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.

VOLUME III FALL, 1941 NUMBER 11

In This Issue: *Page*

Published by

THE GEMOLOGICAL INSTITUTE OF AMERICA

541 South Alexandria Ave. Los Angeles, California

A Solution To Diamond Color Grading Problems*

by

ROBERT M. SHIPLEY AND R. T. LIDDICOAT

For generations two important problems have faced the men who grade diamonds. They are, first, an accurate method of imperfection detection, and, second, the accurate determination of the slight color nuances present in the gems. Research conducted at the Los Angeles laboratory of the Gemological Institute of America brought about the introduction to the trade some time ago of the Diamondscope, which has effectively solved the problem of accurate imperfection detection.

Continued research on the part of the Robert Shipleys, Senior and Junior, brought about the recent introduction of a uniform diamond-grading lamp and of a method of grading diamond colors against a standard in the form of a definitely set and constant scale, as incorporated in the new G.I.A. Colorimeter. This is the first time a color-grading "yardstick" has been established.

The presence, or absence, of imperfections plays an important role in the evaluation of diamonds, but imperfection detection does not offer as great a problem as the determination of color grades. To persons inexperienced in color grading, most of the gem variety diamonds appear colorless, and many of them slightly bluish. This is particularly true when the gem is observed "table up" under bright daylight and certain types of direct artificial light. However, when their body color is examined under the exacting conditions of the laboratory, some are colorless, but the vast majority are found to contain varying intensities of yellow. An occasional diamond possesses a blue body tint, but if so, it should probably be considered a "fancy" and command a high price.

There are several difficulties that confront the diamond expert when he attempts to reach a decision in regard to the color grade of a stone. Federal Trade Commission fair-trade-practice rules in the United States and the rulings established by the American Gem Society in both the United States and Canada require that the color of the stone be graded entirely on the basis of its body color. Even to the most experienced diamond man, without specially designed scientific aids there are many factors that have made this difficult.

Need for Constant and Controlled Light Source and Environment

The problems that face diamond color graders that could, in part at least, be solved by a standardization of grading conditions, were summed up by Robert M. Shipley as follows:

*A.G.S. Research Service.

"Diamond has a very high dispersive power, and as a result flashes of the various colors of the spectrum continually strike the eye, the predominance of any one of which seriously influences the decision of the grader.

"A second difficulty is caused by direct reflections from the mirror-like surfaces of the diamond of the source of the light that is falling upon the stone. These reflections both obscure the body color and cause confusion between the color of the reflections and the true body color of the stone. When the stone is being observed table-up, this problem is increased.

"A third important problem is presented by the examination of the stone under too bright lighting conditions. Here the extreme brilliancy of the light, even when reflected from inside the facets of the pavilion, tends to prevail over the true body color.

"Fourth, light reflected into the diamond from surrounding objects, from the walls of the room, the walls of the nearby buildings, yellowish and brownish store fixtures, and also from the blue of the sky, is another source of error to the diamond man. Reflections from buildings, walls, or fixtures usually make the diamond appear more yellowish or brownish, and reflections from the blue sky more bluish (because of the reflection of the blue sky from the mirror-like surface of the diamond). Stones graded too close to a door or window often reflect the color of the sky resulting in incorrect decisions as to their true color.

"Fifth, one of the most important causes of the anomalies that so often trouble a diamond grader is the change of color shown by many fluorescent stones when viewed under different light conditions. Often a fluorescent diamond which appears slightly yellowish under artificial light appears distinctly bluish in daylight. Many fluorescent diamonds even vary in interior daylight, depending upon the amount of ultra-violet light which has been filtered out by the glass of the windows and doors. Such diamonds are more bluish near an open window.

"Sixth, daylight itself varies so markedly from one part of the day to another, as well as one time of the year to another, that many graders are led astray. There is a concentration of light of the wave lengths at one end of the spectrum during certain times of the day, and the other end at other times. Also, different qualities of light are found on sunny and cloudy days. The red and yellow glow at sunrise and sunset affects color. Smoke and dust in the atmosphere tend to make daylight more yellowish.

"Seventh, nearly as important as variations in quality of daylight are the variations in quality found in various types of artificial light used in color grading. Some graders use frosted bulbs, others use fluorescent light, a third common method of grading is to use a light with a blue filter, still a fourth man might use a frosted blue bulb, and a fifth a common bulb with a blue reflector. Even by the most experienced of diamond graders, the varying qualities of the artificial lights mentioned affect greatly the color grade determination."

It was in an effort to solve the many problems here set forth that the research was carried forward in the G.I.A. laboratory which lead to the perfection of the new Diamolite. The instrument satisfies the need for ideal grading conditions by establishing a constant and controlled light source and environment.

The Diamolite

The Diamolite (Figs. 1 and 2) affords a light source as closely approximating daylight as possible. In addition, it controls the intensity of the light and the direction from which light falls upon the stone, preventing unwanted and falsifying reflections. The overabundance of the long rays of the spectrum, counterbalanced by a special blue filter, give, as a result, a light that lacks only the ultra-violet rays of daylight.

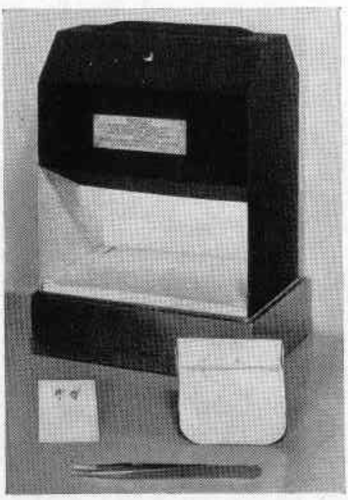

Figure 1
The new G.I.A. Diamolite

Figure 2
Grading a group of stones on the Diamolite

Filters are made to exact specifications so that all light given is the same quality. A dull-white finish on the interior diffuses the light, also preventing unwanted reflections. To be conveniently used in a retail store the instrument is made as small and compact as possible.

In general, the Diamolite accomplishes three objectives:

(1) It establishes a constant light source.

(2) The light source is controlled as to the direction in which it falls as well as to the amount of diffusion it undergoes before striking the stone.

(3) The environment for grading is also controlled, because reflection is completely cut out from all directions except from the front lower portion of the instrument, and this direction can be easily controlled.

By accomplishing the first objective (a constant light source) the Diamolite eliminates the fifth, sixth, and seventh problems of the seven mentioned that confronted the diamond grader. The fifth problem is solved because a fluorescent stone will grade approximately the same in any Diamolite and, therefore, is not subject to variations of color as when observed in different types of daylight. The constancy of the light source also solves the sixth and seventh problems caused by variations in light sources.

The second objective (controlled light) solves the first, second and third problems. Control of the light source prevents the old trouble due to flashes of fire as well as the difficulties caused by direct reflections of the light source. In the same manner, control of the light source prevents too intense a light from falling upon the stone.

The third objective (controlled environment) solves one of the most troublesome of problems confronting the diamond grader—that listed as the fourth problem—which refers to the anomalies arising from surface reflections of surroundings.

Thus it is easily seen that the establishment of the Diamolite enables the diamond grader to work without being troubled by most of the problems that have so long made for poor diamond grading.

The Need for a Color "Yardstick"

The Diamolite was introduced to bring about the solution of the problems of ideal grading conditions. Even when using a Diamolite, a further difficulty presents itself to the jeweler grading a paper of diamonds. In most cases the jeweler grades a group of stones relative to one another, arriving at their order from best to poorest as he sees it under the lights he is using. One paper of stones may be confined in color to only one or two grades. Another may be evenly distributed over the whole color range. A third may have a concentration of stones in the better or poorer colors. Patently, it is difficult under such conditions to keep the grades used constant. The only available means by which the jeweler can maintain the constancy of the grades he sells is to maintain a series of key stones established for comparison of diamond color nuances and to keep the series intact. Even with the key stones, most jewelers have no idea of how their series of comparison stones compares with that of other jewelers. Even if his best grade corresponds closely with that of a competitor, the other grades used probably differ markedly from those of other diamond men. Even if such a series has been maintained, no substitution has been practical as the substitute diamond may possess anomalies which would change the relationship of the stones in the series. As a result, the jeweler's business may be suffering either from criticism by competitors of stones he has sold, or he may be paying higher prices for his grades than are being paid by competitors. In addition, he may be classifying his diamonds in one of the widely used systems for which no standard exists, such as River, Wesselton, etc., or blue-white, white, etc. Many persons in the trade have urged the discontinuance of these trade terms because their definitions now vary widely and to redefine them and obtain the co-operation necessary to establish them as a standard would probably be impossible.

Until the jeweler knows exactly the position of each of his key stones in relation to some fixed standard (i.e., in relation to the units of a standard "yardstick"), he has no accurate method of grading new stones that come to him. Upon consideration of these problems it becomes evident that the solution must lie in a definite and constant standard by which diamonds can be graded with great accuracy. Nine years of research in the G.I.A. laboratory has finally borne fruit with the introduction to the trade of the new G.I.A. Colorimeter and its use as a diamond yardstick for A.G.S. members, which was authorized by the A.G.S. at their 1941 annual conclaves.

The Colorimeter

The Colorimeter (Figs. 3 and 4) consists of an indirect light source illuminating two trays placed side by side, in one of which a diamond is placed. Above the tray is a colored wedge that is just out of focus in the field. The "yardstick," or scale, is attached to the color wedge used for comparison and the divisions marked on the scale make it possible to read exactly the movements (controlled by an external rack and pinion) of the wedge within the instrument. The microscopic attachment shows a divided field bringing the two troughs into focus so that they are in juxtaposition, one on each side of the field. When looking through the eyepiece, the scale is moved in and out until the color of the wedge matches exactly the color of the diamond.

Figure 4
R. T. Liddicoat grading with the Colorimeter

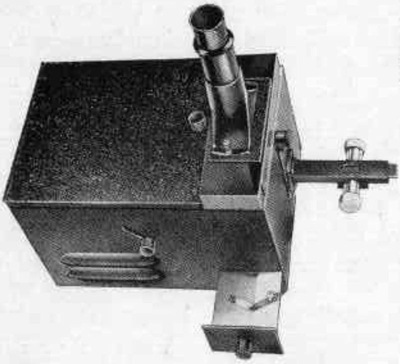

Figure 3
The new G.I.A. Colorimeter

The scale, or "yardstick" of the Colorimeter is of considerable importance because it is one of the key points of the new system. Following the recommendations of the Diamond Importers' Advisory Group of the American Gem Society's International Nomenclature Committee, the use of terms to indicate color grades is avoided. In grading stones on the Colorimeter a system of symbols was adopted which corresponds to the diamond grades on the "yardstick." The scale is divided into seven equal parts between zero and six. These are further separated by half-division marks. The scale may be said to cover the same terms as were covered by grades from River (colorless) to yellow. The half-division of the scale above zero is absolutely colorless. A *very* slight tinge of color appears in the next half-division. V nearly corresponds to what some diamond men call a Cape; others a Top Cape. This is a very rough comparison, for in general the grades between 0 and VI are not comparable to the old terms as the new divisions are simply mechanical. Between each one of the seven divisions is a half mark, thus recording twelve color grades between the faintest blue and yellow. The instrument also grades quarter divisions (not marked on the scale).

The 1941 Conclaves of the American Gem Society recommended the use of the Colorimeter scale as the standard, and the Gemological Institute is now grading a series of key or master stones for A.G.S. members which they will use as comparators in grading their diamonds, but no member will be allowed to sell key stones as having been graded by the American Gem Society. Using stones graded on the G.I.A. Colorimeter as key comparison stones in connection with the Diamolite, the diamond man can determine grades down to at least the half division. Unlike the infrequently used key series of the past, any stone sold from a key series graded on the Colorimeter may be replaced by a stone of the exact color.

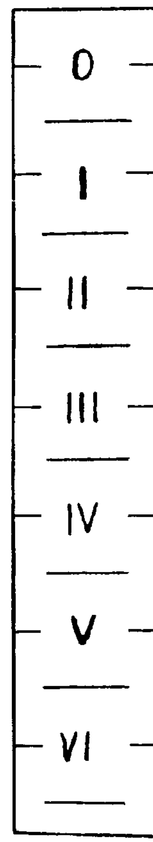

Figure 5
The "yardstick"

It will be noticed on the scale (Fig. 5) that the zero division could be considered to extend to I and the next division from I to II. Working on this idea, the following symbols can be envisioned. Suppose the stone was in a position on the scale equal to the half mark between one and two. This can be marked by the symbol +, which is, of course, the symbol "one" crossed in the middle by a dash. Thus, verbally, the symbols would mean nothing to a customer, but among A.G.S. members could be called "line one dash" instead of grade one and a half, thus avoiding the use of a numeral. When grading on the Colorimeter, if the stone is found to be approximately between + and II (one and a half and two) which would be one and three-quarters, it could be marked in this manner, ‡. Similar markings could be followed on each of the other divisions. This system of symbols has been adopted and is being applied to the diamond papers in the series of master (key) stones now being graded by the G.I.A. on its Colorimeter for A.G.S. members.

Thus, the problem of the relative color of the grades seems to have been largely solved for the jeweler who has a series of key stones graded on the "yardstick" and who does all of his own color grading under the constant light of the Diamolite.

An International Standard Established

Now, for the first time, a standard for the color grading of diamonds has been established in the United States and Canada. Two A.G.S. members who have had identical series of master stones graded on the Colorimeter, and who use them as comparators when grading in the Diamolite, are, in effect, comparing their purchases against the same master stones, under the same light, and in the same room!

ARKANSAS DIAMOND MINE CHANGES HANDS

The Arkansas Diamond Corporation sold its "pipe" mine in Pike County to a Chicago syndicate. The increased demand for industrial diamonds, together with the high wartime prices, has evidently led the buyers to the belief that development on a commercial basis may soon be possible.

ANDERSON'S THEORY OF THE CAUSE OF SILK SUPPORTED

The latest report on the silk in corundum adds weight to B. W. Anderson's findings that indicated the cause to be rutile. Conclusions drawn by Lala Penha, C.G., in an address given in March, 1941, before the Eastern Conclaves of the A.G.S. and later appearing in the September, 1941, issue of *Jewelers Circular Keystone* show that her findings lend support to those of Anderson.

Natural and Cultured Pearl Differentiation*

by

A. E. ALEXANDER, Ph.D.†
Bureau of Natural Pearl Information
New York, N.Y.

X-Ray Diffraction of Pearls

The x-ray diffraction method for differentiating cultured pearls from those wholly of natural origin was used as early as 1924 by Dauvillier,[1] and later by Shaxby,[2] 1925, and Anderson,[3] 1932. In the course of the writer's pearl research, it was deemed advisable to investigate at greater length the x-ray diffraction method as originally used by the above-mentioned scientists.[4]

It has been found, for example, that certain cultured pearls yield definite natural pearl diffraction patterns, while many natural fresh-water pearls are capable of producing distinct cultured pearl diffraction patterns.

A genuine natural pearl is usually composed of submicroscopically thin layers of aragonite deposited concentrically throughout the jewel. These mineral layers may be densely packed, as in the case of certain Australian pearls, or they may be less well packed, as in the case of some Persian Gulf varieties. The x-ray equipment generally used for pearl diffraction work employs an oil-cooled Coolidge tube with copper anode and tungsten target; primary current 100 volts AC; secondary 75 kilovolts, 10 milliamperes. A pinhole "camera" of 0.02-inch diameter permits passage of the pencil of x-rays which are directed on the pearl to be tested.

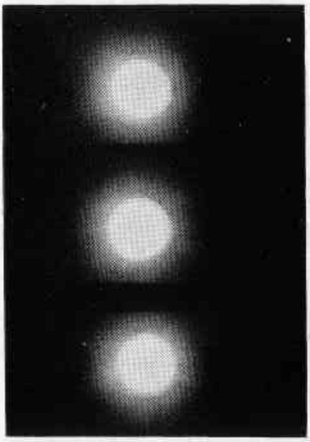

Figure 1
Diffuse natural pearl diffraction pattern.

If the natural pearl is of the usual type and density, a diffuse x-ray pattern will be obtained. (Fig. 1.) The gem to be x-rayed is placed in three positions during the course of the procedure, 90 degrees apart, from

1 Dauvillier, A.: Compt. rend., 179, 818-819, 1924.
2 Shaxby, J. H.: Phil. Mag., 49, 1201-06, 1925.
3 Anderson, B. W.: Brit. J. Radiol., 5, 57-64, 1932.
4 Alexander, A. E.: Am. J. Sci., 238, 366-71, 1940.

* G.I.A. Research Service.

† The pearl research forming the basis of this report was financed by Pearl Associates, Inc., of New York, and conducted in the laboratories of the Mellon Institute of Industrial Research, Pittsburgh, Pa.

which three different exposures are made. If the natural pearl is structurally perfect, but less dense than in the first-mentioned case, a "spot" or spoke-like diffraction or lauegram may be obtained from two, and in some instances all three, positions to which the pearl was subjected. (Fig. 2.)

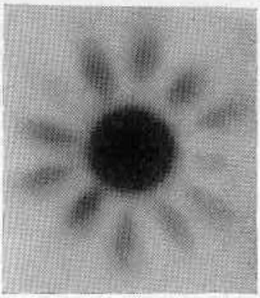

Figure 2
"Spot" or spoke-like natural pearl diffraction pattern. Typical.

Natural pearls may yield a spot pattern in one direction and diffuse diffraction patterns in the other two, or the reverse may hold. Results of this kind mean that in one or more planes of the gem, the individual laminae are more closely packed than in the third direction—if two diffuse and one spot pattern have been registered on the x-ray film. Still other combinations are possible, all dependent on the density difference inherent in the particular pearl being tested.

Cultured pearls, on the other hand, yield quite distinctive x-ray diffraction patterns. We know that the Japanese cultured pearl contains a large mother-of-pearl nucleus and that this man-inserted irritant is composed of parallel (or nearly so) layers of pearl aragonite; surrounded, of course, by concentric layers of the same substance deposited by the pearl-oyster over a year or two of time. When a Japanese cultured pearl is x-rayed one finds that a maltese cross, or modification thereof is obtained, if the x-rays impinge on the mineral matter normal to the (010) plane or normal to the (100) plane. (Fig. 3.) If, on the other hand, the x-rays impinge on the (001) or iridescent surface, a symmetrical "spot" or halo (diffuse) pattern results.

Were no anomalous conditions encountered, one would be prone to accept the x-ray diffraction method as infallible. However, a few large Japanese cultured pearls (of 30-40 grain weight) may contain mother-of-pearl cores that average as little as 50% of the total linear diameter, rather than the usual 75-95% of the total linear diameter as is found in the great majority of cases. (Fig. 4.) Cultured pearls with cores of small size, will yield natural pearl diffraction patterns. This condition is possible, because the *mass* of natural pearl aragonite which surrounds the core is in such cases very much

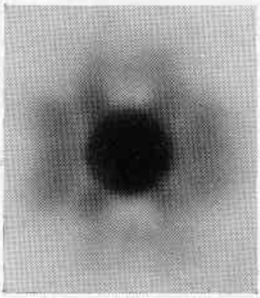

Figure 3
"Maltese" cross diffraction pattern obtained from a cultured pearl. Typical.

greater than the *mass* of mother-of-pearl shell which forms the nucleus. On the order of 8-1 in the case of a large cultured pearl containing a core measuring 50% of the total linear diameter. The effect of the core material is consequently masked or negatived and only the nacre which is natural pearl aragonite produces the diffraction effect.

Again, as mentioned above, certain natural fresh-water pearls may yield distinct cultured pearl diffraction patterns. This is due to the fact pearls of this type possess in their geometric centers, peculiar mineral arrangements that are dissimilar to that which is found in the remainder or outermost part of the gem. In some, one finds that the central

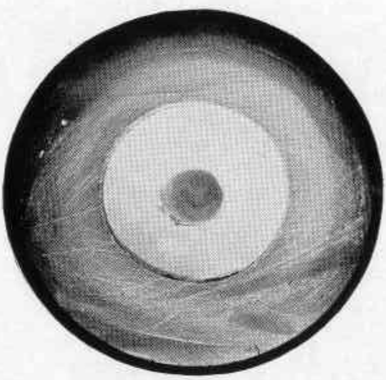

Figure 4

Sectioned 47-grain cultured pearl, showing mother-of-pearl nucleus 50% of total diameter. A cultured pearl with a core this small is rare.

area, oval in shape, is oriented in the basal plane (001). The concentric layers which surround this "nucleus," on the other hand, has been deposited normal to the mineral matter of the "nucleus." We have, therefore, a grating effect that is analogous to, but not identical with, that which exists in mother-of-pearl substance.

The reason for the maltese cross diffraction pattern may, therefore, be explained on the basis of this structural mineral arrangement. As

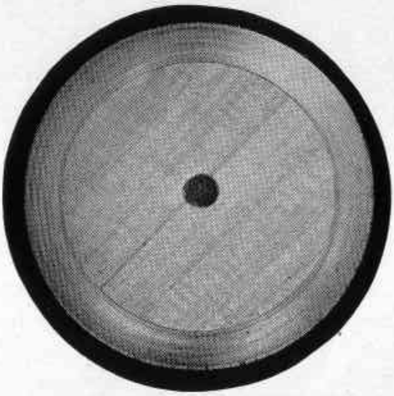

Figure 5

9.8 (nine-eight) grain cultured pearl, showing large mother-of-pearl core. A typical cultured pearl of today. A thin section. (Made 1940.)

many as 30-40% of the natural fresh-water pearls tested by the x-ray diffraction method produced anomalous x-ray diffraction patterns. However, this is not too serious a condition, for as we know, it is relatively easy to distinguish by external characteristics natural fresh-water pearls from the cultured variety. The former possess a different appearance or "orient."

Lastly, we have the case of the fresh-water cultured pearl. A few specimens have been brought to the writer's attention. These pearls contain glass cores, which may average 50-70% of the total linear diameter. Glass is for the most part inert to x-rays, producing a certain degree of diffusion on a photographic plate.

A pearl, therefore, containing a glass core will yield only a diffraction pattern of a natural pearl, since the natural pearl aragonite which surrounds the glass core, alone diffracts the impinging x-rays. Fig. 5 shows such a pearl in thin-section.

X-Ray Fluorescence in Pearls

That some pearls fluoresce under x-rays and others do not has been commented upon by several investigators.[5, 6] However, the observations that have been made have not been accurately recorded. As a result of the writer's research, it has been found that natural pearls from the Persian Gulf do not fluoresce, that a few Australian pearls may fluoresce, and that all Japanese cultured pearls and all natural fresh-water pearls as well as fresh-water shell fluoresce conspicuously.

The cause of this interesting phenomenon was sought and through microchemical and spectrographic analyses it was possible to attribute the effect to the presence of the element manganese. The Japanese use fresh-water shell to initiate the pearl process and it is the presence of this material in any cultured pearl that makes for the marked fluorescence noted when pearls of this kind are activated by x-rays. Natural fresh-water pearls contain varying amounts of the element manganese (contributing to the pink hue of many fresh-water pearls and shell) and, therefore, likewise fluoresce conspicuously. The effect is instantaneous, and is best observed in a lead-lined, light-tight viewing box especially designed for this type of work. The pearls should be activated by x-rays generated from a tube equipped with a tungsten target, using 90 kilovolts and 10 milliamperes.

While this test is not infallible, it nevertheless serves as an indication and permits rapid separation of many pearls which can then be further studied by radiographic or optical means.

5 St. John, and Isenburger, H. R.: "Industrial Radiography," p. 163, Wiley (N.Y.) 1934.
6 Baldi, E.: La Chimica., 13, no. 5, 124-128, 1937.

(To be concluded)

DIAMOND GLOSSARY

(Continued from last issue)

This diamond glossary has been compiled to attempt to satisfy a definite need. Terms included are only those specifically related to the study of the diamond —for other gemological terms see the "Gemological Glossary."

Bantam. South African miners term for associated minerals in the river diggings, that indicate the proximity of diamonds.

Barkly West. See Klip-Drift.

Barnato, Barnett ("Barney"). 1852-1897. English speculator. Came to Kimberley in 1873. Changed his name from Isaacs to Barnato. Barnato bought his first diamond claim in Kimberley in 1876, and in 1881 floated his first company. His ambition to unite all companies in Kimberley under a single organization led first to rivalry and finally amalgamation (1888) with Cecil Rhodes who had succeeded in consolidating the De Beers Mining Companies. (Brit.).

Basalt (melilite). This basalt apparently was formed from same magma which gave rise to kimberlite, the differentiation resulting from local conditions of formation.

Base. The portion of a cut stone which is below the girdle. The basal plane of a crystal. See Pavilion.

Batea. Brazilian term for a wide, shallow pan used by early diamond and gold prospectors.

Belgian Congo (West Africa). Rich alluvial deposits were discovered in 1907, but exploitation did not begin until about 1912. The original source of the diamonds is as yet unknown. The deposits at the present time (1940) in carats are predominant producers of the world, largely industrial diamonds.

Bench Placers. Placers in ancient stream deposits from 50 to 300 feet above present streams. See Gorgulho.

Berghem, Lodewyk or **Ludwig van.** See Berquem, Louis de.

Berquen, L. von. See Berquem, Louis de.

Berquem, Louis de (Lodewyk or Ludwig van Bergham, L. von Berquen, Louis de Berquem). A cutter of Bruges, credited (perhaps incorrectly) with the first symmetrical faceting of the diamond.

Bezel. The upper portion above the girdle, of a brilliant cut stone. See, also, Bezel facets.

Bezel Angle Gauge. See diamond angle gauge.

Bezel Facets. The eight facets on the crown of a round, brilliant cut gem, the upper points of which join the table and the lower points, the girdle. If the stone is a cushion-shaped brilliant, four of these bezel facets are called corner facets.

"Bicycle Tires." Brilliant cut diamonds with girdles which are too thick.

"Big Five." The Dutoitspan, Bultfontein, De Beers, Kimberley and Wesselton mines are often referred to as the "Big Five." Often classified as the De Beers Mines, because of common ownership. See, also, De Beers Mines.

Binocular Microscope. Magnifier equipped with twin objectives and oculars.

Bizel. Same as Bezel.

Bizet. In gem cutting, the part of a brilliant between the table and the girdle, occupying one-third of its depth and having 32 facets. (Standard.)

Black Diamond (gem). A fancy, occasionally found, particularly in Borneo, less commonly in Brazil and South Africa; when cut, while it has no prismatic play, it has a magnificent lustre, almost metallic. It is much in demand as a mourning ring in eastern countries as it is in Portugal. (Ball.)

Black Diamond. Carbonado. Also may refer to almost black gem diamond. Rarely used in jewelry. Incorrectly used for hematite.

Blebby. Containing bubble cavities or vesicles.

Blemishes. Surface imperfections, a majority of which are results of inferior "cutting" and include cracks, cavities, "nicks," knots, scratches, facets cut exactly parallel to the grain. Some authorities also classify flat surfaces and naturals on the girdle as blemishes.

"Blocker." See "Lapper."

"Blow or Chonolith. A lens-shaped expansion of a dyke.

"The Blue." See Blue Ground.

Blue Bird Diamond. A trade-mark name applied by an American importing firm to the diamonds advertised and sold by it.

Blue Diamond. A distinctly blue color, even though it be a very light blue, is a fancy diamond. Blue diamonds are extremely rare. See, also, Fancies; See, also, Hope diamond; See, also, Wittlesbach diamond.

Blue Earth. See Blue ground.

Blue Ground or "the blue" (South Africa). A miner's name for the altered peridotite, or kimberlite, a rock which contains the diamonds in the South African mines.

Blue Jager. Term sometimes used for Jager because diamonds of other qualities also come from the Jagersfontein mine. See Jagers.

Blue River. Strict definition same as Jager. See Jager. Term occasionally used for Rivers because diamonds of other qualities come from rivers, but, unless stone is actually blue, such usage approaches misrepresentation.

Blue Wesselton. An unsatisfactory and inaccurate term from a scientific standpoint. Only the color known as Jager can possibly be graded as blue.

Blue-White. Color grade of diamond used by some dealers. Term not standardized. Blue-white is a color midway between blue and white (a fancy diamond). A misnomer often used. U. S. A. Federal Trade Commission characterizes it an unfair practice to use term with effect of misleading or deceiving customers by selling yellowish gems as blue-white.

"Blue-White Wesselton" (Top-Wesselton). A misnomer. See Blue-white.

Boart. Same as Bort.

Body Color. The color of a diamond as observed when examined by transmitted light against a white, neutral grey or black background. The resulting appearance is known as "body color."

Bohemian Diamond. Rock crystal.

Boort. See Bort.

(To be continued)

DIAMOND GLOSSARY

(Continued from last issue)

This diamond glossary has been compiled to attempt to satisfy a definite need. Terms included are only those specifically related to the study of the diamond —for other gemological terms see the "Gemological Glossary."

Bantam. South African miners term for associated minerals in the river diggings, that indicate the proximity of diamonds.

Barkly West. See Klip-Drift.

Barnato, Barnett ("Barney"). 1852-1897. English speculator. Came to Kimberley in 1873. Changed his name from Isaacs to Barnato. Barnato bought his first diamond claim in Kimberley in 1876, and in 1881 floated his first company. His ambition to unite all companies in Kimberley under a single organization led first to rivalry and finally amalgamation (1888) with Cecil Rhodes who had succeeded in consolidating the De Beers Mining Companies. (Brit.).

Basalt (melilite). This basalt apparently was formed from same magma which gave rise to kimberlite, the differentiation resulting from local conditions of formation.

Base. The portion of a cut stone which is below the girdle. The basal plane of a crystal. See Pavilion.

Batea. Brazilian term for a wide, shallow pan used by early diamond and gold prospectors.

Belgian Congo (West Africa). Rich alluvial deposits were discovered in 1907, but exploitation did not begin until about 1912. The original source of the diamonds is as yet unknown. The deposits at the present time (1940) in carats are predominant producers of the world, largely industrial diamonds.

Bench Placers. Placers in ancient stream deposits from 50 to 300 feet above present streams. See Gorgulho.

Berghem, Lodewyk or **Ludwig van.** See Berquem, Louis de.

Berquen, L. von. See Berquem, Louis de.

Berquem, Louis de (Lodewyk or Ludwig van Bergham, L. von Berquen, Louis de Berquem). A cutter of Bruges, credited (perhaps incorrectly) with the first symmetrical faceting of the diamond.

Bezel. The upper portion above the girdle, of a brilliant cut stone. See, also, Bezel facets.

Bezel Angle Gauge. See diamond angle gauge.

Bezel Facets. The eight facets on the crown of a round, brilliant cut gem, the upper points of which join the table and the lower points, the girdle. If the stone is a cushion-shaped brilliant, four of these bezel facets are called corner facets.

"Bicycle Tires." Brilliant cut diamonds with girdles which are too thick.

"Big Five." The Dutoitspan, Bultfontein, De Beers, Kimberley and Wesselton mines are often referred to as the "Big Five." Often classified as the De Beers Mines, because of common ownership. See, also, De Beers Mines.

Binocular Microscope. Magnifier equipped with twin objectives and oculars.

Bizel. Same as Bezel.

Bizet. In gem cutting, the part of a brilliant between the table and the girdle, occupying one-third of its depth and having 32 facets. (Standard.)

Black Diamond (gem). A fancy, occasionally found, particularly in Borneo, less commonly in Brazil and South Africa; when cut, while it has no prismatic play, it has a magnificent lustre, almost metallic. It is much in demand as a mourning ring in eastern countries as it is in Portugal. (Ball.)

Black Diamond. Carbonado. Also may refer to almost black gem diamond. Rarely used in jewelry. Incorrectly used for hematite.

Blebby. Containing bubble cavities or vesicles.

Blemishes. Surface imperfections, a majority of which are results of inferior "cutting" and include cracks, cavities, "nicks," knots, scratches, facets cut exactly parallel to the grain. Some authorities also classify flat surfaces and naturals on the girdle as blemishes.

"Blocker." See "Lapper."

"Blow or Chonolith. A lens-shaped expansion of a dyke.

"The Blue." See Blue Ground.

Blue Bird Diamond. A trade-mark name applied by an American importing firm to the diamonds advertised and sold by it.

Blue Diamond. A distinctly blue color, even though it be a very light blue, is a fancy diamond. Blue diamonds are extremely rare. See, also, Fancies; See, also, Hope diamond; See, also, Wittlesbach diamond.

Blue Earth. See Blue ground.

Blue Ground or "the blue" (South Africa). A miner's name for the altered peridotite, or kimberlite, a rock which contains the diamonds in the South African mines.

Blue Jager. Term sometimes used for Jager because diamonds of other qualities also come from the Jagersfontein mine. See Jagers.

Blue River. Strict definition same as Jager. See Jager. Term occasionally used for Rivers because diamonds of other qualities come from rivers, but, unless stone is actually blue, such usage approaches misrepresentation.

Blue Wesselton. An unsatisfactory and inaccurate term from a scientific standpoint. Only the color known as Jager can possibly be graded as blue.

Blue-White. Color grade of diamond used by some dealers. Term not standardized. Blue-white is a color midway between blue and white (a fancy diamond). A misnomer often used. U. S. A. Federal Trade Commission characterizes it an unfair practice to use term with effect of misleading or deceiving customers by selling yellowish gems as blue-white.

"Blue-White Wesselton" (Top-Wesselton). A misnomer. See Blue-white.

Boart. Same as Bort.

Body Color. The color of a diamond as observed when examined by transmitted light against a white, neutral grey or black background. The resulting appearance is known as "body color."

Bohemian Diamond. Rock crystal.

Boort. See Bort.

(To be continued)

A GEMOLOGICAL ENCYCLOPEDIA

(Continued from last issue)

by HENRY E. BRIGGS, Ph.D.

PHENACITE

It was not until 1833 that mineralogists were able to distinguish between phenacite and quartz. The name is derived from the Greek word PHENAX, meaning a deceiver. Today, however, the matter of determining these minerals is a simple one, for phenacite is not only harder than quartz, being 7½ to 8, but it is heavier since it has a gravity of 3.0. The index of refraction of phenacite is 1.66. It is uniaxial and optically positive, and in this respect is the same as quartz. It is colorless and transparent, with a vitreous luster, breaks with a conchoidal fracture, composition is beryllium silicate, Be_2SiO_4. It is occasionally found with a light yellow tint, and also with a pinkish cast, when it is sometimes mistaken for topaz. Since the index of refraction and dispersion are low, the mineral has little fire, and has not been very popular as a gem. It is, however, durable, and will show a fair amount of brilliancy if it is carefully cut. The gem should be oriented so that the table is parallel to the optic axis of the crystal to get the maximum brilliancy. The eight bezel facets (upper main facets) should be inclined at an angle of 52 degrees, and the eight lower or pavilion facets should be inclined at an angle of 39 degrees to get a stone of the maximum brilliancy. The brilliant cut is the most suitable. Phenacite is found in the Ural Mountains, Brazil, Mexico, Maine and Colorado.

MOLDAVITE

Moldavite and obsidian are volcanic or natural glasses and are sometimes used as gems. They are not true minerals in that they have a variable composition and the properties are also variable. The hardness is variable, ranging from 5½ to 7. The specific gravity is variable also, ranging from 2.4 to 2.6 or even higher. Both obsidian and moldavite are amorphous, but occasionally show anomalous double refraction due to stress caused by rapid cooling. It breaks with a distinct conchoidal fracture, leaving sharp edges the same as ordinary glass. It is transparent to opaque. Colors are from very light tan through the yellows, browns, reds and reddish browns to black and also mottled brown and black are found. Moldavite, or tektite, as it is sometimes called, is a bottle green color, and is found in Bohemia and Australia. It is easily imitated with ordinary glass, and hard to tell the genuine from the "fake." Obsidian is widely distributed in all volcanic localities.

PREHNITE

When prehnite is of an oil-green color it makes a very attractive gem stone. However, it is not much used. The mineral crystallizes in the orthorhombic system, but it is only rarely that a good crystal is found. It is usually found in rounded masses and rolled pebbles. Prehnite has a hardness of 6 to 7 and its specific gravity is 2.8 to 3.0. It occurs in several colors, including shades of green, yellowish, white and colorless. It is transparent to translucent. The mean index of refraction is 1.63; biaxial and optically positive; luster vitreous to waxy; composition is a silicate of calcium and aluminum, $H_2Ca_2Al_2(SiO_4)_3$. The most important sources are New Jersey, Lake Superior region and France .

TITANITE

Titanite, or sphene, as it is usually called, is a most beautiful gem, but it has not been very popular. It is monoclinic in crystallization and the hardness is low, being 5 to 5½. The gravity is 3.4 to 3.6; the mean index of refraction 1.95 and dispersion .050—both high. Its birefringence is .135, highest of the gem stones. The luster is adamantine and it is transparent in the gem variety. Titanite occurs in greyish, yellowish, greenish and brownish tints. It is biaxial and optically positive. The composition is a silicate of calcium and titanium, $CaTiSiO_5$ being the formula. Principal localities are Switzerland, Tyrol, Maine and New York.

LAZURITE (Lapis Lazuli)

Lazurite is a blue mineral of rather complex composition. It occurs with many other minerals such as granular calcite, scapolite, pyrite, amphibole, etc., and is cut and sold as lapis lazuli. The "sapphirus" of the ancients was undoubtedly lapis lazuli and the sapphire of the scripture was probably lazurite. It is one of the first gems used as such by man and was in ancient times very highly esteemed and considered to possess many powers. The hardness is 5 to 5½ and the specific gravity near 2.4. Lazurite is cubic in crystallization and, therefore, isotropic. The index of refraction is 1.50. The luster is vitreous to greasy, and it is semi-translucent to opaque. The composition of lazurite is rather complex, being a sodium, calcium, and aluminum sulpho- and chloro-silicate. The blue color is due to the presence of sulphur. Lapis lazuli is imitated by stained or dyed agate and is sold as "Swiss Lapis." Sodalite and lazulite are two minerals which are very similar in appearance to lazurite. The principal localities for lazurite are Siberia, Chile and California.

RUTILE

Rutile is very little used as a gem except as it occurs as an inclusion in quartz (rutilated quartz). However, it does occur in crystals which are suitable for gem use. The crystallization is tetragonal, occuring in slender crystals which are often twinned. The hardness is 6 to 6½ and the specific gravity 4.2 to 4.3. The index of refraction is very high, the mean index being 2.71. The luster is adamantine to metallic and it is transparent to opaque. The color ranges from blood-red to reddish brown and black. It is uniaxial and optically positive. The composition is the same as that of anatase $TiTiO_4$. Titanium oxide. Rutile occurs in gem grade in Alaska, Norway, Sweden, Tyrol, Virginia and Madagascar.

(To be continued)