphire (center) and a Burma sapphire (bottom). The greater amount of coloring material, i.e., titanium and iron, in the Burma sapphire causes it to exhibit much more pronounced emission bands than does the Ceylon sapphire, the bands of which are decidedly weaker and fewer. And yet, the infinitesimal proportion of intermolecular impurities of Fe and Ti is still sufficient to produce the blue color in Ceylon sapphires. The emission spectra make it possible to interpret the results qualitatively as well as quantitatively. No spectrograms of Cashmere and Siam sapphires are published here because these stones' differences, rather in hues than in tones, seem to originate from a reciprocal change of proportional amount of titanium and iron rather than from simultaneous variation of both.

These circumstances affecting the colors of sapphires lead to the conclusion that other optical and physical properties must also be slightly different. The study of the luminescence often yields conclusive information. Sapphires show differences of luminescence under cathode and under ultra-violet rays. For practical exercise Table I may be useful.

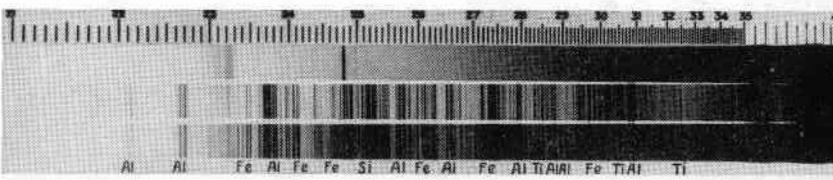



*Figure 1* —*photo by Dr. Gübelin*

*Spectograms of Ceylon Sapphire (center) and Burma Sapphire (bottom). Top spectrum is that of the arc.*

Though the use of this table becomes more effective as experience is gained in testing sapphires under cathode and ultra-violet rays, and as scores of stones are carefully examined, the table cannot be regarded as absolutely complete; deviations from standards do occur and may be dependent on inclusions and other impurities within the stones. Thus, in many cases this method does not render any results. Besides, the behavior of the coloring substances in sapphires is much less calculable than that of those in rubies and much research is still needed before incontestable knowledge is attained.

Turning to our standard-testing methods we will again find slight

**TABLE I**

| *Stone* | *Color* | *Cathode rays* | *U-V rays* |
|---|---|---|---|
| Cashmere sapphire | fine blue<br>dark blue | green blue | medium |
| Burma sapphire | dark blue | dark purple (strong) | weak |
| Siam sapphire | inky blue<br>dark blue | dull red (weaker) | weak |
| Ceylon sapphire | light blue | vivid red (strong) | strong |

but interesting differences in refractive index and density. Siam sapphires have a higher specific gravity than those from Burma and Ceylon, and the disparity in respective R.I. is the following:

| | | |
|---|---|---|
| Siam sapphire | $e_d$ =1.763 | $w_d$ =1.775 |
| Burma sapphire | $e_d$ =1.762 | $w_d$ =1.773 |
| Ceylon sapphire | $e_d$ =1.760 | $w_d$ =1.768 |

(Note: e and w represent epsilon and omega, respectively.)

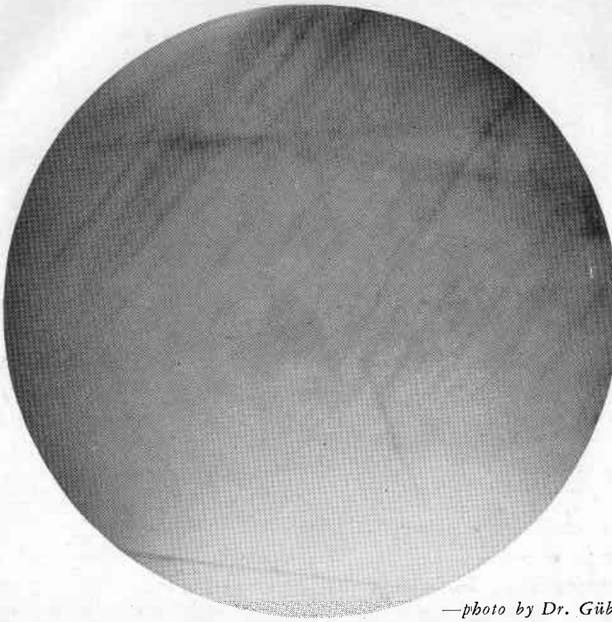
these being the average constants of ten readings. Stones containing a large percentage of pigment will normally show higher refractive indices and specific gravity.

The differences offered by the described tests are too small for sure detection, and it must be remembered that neither of these methods of discrimination should be regarded as more than a mere indication.

After these preliminary remarks it may be recalled that in my papers of Spring and Winter 1940 in *Gems & Gemology* (Vol. III, Nos. 5 and 8), I suggested the distinction between the oriental rubies by means of their locally varying inclusions to be by far the surest method. Equally, the microscope may again assist the gemologist in determining the origin of a given sapphire. Therefore, after a thorough and accurate study, the mystery of the wide variation in inclusions of the sapphires from the four noteworthy sources in the Orient may be further clarified by the following description of the microscopic peculiarities.

The conditions under which sapphires have grown are locally different, i.e., the mineral association, the mother rocks and the actual genesis of the gems are, to a certain extent, typical of each locality. As a result the inclusions which are but traces of the process of growth must also vary.

To the eye the interior appearance of sapphires from Cashmere is oftentimes what might best be termed "hazy," which is likely to contribute to the beauty of color. But under the microscope this haziness dissolves into most curious and interesting veil-like formations, which are composed of wavy filaments reminiscent of a fine silk tissue woven in a hexagonal pattern, the single twines intersecting at angles of 60°, respectively 120°. (Fig. 2.) However, they are not rutile needles and can readily be distinguished



—*photo by Dr. Gübelin*

*Figure 2*

*Veil-like filaments of hexagonally intersecting fibers which consist of minute fissures. 100x.*

from these. Exaggerated magnification shows the single fibers to consist of tiniest and subtle fissures or hollow tubes of a slightly brownish color and generally lying across the direction of the wavy threads.

Liquid inclusions in sapphires from Cashmere manifest a special design. They start from apparently thin and striped films of a more or less intense yellow to brown hue, spreading into net-like, skeleton-shaped irregular systems of liquid-filled channels which in further continuation range downwards to single microscopic drops of liquid. (Fig. 3.) As a whole they show sharply bordered, flatly shaped formations with rounded rims. The irregular liquid tubes are always located around the borders of the thin films which most probably are gas-filled cracks. When these films in the center of the entire inclusion are looked at perpendicularly they appear in the color of the sapphire and gradually turn yellow and brown, the more the stone is inclined in regard to the direction of vision. Such a phenomenon always results from total reflection of light upon gas-filled planes in a stone.

It is only logical that the inclusions in sapphires originating from localities where red and blue corundums grow adjacently should be equal in rubies found in the same place and that what has been written

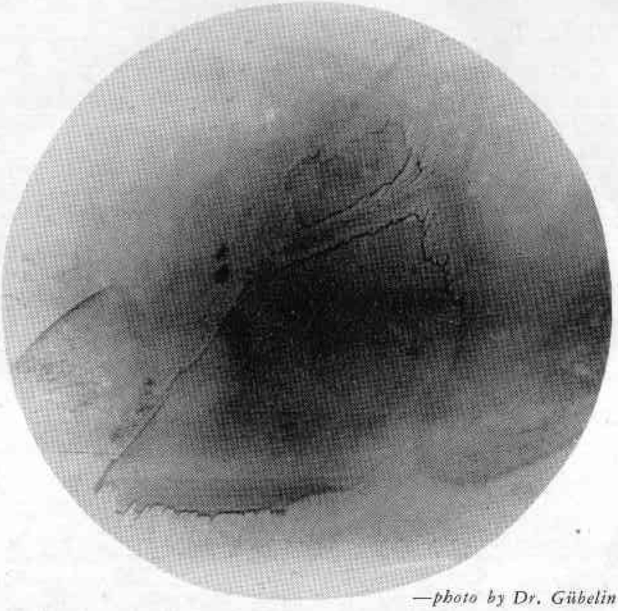


*Figure 3*
*Large flat films dissolving into net-like formations and single drops of liquid. 100x.*

*—photo by Dr. Gübelin*

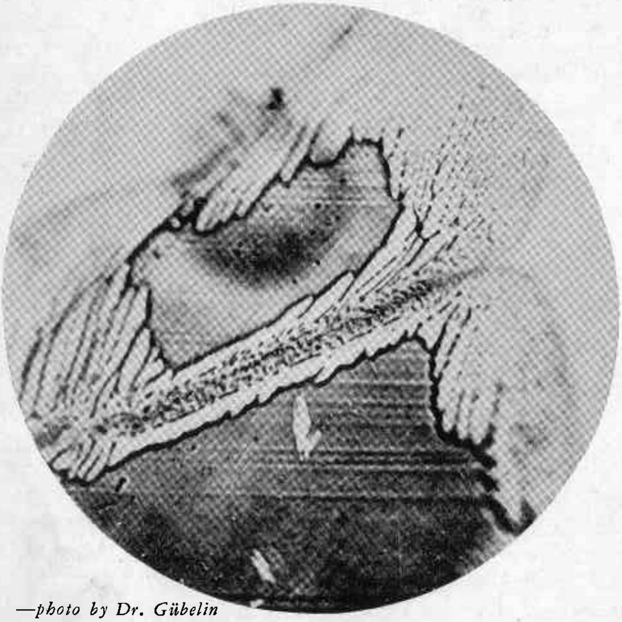
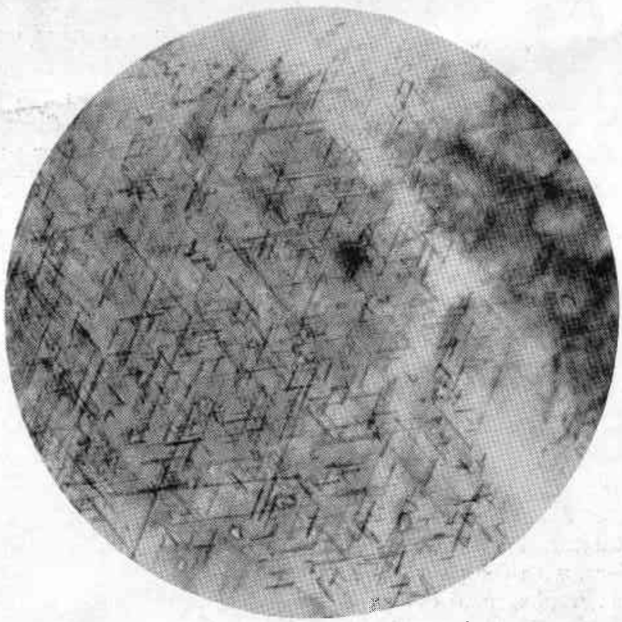


*Figure 3*
*Large flat films dissolving into net-like formations and single drops of liquid. 100x. Same picture but vastly blown up.*

*—photo by Dr. Gübelin*

about rubies in previous articles of mine may also be applied to the sapphires of corresponding source of origin. Anyway, as there are several interesting facts which it is useful to note, a short reiteration of the discernible features is herewith called for.



—photo by Dr. Gübelin

*Figure 4*

*Short, thickly strewn rutile needles (silk) hexagonally arranged in Burma Sapphire. 75x.*

Burma sapphires have as their most characteristic inclusions rutile needles which are either thickly strewn through the gem or more generally grouped to typical patches, clouds and zones (=zonal structure). They are found to have developed along the prism planes and when looked at parallel to the optic axis of the mother stone they intersect at angles of 60°, respectively 120°; i.e., their distribution is ruled by the hexagonal crystal lattice of corundum. Because of their arrangement parallel to the basis and perpendicular to the optic axis these intersecting rutile needles are of decisive assistance in finding the direction of the optic axis (interference figures and dichroism). Fig. 4 depicts a Burma sapphire showing typical patches of rutile needles. It is generally agreed to call these needle-like and slender crystals "silk." The habit of the rutile needles in Burma sapphires is markedly shorter than in Ceylon stones. Also, they appear black in transmitted light because of their high refractive index.

*(To Be Continued)*

# Synthetic Emeralds Appear Commercially in Small Quantities*

*by*

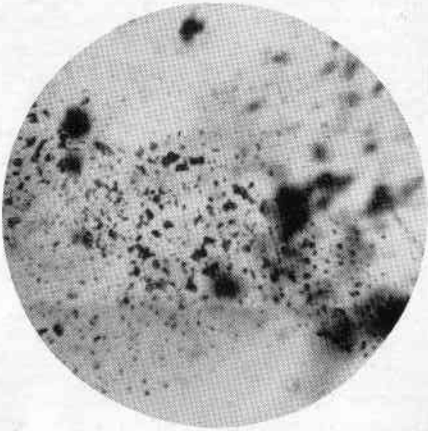
ROBERT M. SHIPLEY

Synthetic emeralds have appeared commercially in the jewelry trade, but so far in small numbers. They have recently been offered to retailers on the Pacific Coast by a representative of a San Francisco jewelry house.

Sizes up to and slightly over one carat are being offered from $12.50 to $80.00 per carat depending upon size and quality. A statement has been made that sizes of two or even three carats may soon be offered, but we can obtain no confirmation of this fact.

Like several synthetic emeralds previously examined by us, some of these would deceive the ordinary jeweler. Statements to the effect that such jewelers, with the aid of a few photo micrographs, can detect all synthetic emeralds are unfortunate and can result in disappointment for those jewelers. However, jewelers with some experience in handling genuine emeralds, or who have progressed sufficiently in their study of gemology, should easily detect any of the fashioned synthetic emeralds which have been reported by the Gemological Institute.

Six of these stones were examined by Richard T. Liddicoat, C.G., and the writer in the Gemological Institute's Laboratory. *Some* are of good emerald color but lack the transparency and brilliancy of good quality genuine emerald. The whitish wisp-like markings described and illustrated on pages 146 to 150 of *Gems & Gemology*, Summer, 1941, are prominent under magnification, in all except one. In the latter, the small irregularly shaped inclusions mentioned (but not pictured) in the same article (at beginning of page 150) are "sprinkled" throughout the stone. The stone contains no other inclusions. These latter are probably particles of coloring matter. We illustrate these inclusions as observed in another synthetic emerald. However, the stone more



*—photo by Dr. Gübelin*

recently examined by us contains only the smaller sized inclusions of this illustration and, while greenish in color under high magnification,

*(Continued on Page 42)*

*A.G.S. Research Service.

# BOOK REVIEWS

***Diamond and Gem Stone Industrial Production.*** **Paul Grodzinski. N.A.G. Press Ltd., London, 1942. 15 shillings.**

So far as the reviewer knows, this is the first book devoted solely to the industrial uses of the diamond, precious stones and other extremely hard substances. In it is not only conserved the meat of many technical papers on one or more phases of the subject, but also wisdom from the author's wide practical experience. The immediate object of the book is to furnish an authentic technical background for the English diamond-cutting industry, which has sprung up since the Low Countries were overrun. It is particularly timely, as neither the United States nor Great Britain can longer depend on imports for their supplies of jewel bearings and diamond dies—both a "must" in making the instruments by which our pilots control their planes and for other defense purposes. The book should be on the bookshelf of every diamond cutter, lapidary and maker of diamond dies, diamond-set tools and instrument jewels.

The book is, to all intents and purposes, an artisan's vade mecum and in consequence the reader can best grasp the scope of the book from the following summary of its chapters:

Chapter I—"Technology of Machining Methods": The problems of machining hard substances (speed, pressure, etc.), the relative hardness of abrasives, their differing abrasive action, and the grinding action of abrasive wheels; the lubrication of the grinding surface and binders for diamond-impregnated wheels.

Chapter II—"Dividing of Diamonds and Gem Stones" including chipping, cleaving and sawing; with the machinery and methods required therefor. While most of the chapter is devoted to the diamond, the shaping of piezo-electric quartz plates and the sawing of gem stones are described.

Chapter III—"Bruting," referring, of course, to the shaping of diamonds.

Chapter IV—"Cutting and Polishing": The scaifes and dops used in the facetting of diamonds; machinery for the shaping and polishing of gem stones into cabochons and facetted cuts; the machinery used in the grinding and polishing of quartz plates and the preparation of slides for petrographic and metallographic study.

Chapter V—"Drilling and Boring of Holes" in diamonds and gem stones, largely devoted to the methods of producing diamond dies and instrument jewels.

Chapter VI—"Carving and Engraving" of diamonds, gem stones and hard metals.

Chapter VII—"Diamond Powder": Methods of crushing diamonds and grades of the resulting product.

Chapter VIII—"Diamond-dust Impregnated Tools" with description of the bonding material and methods of manufacture.

Chapter IX—"The Manufacture of

Diamonds and Gem Stones for Ornamental Purposes": Diamond cutting and that of gem stones in the brilliant form; gem stones, both cabochon and as facetted stones.

Chapter X—"The Manufacture of Watch and Pivot Bearings": A very valuable and complete chapter on the subject; particularly timely, now imports from Switzerland are largely cut off. The various types of jewel bearings and the machines and methods used in their processing are described.

Chapter XI—"Manufacture of Diamond and Hardmetal Dies": This chapter, with its description of the machine involved, is also of direct value to the American war effort.

Chapter XII—"Industrial Diamonds": This chapter is devoted to the proper shaping of industrial diamonds to be set in tools for truing emery wheels and for turning alloy steels.

Chapter XIII—"Setting Industrial Diamonds": Describes metals in which diamonds are to be set and the methods employed.

Chapter XIV—"Grinding and Lapping of Sintered Carbides": The final shaping of these extremely hard substances with the help of diamond dust or a diamond-impregnated wheel is described.

The book ends with a short bibliography, several appendices and a few useful tables; 183 line drawings clarify the text.

While to some of us a chapter on the occurrence and available supply of industrial diamonds and the manufacture of synthetic corundums would have added interest, the book, on the whole, is excellent. Few flaws can be discovered, although the statement that the carbonado is harder than the gem stone (p. 234) is not true, according to the experimental data at the reviewer's disposal. The author also, unfortunately, does not give the weight (p. 90) deserved to the careful scientific work of Dr. Kraus and his colleague, Dr. Slawson. A few other minor errors are noted.

In résumé, Mr. Grodzinski and his publisher, Mr. Arthur Tremayne, are to be congratulated for producing a book of such value to the diamond cutter and to other industrial users of the diamond and other gem stones.

SYDNEY H. BALL.

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# Synthetic Emeralds

*(Continued from page 40)*

they appear as black inclusions under 10x to 40x. They are, of course, not the typical genuine liquid inclusions pictured in Figures 2 or 3 in previous article (above mentioned).

In common with all synthetic emeralds examined in the Gemological Institute's Laboratory or reported by Doctor B. W. Anderson of the London Laboratory, these synthetics have the same double refraction, dichroism, and approximately the same refractive index, specific gravity and hardness as the genuine.

# DIAMOND GLOSSARY

*(Continued from last issue)*

**Cutting, History of.** Diamond began to be cut with a symmetrical arrangement of facets about 1450 or later. Names associated with early faceting are Herman of Paris and Louis de Berquem.

**Cyclic.** Circular as in certain types of repeated twinning that tend to produce circular forms.

**Da-grade Color grading unit.** Light for diamond grading developed by Gemological Institute of America. Superceded by the improved Diamolite. See Diamolite.

**Darcy Vargas.** Brazilian diamond. Weight, 460 carats. Found in Municipality of Coromandel, State of Minas Geraes, 1739.

**Dauphiné Diamond.** Rock crystal (quartz.)

**D.C.** An abbreviation in the trade meaning diamond or brilliant cut.

**DeBeers Consolidated Mines, Limited.** Cecil Rhodes completed the consolidation of the various claim holders in the DeBeers Mining Company before Barney Barnato had succeeded in a similar effort with the Kimberley Mine. Later the two concerns were amalgamated, resulting in the formation of the DeBeers Consolidated Mines, Limited. This concern later gained control of Dutoitspan and Bultfontein Mines. In 1890 the Wesselton mine was discovered and operated by DeBeers. Control of Koffyfontein and Premier Mines was obtained in 1911 and 1917, respectively. Later the Jagersfontein and the mines of S. W. Africa were also taken over.

**DeBeers Diamond.** A 440 carat octahedron discovered in the DeBeers mine in 1888. A stone of 234.5 carats was cut from it and sold to an Indian prince.

**DeBeers Mine.** A pipe diamond mine discovered in South Africa in 1871. Operated until 1908.

**DeBeers Mines.** The Dutoitspan, Bultfontein, DeBeers, Kimberley and Wesselton Mines are often classed as the DeBeers Mines because of common ownership. They are also often referred to as the "Big Five."

**Deformed Crystal.** A crystal deformed or twisted out of its normal shape, so that its interfacial angles may differ widely from the regular form. See Distorted Crystals.

**Degree.** (1) Angular measure—one degree equals 1/360 of the circumference of a circle. (2) A subdivision or unit of measurement as in a thermometric scale, Fahrenheit and Centigrade.

**Density.** Refers to the mass of a material per unit volume. See Specific Gravity.

**Derya-Noor or Deryai-Noor ("Sea of Light").** Legendary diamond believed by some authorities to be identical with the Great Mogul and the Orloff. See Great Mogul. See Orloff.

**Dewey Diamond.** Diamond found at Manchester, Virginia, in 1885. It is an octahedron of fine form but poor quality. Weight, 23¾ carats.

**Diabase.** A dark basic igneous rock with lath-shaped feldspar crystals. Believed to be the source rock of diamonds in some areas.

**Diamant.** A Middle English form of spelling diamond.

**Diamante.** (Sp.) Diamond; D. *en-bruto,* a rough diamond; D. *negro,* a bort.

**Diamantiferous.** Bearing or containing diamond.

**Diamantina District (Brazil).** Region in the neighborhood of the first discovery of diamonds in Brazil.

**Diamantinas.** Grade of Brazilian diamond. Inferior to stones from Bagagem and Canavieiras. Name comes from the character of the majority of the stones from District of Diamantinas.

**Diamolite** (Trademark). An instrument for color grading of diamonds, affording an artificial light source as closely approximating daylight as possible (in 1942) and designed largely to eliminate colored reflections from surroundings.

**Diamond.** A native crystallized form of carbon. Very hard. Used as a gem when pure and clear. Usually tinged slightly with yellow or, less often, with brown. Frequently colorless, but sometimes colored green, blue, red and black, rare. See also Bort. See also Carbonado.

**Diamond Angle Gauge.** Gauge which measures the comparative correctness of the angles for the slope of the bezel facets in relation to the table.

**Diamond Chisel.** A cutting chisel having a diamond or V-shaped point.

**Diamond Core Drills.** The drill bit is a hollow steel cylinder, the bottom of which is studded with small diamonds to act as a cutting edge.

**Diamond Corporation.** The Corporation was formed in 1930 and is composed of the previous Diamond Syndicate which owns 50% of the stock, DeBeers Consolidated Mines which owns 32½%, Consolidated Diamond Mines of South West Africa with 12½%, and Jagersfontein Mining and Exploration Company with 5%. (Year 1942.)

**Diamond Cut.** A term used by some lapidaries to mean brilliant cut. See Brilliant cut.

**Diamond Imperfection Detector.** A monocular microscope mounted on a Diamond Imperfection Illuminator.

**Diamond Imperfection Illuminator.** An instrument used in combination with (1) a binocular microscope, (2) a monocular microscope or (3) an aplanatic loupe for the detection of imperfections in a diamond. The interior of the diamond is completely illuminated, eliminating reflections from the surface of the stone. The instrument is adjusted for different types of magnifiers. When a 10x aplanatic, achromatic loupe or the monocular microscope is used, the instrument is called a Diamond Imperfection Detector; when a binocular microscope is used it is called a Diamondscope (Trademark).

**Diamond Lamp.** A special type of lamp with a silvered reflector containing many protuberations. This reflector throws a multitude of reflections (one from each of the protuberations) into the diamond, and causes a scintillation of the diamond, which is similar to that caused by a multitude of lights in a ballroom or other similar environment.

**Diamond Powder.** See Dust.

**Diamond Producers' Association.** The Association is made up of the Diamond Corporation, the South African Government and the South African diamond mining companies. The Association markets the output of all its members through the Diamond Trading Company (1933). See Diamond Trading Company.

**Diamondscope (Trademark).** A binocular microscope mounted on a Diamond Imperfection Illuminator.

**Diamond Syndicate.** The Syndicate was formed by Cecil Rhodes in 1890 and was made up principally of firms also interested in the Producing companies. The Syndicate made contracts with the Producing companies for their outputs, and through the methods adopted, established the prices of diamonds to the consumers and to the producers. Still controls 50% of the Diamond Corporation stock, but is otherwise no longer active.

**Diamond Trading Company, Limited.** The marketing outlet for the Diamond Producers' Association.

**Diamond Wheel.** A wheel made of metal, as copper or iron, and charged with diamond powder and oil, used in grinding gems.

**Diaphaneity.** The property of being either transparent or translucent.

**Diggings.** See Dry Diggings. See Wet Diggings.

**Dike.** A vertical or inclined fissure in the earth's crust which has been filled with a mass of igneous material forced upward while molten and becomes rock by cooling. Diamonds are sometimes found in Dikes.

**Dimorphism.** Crystallization of a chemical compound into two different crystal forms. Carbon appears in two forms, in diamond and graphite.

**Dispersion** (Fire). The property possessed by a stone which breaks up a beam of white light into the rainbow color of the spectrum. Diamond has a dispersion of .044, the highest of any colorless gem.

**Distorted Crystals.** Crystals whose faces have developed unequally, some being larger than others. Some crystal forms are drawn out or shortened, but the angle between the faces remains the same. See Deformed crystals.

**Dodecahedral.** Pertaining to the rhombic dodecahedron, a form with twelve faces in the cubic system.

**Dodecahedral Cleavage.** Cleavage is in six directions parallel to pairs of opposite faces of the dodecahedron. In diamond it is not as perfect as the octahedral cleavage. The presence of this cleavage in diamond is occasionally disputed.

**Dodecahedron.** A geometrical crystal form in the cubic system. See also Rhombic dodecahedron.

**Dop.** Any device which is used to hold a diamond during any stage of the process of cutting is called a "dop."

**Dop Marks.** Marks left on surface of a diamond by "fingers" of the dop.

**Double Color.** See Premier. See Fluorescent diamond.

**Double-cut Brilliant.** A diamond cutting with two rows of facets on the upper side. See also Triple cut. See also Single cut brilliant.

**Double Dutch Rose; Double Holland Rose.** A rose-cut stone with ~~24~~ 36 triangular crown facets and a large culet. See Holland rose. See also Rose. Also known as a "rose recoupee."

**Double Holland Rose.** See Double Dutch Rose.

**Double Rose Cut; Double Rosette.** Two Holland rose cuts base to base, making a stone without a table or culet. See Pendeloque.

**Double Rosette.** See Double Rose.

**Doublets.** Occasionally reappear in the trade, sometimes with a base of other colorless stones, and sometimes with two pieces of diamond cemented together.

**Draw color, To.** When several diamonds are placed in a diamond paper together and light passes through one stone after another, the slightly colored light from each stone intensifies the slight color in the other. The group of stones is then said to "draw color."

**"Drek"** (Dutch). Used to describe the inferior type of diamonds that were cut in Antwerp and Nuremberg.

**Dresden, English.** See English Dresden.

**Dresden Green.** An Indian diamond, apple green in color. Weight, 41 m.c. Bought by Augustus the Strong of Saxony (1670-1733). Set in an ornament displayed in the Green Vaults of Dresden. (Previous to 1939.)

**Dresden White.** See Saxon White.

**Drop-form Cut.** See Briolette. See Pendeloque.

**"Dry Diggings."** Term used to differentiate diamond diggings in volcanic pipes from river or alluvial mining.

**Dudley Diamond.** See Star of South Africa.

**Durability.** Ability of a gem stone to resist chemical and abrasive influences. Durability depends largely, but not entirely, on the hardness and the toughness of a mineral. Diamond is the hardest of objects. Will scratch any other substance. Extremely difficult to polish, but will retain polish indefinitely. A sharp blow or a rapid temperature acting upon inclusions are the only normally encountered agents which tend toward its disintegration.

**Dust, diamond (all varieties).** Used in cutting and engraving the diamond and the lapidary's wheel for faceting the diamond, a method said to have been introduced by L. von Berquen of Bruges.

**"Dutch Bort."** Zircons found in the South African diamond mines.

**Du Toit Diamonds.** Two diamonds of a yellowish tinge from Dutoitspan mine, Kimberley. One weighed 250 carats, the other 127 carats.

**Dutch Rose.** See Holland Rose.

**Dutoitspan Mine** (South Africa). Second diamond pipe discovered in September, 1870, on the farm Dortsfontein, near present town of Kimberley. Dutoit's pan was the name given to the pan or natural land basin upon this farm. The deposit proved very easy to work. Because of the absence of water in these deposits, they became known as "dry diggings" in contrast to the "river diggings" or wet diggings. Yellow is the predominating color of Dutoitspan mine diamonds.

**Dyke.** See Dike.

*(To be continued)*

# A GEMOLOGICAL ENCYCLOPEDIA

*(Continued from Spring, 1942, Issue)*

By HENRY E. BRIGGS, Ph.D.

## RHODONITE

Rhodonite is a pinkish or red mineral often found with unique markings of black. It is opaque and is cut into beads, cabochons, etc. It takes a high polish and when nicely marked makes a very attractive gem stone. The hardness is from 5 to 6 and the specific gravity from 3.4 to 3.7. It occurs in pink to red and occasionally yellowish, greenish or brownish, all of which will easily change to black by the changing of the manganese oxide which lends the color. The luster is vitreous to pearly and the mean index of refraction is 1.73. The crystallization is triclinic, but it is usually found in masses. Rhodonite is biaxial and optically negative. The composition is $MnSiO_3$. The principal supply of gem grade rhodonite comes from Russia and California.

## VESUVIANITE

Vesuvianite, or idocrase, is another gem which is offered under a host of different names. It is impossible here to list all the names which are applied to this mineral in different localities. It occurs in prismatic tetragonal crystals and in compact masses. The hardness is 6½ and the specific gravity is 3.3 to 3.5. The mean index of refraction is 1.72. It is uniaxial and usually optically negative but does occur optically positive rarely. In composition it is a silicate of calcium and aluminum, $Ca_6[Al(OH,F)]Al_2(SiO_4)_5$. It occurs in greens, yellows, browns and rarely in reds, blues, or blacks. Pleochroism is distinct in the darker specimens. Important localities are California, Mount Vesuvius, Siberia and Norway.

## DATOLITE

Datolite is a monoclinic mineral occurring in white, greyish, pale-green, yellow, red, amethyst, and olive greenish colors. It has a vitreous luster and is transparent to opaque. Its hardness is 5 to 5.5 and its specific gravity 2.9 to 3.0. It is biaxial and optically negative in character. The mean index of refraction is 1.65. In composition it is a borosilicate of calcium, $Ca(B.OH)SiO_4$. Important localities are Scotland, Italy, Massachusetts, Connecticut, and Lake Superior copper region.

## GOLD

Native gold in crystals, as wire in white quartz, or in nuggets, is often used as a set in pins, brooches, etc. In form, gold is cubical, but crystals are not common. The hardness is 2½ to 3 and the specific gravity is 16 to 19, depending on the purity. The luster is metallic and the streak golden yellow. It is not attacked by acids except aqua regia.

## HEMATITE

Hematite is an important ore of iron, its composition is merely oxygen and iron after the formula $Fe_2O_3$. The gem variety occurs in hexagonal crystals, with a hardness of 5½ to 6½ and a specific gravity of 4.9 to 5.3. The luster is metallic and the streak red. Since the mineral is always opaque it is cut usually en cabochon and is often seen now as intaglios. Its widely distributed important localities are England, Minnesota, Norway and Sweden.

## SMITHSONITE

This mineral is little used as a gem, however, we see it occasionally in the form of a cabochon. It is hexagonal in crystallization and has a hardness of 5 and a gravity of 4.1 to 4.5. It is colorless when pure but is usually greyish, yellowish, bluish, greenish, brownish or white but also occurs occasionally in a delicate pink. The mean index of refraction is 1.75. It is uniaxial and optically negative in character. The luster is vitreous and it is translucent to opaque. Pleochroism is very weak. In composition it is a carbonate of zinc, $ZnCO_3$. Important American localities are Marion Co., Arkansas, and Kelly, New Mexico.

## COBALTITE

Cobaltite is an opaque ore of cobalt and is sometimes cut as a gemstone. Its crystallization is cubic. Its hardness 5½ and specific gravity 6.0 to 6.4. The luster is metallic and the color is a metallic white inclining to a pink. The streak is greyish-black. Composition is sulphide of arsenic and cobalt, CoAsS. Important localities are Sweden, Norway, England and Ontario, Canada.

## SODALITE

Sodalite is used to some extent as a gem and really deserves more attention than it gets. In crystallization it is cubic and therefore isotropic. The hardness is 5½ to 6 and the specific gravity 2.14 to 2.30. It is a dark blue in color and transparent to translucent. Occasionally, however, it is found in other colors including grey, greenish, yellow and lavender-blue. The index of refraction is 1.48. In composition the mineral is rather complex, being a sodium aluminum chloro-silicate, $Na_4Al_2\ (AlCl)\ (SiO_4)_3$. It is seldom that it is found transparent in crystals large enough to cut, but when such gems are found they are very beautiful. They resemble the blue spinel in appearance. Important localities are Norway, Maine, Ontario, Canada, and the Ural Mountains.

*(To be continued)*