Gems & Gemology

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

VOLUME I NOVEMBER-DECEMBER, 1934 NUMBER 6

In This Issue:

Published by

THE GEMOLOGICAL INSTITUTE OF AMERICA

3511 W. Sixth Street Los Angeles, Calif.

EDITORIAL FORUM

ONE YEAR OF PUBLICATION

With this issue, *Gems & Gemology* completes its first year of publication. The work necessary in order to publish these six issues has been infinitely harder than the casual reader would imagine. And our contributors have supplied the highest type of material, with no reward for their efforts other than the gratitude of the editors and of the subscribers.

◆

Gems & Gemology has been commended and it has been condemned. In the main, we have had more compliments than criticisms. And even those who criticized have hastened, in the same breath, to declare that *Gems & Gemology* has a very real value.

◆

Not, mind you, that we dislike or discourage criticism. It is only by making changes that we can increase the value of *Gems & Gemology* to its readers. The suggestions received are regarded as our book of rules.

◆

The criticism that we have received more than any other is that the material heretofore included in *Gems & Gemology* has been somewhat too technical for the average reader. It is our intention—evidenced even in this issue—to alter our policy and choose articles of more general interest to the jewelry trade.

◆

We are making every effort to secure more diversified and more generally interesting material. In addition to the regular features of *Gems & Gemology*, which will be continued along their present lines, several interesting new series will be inaugurated. One of these is a group of articles on the precious metals and their use in jewelry. Another series consists of a number of surveys of the gem and jewelry trade in distant parts of the world. This latter material is being prepared by gemological students and will therefore deal especially with the gem markets in foreign localities.

◆

But our primary intention is to deal more intensively with the gem trade in America. It will be our purpose to issue a service practical to the needs of the gem dealer in this country. To this end we will publish as much material as possible suggesting means of increasing sales of diamonds, colored stones, and fine jewelry. We shall solicit articles explaining the sales methods used by jewelers who are success-

Gems and Gemology is the official organ of the American Gem Society and with it is included the Bi-Monthly Confidential Service of the Gemological Institute of America. It is published as a part of the educational gem and jewelry program of the American Gem Society by the Gemological Institute. The Gemological Institute of America is a non-profit educational institution directed by voluntary boards consisting of international gem authorities and appointees of American jewelry trade associations. It confines its activities to the furnishing of education, books, instruments and educational publicity material of a gemological or jewelry nature. In harmony with its policy of maintaining an unbiased and uninfluenced position in the gem and jewelry trade, no advertising is accepted in this or any other of its publications. *Gems and Gemology* will not overlap the field of any other periodical in America or England.

fully applying gemology in their businesses.

♦

We shall also publish material explaining proven methods of displaying gems to their best advantage. For this purpose, we shall report on effective displays used by jeweler-gemologists, whenever possible using actual photographs for illustration.

♦

The technical material which has heretofore featured in *Gems & Gemology* will *not* be eliminated in order to achieve these ends. The reader who is an advanced student of gemology will continue to find in these pages reports of the latest advances of his fast-developing science. There will be further articles explaining the building and use of a gemological laboratory. Material concerning diamonds will continue to appear.

♦

And, as we have always done, we shall continue to follow the suggestions of our readers. We earnestly solicit criticism. If *Gems & Gemology* is to be of great value to its readers, it can do so only through supplying them with the material which they wish most to read. Therefore we ask that anyone who has a suggestion for the improvement of this publication send it to us without hesitation.

♦

Gemology Goes Over

Encouraging reports have been received from Robert M. Shipley, president of the G.I.A., who is making an organization tour through the East on behalf of both the Gemological Institute and of the American Gem Society. Gemology is becoming known to the majority of the jewelers in that section of the country, Mr. Shipley reports. And those jewelers who have already studied the courses of either the Institute or of the Society are extremely enthusiastic about the benefits deriving from an increased knowledge of their business.

♦

Strangely enough, the group of jewelers who show the greatest enthusiasm about gemology are not in the East, but in the Middle West. Mr. Shipley stopped off at Milwaukee. This city was, before Mr. Shipley's most recent visit, already more thickly populated with gemological students than almost any other in the country. Mr. Shipley's meetings there were enthusiastically attended, not only by Milwaukee jewelers, but also by dealers for neighboring communities. Many new students have been enrolled in both the G.I.A. and the A.G.S. courses directly as a result of the Milwaukee meetings.

♦

Nor is Wisconsin the only state which has responded heartily to Mr. Shipley's spreading of the gemological gospel. Everywhere he has lectured, the G.I.A. president has found a sincere and growing interest in the science of gem-stones.

♦

Another Display Service

Following our policy of furnishing service to the retail jeweler, we inclose with this issue a Christmas window display card. The card is worded to attract passers-by away from lower-priced stores and into the establishments of jewelers.

We suggest that you frame the card appropriately and display it in a prominent place in your show window. It is patterned after displays tried and proved effective by the Gemological Institute of America, and we feel sure that you will be pleased with the results it produces.

The Headquarters of the Gemological Institute of America

PHOTOGRAPH BY HERBERT LYMAN EMERSON, JR.

The Executive Office and Lecture Room of the Gemological Institute in Los Angeles

---

CAN YOU ANSWER THESE QUESTIONS?

Of what gem species is Emerald a variety?

Has Emerald ever been produced synthetically?

What is Morralla?

Are there sources of Emerald in South America other than those of Colombia?

In what country are the majority of first-grade Emeralds sold?

Answers will be found in *Emerald Mining in Colombia*, beginning on page opposite.

Emerald Mining in Colombia*

C. KENDRICK MacFADDEN

Director, General Mining Co.; Chairman, Bogota Syndicate

WHEN the first groups of Spanish adventurers reached the highlands of Columbia, they were amazed at the vast stores of emeralds which had been treasured by the Indian tribes inhabiting that area. The reports of the most famous Conquistador, Gonzalo Jiminez de Quesada, were said to be replete with descriptions of the wonderful emeralds in possession of the natives, and one of his first efforts after his arrival on the High Plateau in 1537, when he subjugated the principal chieftains, was to ascertain the sources from which the Indians had obtained their gems. Many of the records of these explorers still remain in the ancient archives at Bogotá.

It is recorded that among the early remittances sent to the Spanish Crown by the Conquistadores were four chests of emeralds, many of them of large size, one of the large crystals having been cut into the form of a small cup.

Indians and Emeralds

It is evident that the native Indian chieftains realized something of the value of the emerald. Its hardness, brilliancy and ability to take a high polish had fascinated the aborigines. It had been mined by the natives in certain areas of the country for centuries. Many of the emeralds had been the subject of barter with other Indian tribes, this trade probably extending to the north as far as Mexico and to Peru and Bolivia on the south.

Throughout the past 300 years, despite the most diligent search, no other emerald-bearing areas than those in Colombia have been found in the Andean range, nor in Central America or Mexico. Therefore the so-called "Peruvian" and "Mexican" emeralds were in all probability the product of the ancient Colombian mines.

Extent of Emerald-bearing Areas

Intensive exploration throughout the emerald-bearing areas in Colombia has disclosed the fact that they are probably only to be found in a narrow strip of territory which extends from the vicinity of Muzo southeast for a distance of about 100 miles to the foothills on the eastern flank of the Andes. The principal commercial deposits are in two localities, one known as the Muzo District and the other as the Somondoco or Chivor District. The geological characteristics of the areas are more or less identical, although the productive gangue at Muzo seems to be more heavily impregnated with carbonaceous material than that in the Somondoco section.

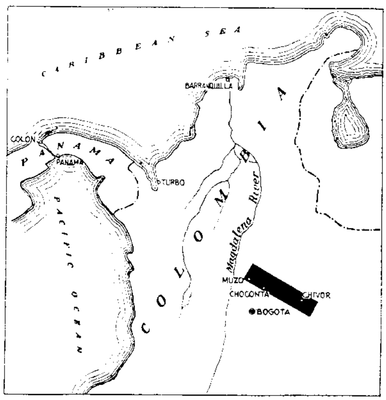
In addition to the emeralds found in pockets or veins, there are some in the float materials along the stream beds which drain the emerald districts, but these finds are inconsequential. Because of the brittle-

*G.I.A. Research Service. Republished with permission from Technical Publication No. 258. American Institute of Mining and Metallurgical Engineers.

ness of the gem crystals, when they become detached from the producing formations, through erosion or otherwise, they are soon ground into worthless chips by the gravels of the streams, which in the emerald-bearing areas are boisterous mountain torrents throughout the rainy season.

The emerald-producing areas so far discovered are covered with jungle growth containing heavy timber. At Muzo, as well as in the vicinity of the Chivor mine in the Somondoco section, the mantle of vegetation and forest has concealed surface outcrops to such an extent that the exploration and subsequent exploitation of much of the more desirable territory is of necessity a slow and laborious process. Some localities which have excellent possibilities cannot be worked economically due to the lack of adequate water supply. In this class of open cut mining large quantities of water are used to remove the debris which the miners dislodge. The necessity arises also for proper disposal of the vast amount of worthless material discarded, and in several cases this particular problem has made commercial exploitation impracticable.

From early days geologists have attempted to correlate the structural conditions which are prevalent throughout the emerald-producing section, but, except along broad general lines, no comprehensive geology has been completed.



Location of Emerald fields in Colombia

The chemical composition of the emerald, as well as its form of crystallization, is well known. The gem material is beryl deposited in hexagonal crystals ranging from a colorless transparency to the deepest emerald green, depending on the amount of chromium contained. During crystallization many of the individual specimens become filled with feather-like flaws which are locally called *jardin* or "garden." Legend tells us that the ancient fortune tellers, by gazing deeply into the foliage of the "garden" enclosed in the emerald, could foretell with certainty happenings which were beyond the ken of the average person. Some of the emerald crystals, especially those obtained from the Somondoco district, have small bright crystals of iron pyrites included in the midst of the emerald material. These brilliant particles seem to be suspended within the emerald, which must have given the "crystal gazer" something of a puzzle to unravel.

Some crystals appear to be formed of layers of alternating light and dark green at right angles to the length of the specimens; others are formed with concentric bands of color—the almost colorless core surrounded by successively deeper green encircling bands—the outer layer being the darkest green. Again, crystals of good size and color will have penetrating and passing through them, at various angles to the main crystal, as many as three perfect hexagonal emerald crystals, often discernible only when viewed in a strong light.

Some of the crystals are twinned, some of triplet form, and often in a single "pocket" will be found an assortment varying in size and crystallization to a remarkable degree. A vein that contains at its outcrop a preponderance of stones of a given color or size will usually yield the same grade of emeralds throughout its length.

The emerald may be imitated by skillful artisans, usually with poor success. It has never been synthetically produced and the genuine stone may be immediately recognized by any competent mineralogist. The specific gravity of the Colombian emerald is from 2.7 to 2.8 and its dichroism is always very marked.

Uncertain Profits

The attitude of the Spanish Crown toward emerald mining is the same as that shown in connection with other classes of mines. In the beginning, the tribute to the Spanish Crown was approximately one-fifth of all mineral wealth obtained, and this applied to the mining of emeralds as well as to the production of the precious metals. From time to time special grants or concessions for emerald mining were given to individuals favored by the government. Some of these grants, according to authenticated records, proved a bonanza to the owners, but in the vast majority of instances the mining operations resulted in no real profit. It is known that in the early days when slave labor was procurable some operations yielded handsome returns, although even with slave labor the unusual hazards of this class of mining must have brought many disappointments.

A Slump in the Emerald Market

One of the most interesting anecdotes regarding the early development described the operations of a titled Spaniard who had received, as his reward for services rendered the Crown, an exclusive mining concession for one of the famous deposits. He expended practically his entire fortune without result, although outcrops on the concession had indicated most attractive possibilities for the finding of rich pockets of emeralds. As his rights were about to terminate, and as a forlorn hope, he followed the suggestion of one of his laborers and tore down what had been supposed to be a worthless mass of formation which had shown no surface indication of emerald-producing veins. To his amazement he uncovered a spectacular deposit, and within a few days extracted emeralds of value exceeding his entire investment. He selected a large parcel of emeralds from the lot and sailed to England, expecting to sell them at top prices to the lapidaries of London, Brussels and Amsterdam. He fitted up a room in his tavern in London and invited all his prospective customers to a magnificent banquet, after which he exhibited his collection of emeralds on a large table, amid the most appropriate setting, and confidently expected to obtain from them an offer for immediate purchase. The gem dealers were astonished at the quantity and quality of the assortment. They asked him, cautiously, whether there were any more such emeralds to be found at his mine. In an attempt to brag of his achievement he announced that all the emeralds had been obtained with a few days' labor and that many more gems remained unmined. The effect on his audience was immediate—they visualized the certainty of a large production of fine emeralds about to be thrown on the market and refused to make a bid. The seller attempted, in vain, to correct his falsification and it is said that his emeralds remained unsold for nearly two years, during which time the purchasers had satisfied themselves that the gems offered were likely to be the only product from that particular property.

Accidental Discoveries of Single Stones

The emerald, probably more than any other gem, intrigues the mind of the itinerant prospector. In its rough form it is an object of beauty; its identification as a valuable gem is immediate. It is often found in a soft or friable formation which, by weathering, exposes fine gem material. Even the most ignorant Indian of the highlands of Colombia is aware of the fortune that will come to him from the discovery of a fine emerald crystal. The history of the country is filled with stories of poor natives who thus unexpectedly find themselves in possession of an emerald of great value.

Throughout the emerald-producing areas, the craw or gizzard of every barnyard fowl that is killed for food is carefully examined, often with profitable results. As many as seventeen small emerald pieces have been recovered from an observant hen raised in the emerald area. The brilliant green particles were evidently selected by the fowl from the less attractive gravels on the range. At Muzo mine, during government operation, every fowl killed throughout the district had to be delivered by its owner to the police for examination of the viscera, under heavy penalty for noncompliance.

During recent years, the Colombian Government has attempted to nationalize all emerald deposits and the sale of rough emeralds has been prohibited, except from certain mining claims, titles to which were perfected many years ago and whose rough emeralds, on being presented to the proper government official and duly certified as to origin, are permitted to be sold; otherwise any rough emeralds discovered throughout the Republic are the absolute property of the government and subject to confiscation. In a case where it is proved that the emerald has been found on the surface, in areas which are not already under concession, the finder is given a proper compensation and it becomes the property of the government.

Present Production and Value of Emeralds

At present, there is but a single emerald deposit in Colombia being developed, this being the Chivor mine, supposed to be the one operated by the Indians before the conquest of the Spaniards. This property, situated in the Somondoco district, is owned by an American company and is the only mining venture of this class that is being systematically developed.

The other great mine from which large production has been obtained intermittently for the past 300 years is known as the Muzo mine. The greater portion of the Muzo deposit is controlled and owned by the government, as is also a neighboring deposit in the Muzo district known as the Cosquez mine, previously operated at great profit. Although no accurate record can be obtained as to the total output of the Muzo district, it is known that the Government of Colombia in certain years has received more than one million dollars from its participation.

The emerald material is sorted by an expert immediately after mining, into five classes or grades and *morralla*, which is a semicrystallized product having much of the appearance of turquoise matrix, but green in color. This material at present is given no commercial value, but has possibilities for use in the manufacture of cuff link settings, and so forth.

Typical Production Figures

No accurate estimate or prediction can be made of the proportions of the several classes in the total mined material. A fairly typical mining return sheet from the Muzo mine covering two months' operations shows percentages of the five principal classes into which the product was divided. The total weight of emeralds recovered was about 10 lb. Avd.

The values given are believed to be considerably higher than are at present used by the government appraisers in estimating the value of the rough material.

It will be noted immediately that notwithstanding the very high value placed on the No. 1 grade, the total value of this grade mined during these particular two months represents less than 8 per cent. of the total values, whereas the No. 5 quality, valued at one-twentieth the price per carat, yields nearly one-third of the total value of the two months' mining.

Two Months' Mining at Muzo Mine

Classes	Weight, Carats	Value[2]	Per Cent of Total Weight	Per Cent of Value
No. 1[1]	523	$ 130,750	0.75	7.70
No. 2[1]	2,182	218,500	3.15	12.80
No. 3	9,548	477,400	13.60	28.60
No. 4	12,649	316,200	18.50	18.50
No. 5	44,116	551,400	64.00	32.40
	69,018	$1,694,250	100.00	100.00

Average per month, 34,509 cts. = $847,125 as operated by English Mining Co.

[1] It will be noted that the No. 1 and 2 grades, having a total weight of less than 4 per cent of the output, yield more than 20 per cent of total value.

[2] Estimated values based on one carat (3 1/5 grains): No. 1 grade, $250; No. 2, $100; No. 3, $50; No. 4, $25; No. 5, $12.50.

The United States provides the best market for the superfine grades, although those classed as No. 2 and even No. 3 find a ready sale at satisfactory prices. The material of cheaper quality has always found a better market in the European countries and this is especially true of India, where the lighter colored stones seem to be in steady demand. In New York the superfine Colombian emeralds are sold at retail as high as $3000 per carat and for some special gems as much as double this amount, thus far outranking the diamond in value.

Fine Color Extremely Rare

It is interesting to note that even during a period when veins containing emeralds of fine color are regularly producing, an almost infinitesimal portion of the total product would grade as superfine gems, the proportion being something like 0.01 per cent. The exact percentages can only be ascertained after the stones have been cut by a skillful lapidary.

The mining manager of the British company which some years ago operated the Muzo mine on special contract with the Colombian Government is authority for the statement that once, after a long period of poor returns, one of the veins "commenced to produce"; a pocket or "nest" of high-grade crystals was encountered and from a few cubic yards of vein material, $400,000 in fine emeralds was obtained in a few hours. Such instances, although rare, are the incentives which urge the mining engineer familiar with gem mining to unravel the geological snarl which at present marks the genesis and deposition of the Colombian emeralds.

The lapidaries who make a specialty of the emerald, or any other colored gem, have as their ideal achievement the production of a cut gem exhibiting the maximum of color combined with as much brilliancy as possible. This calls for skill of a different order that that used in the cutting and polishing of a diamond, whose maximum value depends upon brilliancy alone, provided the "rough" is of superfine quality. The lapidaries who cut and polished the emeralds in earlier days did not possess the skill of the modern gem cutter, who, if he be an artist, may often greatly increase the value of an old emerald by recutting. The weight of the finished gem will be less than the original, but the increased value per carat may add as much as 100 per cent. to the modern appraisal because the color and brilliancy have been enhanced.

In Colombia one may be offered emeralds that have been handed down from generation to generation, which to the inexperienced seem to offer attractive speculative possibilities for purchase. As a general rule these emeralds of ancient cut lack the qualities desired today. It is evident that grading of emeralds is more of an exact science today than 100 years ago. Properly graded emeralds can be purchased more cheaply in New York, London or Paris than in Colombia.

Question:

What is *Chlorospinel?*

See *Gemological Glossary,* page 167.

Mining Engineers Send Diamond Material

The *Gemological Institute of America* has received voluminous notes on the production and sale of rough diamonds from Sidney H. Ball, Mining Engineer of New York City, whose article on the formation of the diamond appears in this issue. These notes clear up many points heretofore misunderstood in the diamond trade of this country; other facts which Mr. Ball points out were formerly unknown to more than a very few persons.

First-hand Information from South Africa

Extremely valuable material has been sent by H. T. Dickinson, Johannesburg, South Africa, Consulting Engineer for the De Beers Consolidated Mines. Included are reports on the operation of the De Beers group of mines and also of the Jagersfontein and Premier (Transvaal). Mr. Dickinson has also furnished a great deal of information concerning the alluvial deposits of South Africa, and geological maps as illustration.

GEMOLOGISTS EARN TITLES

Since the publication of the September-October issue of *Gems & Gemology*, the following have passed the *Qualifying Certified Gemologist* examination:

J. W. Ware, San Diego, California.
Harold Seburn, Greensboro, North Carolina.

The following are the newly qualified *Graduate Members, American Gem Society:*

ILLINOIS
Jack Lund, Chicago.

NEW YORK
Daniel F. Smith, New York City.

NEBRASKA
Elton T. Combs, Omaha.

GEM COLLECTION DRAWS INTEREST

The G.I.A. collection of gem stones, now being used by Robert M. Shipley to illustrate his lectures, continues to arouse interest wherever it is shown. The gems, which are of nearly 100 different varieties, are contained in a partitioned, glass-covered box made especially for this purpose.

Stones which have created particular interest are the two uncut diamonds presented to the Insitute by the De Beers Consolidated Mines, and a fine square-cut Kunzite loaned to the collection by J. W. Ware of San Diego.

Notes As to the Multiple Source Theory of the Diamond*

SYDNEY H. BALL
Mining Engineer, New York

KIMBERLITE pipes are so important as diamond producers that some scientists consider kimberlite as the sole mother rock of the gem. We all admit that it is the sole known commercial rock source of diamonds but it is not the only source and it is possible that other rock sources may become commercial.

Widespread Occurrence

The diamond has been found at a number of places on each of the continents and its geographic distribution, broader than that of kimberlite itself, suggests that the latter can scarcely be in all cases the parent of the gem. Of less weight but also suggestive of multiple sources is the wide range in geologic time, during which diamonds were formed. Its formation antedates the Witwatersrand series (Cambrian or pre-Cambrian) for it occurs as a pebble in "reefs" of several of the South African gold mines while the South African and the Arkansas diamondiferous kimberlites are of late Cretaceous or early Tertiary Age. Graphite is closely associated with the diamond in several diamondiferous igneous rocks; and physically the gem varieties of corundum are of all minerals the nearest analogues of the diamond; graphite is a constituent of igneous rocks varying from the most acid to the most basic; it is also produced by both contact and regional metamorphism and it occurs in veins. The ruby and sapphire are little less catholic in their geologic habitats.

Diamonds in Igneous Rock

Igneous rocks of a wide range of composition and of both terrestrial and extra-terrestrial origin are known to contain diamonds. Beginning with the most basic, they are:

1. Meteoric irons and melts:
   Canyon Diablo and Arva iron meteorites.
   Huntington believed he found diamonds in the Smithville (Tennessee) iron meteorite and cliftonite, probably a pseudomorph after diamond, occurs in the Youndegin (Australia) iron meteorite. Diamonds have probably been artificially produced from melts of iron, silver and lead.
2. Iron-rich basic rocks and meteorite:
   Carcote (Chile) meteorite, consisting of bronzite, olivine and nickeliferous iron.
   In Canada, at four widely separated places, microscopic diamonds have been reported from chromite aggregates in dunites.
3. Peridotites:
   Kimberlite, the mother rock of "pipe" diamonds in

*G.I.A. Research Service. For further details see "Sydney H. Ball, Congres. Internat. des Mines, *6me* Session, Liege, (Belgium), June, 1930, pp. 13-5.

southern Africa and Arkansas.
Peridotitic xenoliths in South African kimberlite.
Novo-Urei (Russia) aerolite consisting of about 67.48% olivine and 23.82% pyroxene.
Artificial melts of olivine and other magnesia- and lime-rich silicates.

Two Types of Kimberlite

The writer has recently summarized the occurrence of diamonds in kimberlite, a greenish-black porphyritic rock of the peridotite family, substantially as follows: (A.I.M.E. Lindgren Volume, "The Ore Deposits of the Western States," N. Y., 1933, pp. 524 to 526): "Two varieties of kimberlite are recognized, one basaltic with prominent olivine phenocrysts but poor in mica; the other, lamprophyric and rich in phlogopite. The first variety is much the more important as a source of diamonds. In both, the diamond is an original constituent, occurring as phenocrysts of various sizes. Common in the kimberlite are coarsely granular nodules, many of which consist of eclogite. They are variously interpreted as local segregations in the kimberlite and as inclusions of an earlier, deep-seated rock of similar composition. Diamonds are occasionally found as original constituents of these nodules.

"Kimberlite occurs in hundreds of local intrusions of late Cretaceous or early Tertiary age, scattered over the vast plateau of southern Africa, notably in the Union of South Africa, Southwest Africa, Rhodesia, southeastern Belgian Congo, and Tanganyika Territory. The intrusions embrace sills, dikes, pipes and intermediate forms. The pipes, which alone are commercially diamond-bearing, are steep-sided, funnel-shaped masses, forced from below usually through flat-lying sediments but in instances through other rocks. Many of the pipes appear to be complex and are ascribed to two or more intrusions of slightly varying age and composition. The elliptical or circular cross-section ranges from a few tens of feet to 2300 feet in diameter and from less than an acre to over 80 acres in area; in the majority of pipes, the diameter decreases downward. To a depth of from 60 to 140 feet, the kimberlite is thoroughly decomposed and oxidized to a yellow clayey mass—'yellow ground.' The underlying 'blue ground' is more or less sepentinized, perhaps by magmatic waters following the kimberlite intrusion.

Proportion of Diamonds to Blue Ground

"Of the numerous kimberlite occurrences of southern Africa, many appear to be barren of diamonds. Many others contain too few diamonds to pay, while those with a commercial content can be counted on the fingers. In the operating mines, the ratio of diamond to rock is from $\frac{1}{17,500,000}$ to $\frac{1}{90,000,000}$. The diamond content may vary markedly within the pipe horizontally, perhaps because of complex character of the intrusion. At the very surface, there is a notable enrichment of diamonds through removal by wind of the lighter constituents of the disintegrated rock. Once this zone of mechanical enrichment is traversed, the diamond content in the majority of pipes decreases with depth. The present deepest working is about 3600 feet. Due probably to favorable physical or physicochemical factors, the horizon near the present surface is of maximum diamond content. Each pipe produces its distinctive type of diamonds, and from the size, shape, color and purity of the stones experts can determine their provenience."

4. Eclogite:

   Garnet-diopside zenoliths in South African kimberlite pipes.

5. Hornblende diabase:

   Hornblende diabase from Oakey Creek, Copeton, 18 miles southwest of Inverell, N. S. W. It consists of labradorite, augite, hornblende, ilmenite, chlorite and a little quartz and chemically resembles the Triassic diabase of Connecticut.

6. Augite-andesite:

   Amygdaloidal augite-andesite probably one of Ventersdorp series (early Paleozoic) of Vaal River. The felspars are relatively acid, that is oliglocase and andesine.

From the above we can positively state that diamonds are constituents of rocks ranging from species more basic than any occurring in quantity on our earth to a relatively acid rock (augite-andesite).

Other Possible Sources

Personally, I believe diamonds probably occur in still more acid rocks. M. Chaper's diamondiferous epidotized pegmatite at the diamond locality of Wajra Karur near Bellary, India, needs confirmation, although somewhat supported by the reported presence of quartz, muscovite and rutile as inclusions in Indian diamonds.

In the past fifteen years a number of geologists have thrown new light on the origin of the upland diamond deposits of Brazil (Boa Vista, Serrinha, etc.). Relations to the enclosing quartzite, the sharp differentiation between the inclusions and matrix, and the vertical position of the majority of the numerous somewhat rounded angular inclusions strongly suggests that these upland deposits are igneous breccias. Consonant with this conclusion is the fact that parcels of diamonds from each deposit have characteristics of their own, which permit of the identification of their source. As to the composition of the highly weathered matrix, we have little data but it appears to be relatively acid. David Draper reports that the principal concentrates are magnetite, hematite and muscovite and he states that chemically it is low in magnesia and contains from 57-69% SiO_2 and from 20-31% Al_2O_3. Mr. John Baragwanath obtained at the Corrego Novo Mine, Minas Geraes, Brazil, a diamond in which R. J. Colony (Am. Jr. of Sci., Vol. V., 1923, pp. 400-2) found quartz in tabular intergrowths and an "undeterminable green chlorite-like or serpentine-like mineral." "The quartz has all the characteristics of ordinary pegmatitic quartz and must have formed, therefore, at a temperature lower than 870° C." The following minerals are reported as inclusions in Brazilian diamonds, gold, pyrite, topaz, rutile, clinochlore and ilmenite. Gorceix states that diamonds rest on specular hematite and that quartz, specular hematite and anatase enclose diamond. While the evidence is by no means conclusive, it indicates that the matrix of the Brazilian upland diamond deposits is a relatively acid rock.

It has been suggested that diamonds are constituents of metamorphic rocks and of veins. Either source seems reasonable although neither is as yet proved.

The heavy minerals associated with diamonds in alluvial mines have been carefully studied but these minerals include the heavy, chemically inert and physically resistant constituents of not only the rocks from which the diamonds were derived but also those from all other rocks of the drainage basin in which the diamond placers occur. They are of little diagnostic value as to the diamondiferous source rock. The minerals however associated with the alluvial diamonds of California, Oregon, Agua Suja (Brazil) and Martopoera (Borneo) suggest derivation from a basic rock while those of some other occurrences suggest strongly as a source an acid rock.

In resume the presence of diamonds in igneous rocks ranging in composition from the most basic to those of at least medium composition is known; their occurrence in even more acid rocks is probable while still other sources are by no means unlikely.

G.I.A. and A.G.S. Expand Courses

A very valuable addition has recently been made to the mail courses of the G.I.A. and also to those of the A.G.S. Robert M. Shipley has written four elementary assignments on precious metals and one on jewelry for the American Gem Society's course. In the Certified Gemologist course, these assignments are amplified by three dealing with the qualities and identification of precious metals in jewelry and jewelers' wares. Also assignments on jewelry forms, enamels, and design are to be incorporated in the latter course.

MARKETING OF DIAMONDS

Conditions of marketing of diamonds have completely changed. The new arrangements were fully dealt with in Sir Ernest Oppenheimer's speech at the meeting of the De Beers Company held on June 8th. 1934.

Briefly put, all the South African Producers deliver their diamonds according to fixed quotas to a Diamond Producers Association, the Board of which consists of representatives of the Producers, the Diamond Corporation, and the Government (South African). The Producers Association sells these diamonds to a concern known as the Diamond Trading Company which has selling offices in Kimberly and London. The method of selling, prices, etc., are fixed by mutual arrangement between the Diamond Trading Company and the Producers Association.

It will be noted that the Diamond Corporation which holds large stocks of diamonds previously purchased from the Producers is a member of the Producers Association and has agreed to dispose of its stocks according to quota.

The arrangement outlined has been in operation since April, 1934, and so far has functioned satisfactorily and has generally established the confidence of the trade in the stability of prices and the firm control of production and sales.

Note by H. T. Dickinson, Consulting Engineer for DeBeers Consolidated Mines.

Gemological Microscopy

(Continued from last issue)

If the gem on the stage is isotropic (singly refractive) or is so orientated that the light is transmitted along a direction of single refraction, the change of color will not take place. Therefore, it is always necessary to place the gem on the stage in at least three different positions before deciding that it is not pleochroic. Even then the difference between the two colors may be so slight as to be almost unnoticeable. In this case, the stone may be said to have no dichroism. However, it cannot upon this basis be pronounced singly refractive. A quick test to determine whether or not a stone is singly refractive is to place the upper Nicol or analyzer in its position in the upper tube of the microscope. The analyzer and polarizer are arranged at right angles to each other so that with the stage clear no light is allowed to pass through the optical system of the microscope. The polarized light transmitted by the polarizer is stopped by the analyzer.

Distinguishing Single from Double Refraction

However, if a doubly refractive stone is place in the path of this light between the polarizer and analyzer, viz., on the stage of the microscope, it so affects the polarized light from below, twisting it into a new plane of vibration, that it can pass through the analyzer. Since singly refractive or isotropic substances do not divide a ray of light into two and do not produce polarization they are unable to twist the polarized light from the polarizer so that it may be transmitted through the analyzer. Therefore, if after the analyzer is placed in position, little or no light comes through at any time during rotation of the stage, the mineral if transparent is indicated to be isotropic. Doubly refractive substances unless viewed along a direction of single refraction will pass a considerable amount of light and the field of view of the microscope will be alternately light and dark four times during a single rotation. When it is light the illumination is practically as brilliant as with the analyzer removed. Because of its inclined facets, a singly refractive gem will usually allow a little light to pass; however, the occasional flashes in this case are easily distinguished from the full illumination caused by a stone which is doubly refractive.

A singly refractive substance may sometimes because of internal strain show what is known as anamolous double refraction. This, however, need never confuse the student. A stone showing polarization due to this phenomenon seldom lights evenly across the whole space which is in focus. Rather irregular parts or patches will show light at a certain position of the stage while others are either never light or are only at a different position of the stage. The anamolous double refraction is very common in diamond, almandine garnet, and synthetic spinel. The latter especially shows a sharp contrast between numerous light and dark patches. Laminations in very rare cases may cause alternate patches of light and dark to be viewed under crossed Nicols.

Credit to Dr. G. F. Herbert Smith

In a previous article by Dr. Thomas Clements, of the University of Southern California, and the author, the use of interference figures in the identification of cut stones was previously outlined. (Since the publication of that article the authors have found that their work was not as they had thought the original application of this principle in gem identification. Dr. G. F. Herbert Smith in his "Gem-Stones" explains very carefully and completely the use of interference figures as a means of identification.) As the previous article in *Gems & Gemology* explained in sufficient detail the methods of securing these figures, this material will not be repeated.

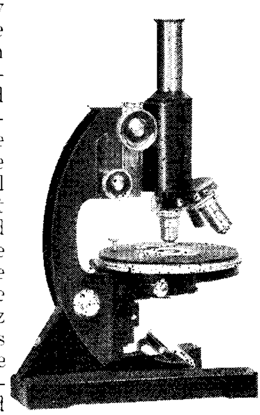
However, it is best to suggest to the student the method for using an ordinary polarizing microscope without the customary petrographic accessories for the same purpose. An interference figure may be secured with an ordinary polarizing microscope merely by focusing through a pair of parallel facets of a gem and removing the eye-piece. Of course, an interference figure will not be found each time the microscope is focused through a pair of parallel facets. In order that the figure become visible the facets must be perpendicular to an optic axis. For this work a high-powered objective must be used. Fortunately the power of this objective need not be so great when thick sections such as gems are used, as it must be when very thin mineralogical slides are used. The 20X objective recommended in our last article has proven very satisfactory for securing an interference figure from a cut gem.

The doubly refractive crystals as stated before are divided into two general classes—uniaxial and biaxial. Uniaxial figures are recognized by their perfect symmetry, i. e., their circular rings and brushes crossed at 90°. (See illustration.) A biaxial figure may be recognized by the fact that its colored rings are elliptical rather than circular, and it may possess either only a single curved brush or a pair of curved brushes which do not intersect. Also the brush of a uniaxial figure is stationery as the stage is rotated, while the brush of a biaxial figure revolves counter to the direction of the stage.

The uniaxial and biaxial groups are each further divided into negative and positive crystals. A uniaxial mineral is said to be positive when ϵ (epsilon), its extraordinary index, is greater than ω (omega), its ordinary index. If ω is greater than ϵ the gem is negative. The biaxial crystals α (alpha) is always the least index, β (beta) the medium index, and γ (gamma) the greatest. If the R.I. of β is closer in value to α, the gem is positive. If the value of β approaches more nearly that of γ, the mineral is negative.

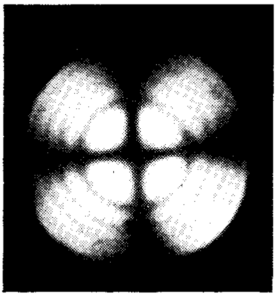
Use of the Quartz Wedge

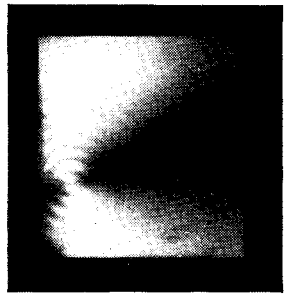
Interference figures whether biaxial or uniaxial may be analyzed for optic sign by the use of a quartz wedge. This is a very thin wedge of quartz mounted between two glass slides to prevent damage. Most quartz wedges, especially those available in America, are cut in such a manner that the so-called "slow ray" vibrates at right angles to the length of the wedge. The direction of vibration of the slow ray is indicated by a pair or arrows. These arrows are placed at the thin end of the wedge—the end which is inserted in the microscope tube. To analyze a uniaxial figure, the figure is first secured and focused as clearly as possible. The quartz wedge is then inserted in a slot just above the objective lens of the microscope. This slot is so placed as to bisect the angles between opposite brushes in the uniaxial figure. As the quartz wedge is moved into the slot (usually from the lower right-hand corner of the field or vision). the colored rings of the uniaxial figure will move toward the center in one pair of opposite quadrants. and will move toward the edges in the other pair of opposite quadrants. If, as the quartz wedge is moved into its slot, the rays in the quadrants at the sides of the quartz wedge move in toward the center, the gem is positive. If the rings in the quadrants at the sides of the quartz wedge move outward away from the center of the interference figure, the mineral is proved to be negative.



Bausch and Lomb Microscope, recommended by the the G.I.A. for gem testing.

Except in a very tiny stone, and then only under unusual circumstances, a biaxial figure with more than one brush will not be visible. The one brush which it is possible to find even in a large stone which is biaxial will almost invariably show a pronounced curve. In order to analyze this interference figure the stage is rotated until the brush has its concave side toward the lower right of the field, i. e., toward the point of insertion of the quartz wedge. As the quartz wedge is inserted, the color rings of the biaxial figure do not move, as those of the uniaxial. Instead when the quartz wedge is inserted, colors appear on each side of the brush.





Left: Uniaxial interference figure shown by Tourmaline.
Right: Off-center biaxial figure of Topaz. The concave side of the brush faces the bottom of the microphoto.

If the colors upon the convex side of the brush become first red, then orange-yellow, green-blue to violet as the wedge is moved in, the gem is positive. The progress of the colors from red to violet in this manner is known as "rising." If the colors on the convex side of the brush (the side to the upper left) "fall" in color, i. e., go from violet through blue, green, yellow-orange and to red, the mineral is negative in optic sign.

A Valuable Test

This material may seem at first to be terribly complicated. It will be found, however, that if the student uses a microscope and applies the tests as suggested here, experimenting for himself and mastering the use of this complicated instrument, he will become proficient at identifying gems with the polarizing microscope. The observation of dichroism and of the differentiation between singly and doubly refractive substances is very simple and may quickly be mastered. However, the student if he possesses a polarizing microscope should learn to apply it to testing interference figures. This test is often the only one by which certain stones may be identified, and it is also very definite in its results. It is, for instance, the only practical test to distinguish between certain almandine garnet and the beta variety of zircon, between tourmaline and andalusite, etc.

Do You Know . . .

Who is reported to own the Sancy Diamond?

See *Important Diamonds of the World*, page 169.

BOOK REVIEWS

***The Genesis of the Diamond,* by Alpheus F. Williams. Ernest Benn, Ltd., London, 1932. Price, $25.00 (subject to change without notice). Available from G.I.A. Book Dept.**

This is by far the most complete work ever prepared upon the subject of diamonds. A great deal of the practical knowledge of the author—who was for years General Manager of the DeBeers Mining Company, and son of Gardner F. Williams, a former General Manager of the same company and author of "The Diamond Fields of South Africa,"—is combined with the writings of other authorities and offered to the reader in two large volumes, totalling 636 pages. Mr. Williams states his own conclusions upon many points and quotes also the agreeing and conflicting statements of other authors. The result is that in one book are combined the pertinent quotations from many books, reducing the reference work necessary upon the part of the student. Unfortunately, Mr. Williams is very positive in many of his beliefs, and the selection of the quotations may have been unconsciously influenced by a desire to prove his theory of the coincident rise of the Kimberlite magma in the diamond-bearing pipes of South Africa.

Unusual Illustrations

The two volumes of the "Genesis of the Diamond" are profusely illustrated. Colored microphotographs of the various diamond-bearing kimberlites and their inclusions are a feature of the book. There are many other microphotos, showing details of the crystal forms and inclusions of diamonds. There are many photographs of sources and of mining methods. In addition to the printed half-tones, there are many line sketches, illustrating hypothetical and proven geological structures of the various sources. Particularly valuable is Mr. Williams' description of each mine individually. The formation of the pipe, its extent, its productivity, and the quality and size of the stones yielded is set forth in each case.

No Synthetic Diamonds

Speaking of the productive pipes, Mr. Williams shows clearly their close interrelation with one another, inferring that all had a more or less common source, seated deep within the earth. The author is more or less friendly to the theory that diamonds may have had their origin in formations other than those which produced the gems of the South African pipes. He definitely disagrees with any statement of the synthetic production of diamonds. He hazards that the minerals produced by experimenters in an attempt to synthesize diamonds may be colorless spinel.

The "Genesis of the Diamond" is an extremely valuable book, and praise is due the author who compiled it. It is deserving of a place in the library of every gemologist who specializes in the handling and knowledge of diamonds although its numerous illustrations and color plates, and beautifully printed text on fine paper makes its two volumes unusually expensive.

—*R. S., Jr.*

SELECTED BIBLIOGRAPHY

(Continued from last issue)

**McLeod, A.
Practical Instructions in the Search for and the Determination of the Useful Minerals, including the rare ores, for the prospector, miner, and as a ready reference for everybody interested in the mineral industry. 2nd Edition, greatly enlarged. New York. John Wiley & Sons, Inc. 1917.

****Merrill, G. P.
The Non-Metallic Minerals. Their occurrence and uses. 2nd Edition. Revised. New York. John Wiley & Sons, Inc. 1910.

*****Miers, Sir Henry Alexander
Mineralogy; an introduction; An introduction to the scientific study of minerals; 2nd Edition. Revised. London and New York. Macmillan & Co. 1929.

****Miller, W. G.
Minerals and How They Occur. A book for secondary schools and prospectors. Revised by A. L. Parsons. Toronto. Copp. 1928.

*****Moses, A. J. and Parsons, C. L.
Elements of Mineralogy. Crystallography and blowpipe analysis from a practical standpoint, including a description of all common or useful minerals, their formation and occurrence, the tests necessary for their identification, the recognition and measurement of their crystals, and their economic importance and use in the arts. 5th Edition, enlarged and in part re-written. Van Nostrand Co. 1916.

**Ohly, J.
Analysis, Detection and Commercial Value of the Rare Metals. A treatise on the Occurrence and Distribution of the rare metals and earths, the methods of determination and their commercial value in the arts and industries with a historical and statistical review of each. 3rd Edition. Denver, Colorado. Mining Reporter Publishing Co. 1910.

****Phillips, A. H.
Mineralogy, an Introduction to the theoretical and practical study of minerals. New York. Macmillan Co. 1912.

**Putnam, Palmer C.
Chart showing the Chemical Relationships in the Mineral Kingdom. New York. John Wiley & Sons, Inc. "Serves as a handy reference book for those who want to know the chemical composition of minerals, as a complement to micro-chemical methods in the laboratory."

*****Rogers, A. F.
Study of Minerals and Rocks.

**Rogers, A. F. and Kerr, P. F.
Thin-Section Mineralogy. New York and London. McGraw-Hill. 1933.

****Smith, H. G.
Minerals and the Microscope. London. Murby. 1927.

*****Spencer, L. J.
The World's Minerals—with forty colored plates and twenty-one diagrams. New York and London. Stokes. 1916.

(To be continued)

A GEMOLOGICAL ENCYCLOPEDIA

(Continued from last issue)

HENRY E. BRIGGS, Ph.D.

Refraction

In the study of gems we will deal more with refraction since we will use the index of refraction to determine many gems. Consequently we will dwell more on refraction than we did on reflection.

Refraction is the bending of a ray of light. When light passes from one medium to another of different density it is bent into an angle exactly at the point where the two mediums meet. Thus a stick thrust into water appears to be bent or broken right at the surface of the water. If the rays are passing from a rare to a dense medium, they will be refracted or bent toward the perpendicular. If the rays are passing from a dense to a rare medium the reverse is true, that is the rays are bent away from the perpendicular. The amount that the rays will be bent depends upon the two mediums in question. In our study one will usually be air so then it will depend entirely on the index of refraction of the other medium in question.

The index of refraction is the ratio between the sines of the angle of incidence and the angle of refraction.

In isotropic minerals this index of refraction is constant and the same in all directions (providing there is no internal or external pressure to interfere with the elasticity of the substance), and is usually expressed by the letter "n" in tables and papers on this subject. Since the indices of these substances are always constant, for water 1.333, for diamond 2.42, for flint glass (lead glass) 1.621, etc., it will be obvious that the index of refraction offers an easy method of determining gem stones.

Double Refraction

Some minerals have different degrees of elasticity in different directions and consequently the refraction will differ along such a mineral's different axes. This is called double refraction and such minerals are said to be anisotropic. Anisotropic crystals may have one or two directions or axes along which a ray of light can proceed without suffering double refraction, that is they may have one or two directions in which they are isotropic or single refracting. Minerals having one such direction or axis are called uniaxial and minerals having two such directions or axes are called biaxial. These axes are the optic axes of the crystal.

When a ray of light passes through an anisotropic mineral in any other direction than along the optic axis of the mineral, the ray is not only refracted but is divided into two rays which proceed through the crystal with different velocities, hence the refractive index of each ray is different. The refractive index of the ordinary ray is designated by the Greek letter ω (omega), the index of the extraordinary ray is designated by the Greek letter ϵ (epsilon). If the index ω is greater than ϵ the mineral is optically negative. If ϵ is greater than ω the mineral is optically positive.

In the biaxial minerals we have three principal optical directions at right angles to each other. Each of these directions has its own index of refraction. These indices are designated by the Greek letters, α (alpha) the smallest, β (beta) the intermediate, and γ (gamma) the largest. If the intermediate index β is nearer in value to α the smallest, then the mineral is optically positive. If β is nearer γ in value then the mineral is negative optically. The determination of these directions in a mineral is accomplished by the aid of a polarizing microscope equipped with some such accessory as a "Berek" compensator.

Minerals are grouped according to their optical and crystallographical character. That is, minerals crystallizing on a certain system will possess certain optical characteristics regardless of what elements may make up the mineral. Below we have a table of the three optical groups and the systems of crystallography which accompany them or *vice versa.*

OPTICAL NATURE	CRYSTALLINE FORM	
Isotropic or single refracting	Cubic system	
	Amorphus minerals	
Anisotropic or double refracting	Uniaxial	Hexagonal
		Tetragonal
	Biaxial	Orthorhombic
		Monoclinic
		Triclinic

Transmission of Light

We have now seen how a ray of light is bent and even divided when passing through certain substances. We see that it is impossible for any transparent medium to transmit all of the incident rays which fall upon it for the reason that part of the light is thrown off again by reflection. Now we will consider another reason why not all of the light is transmitted; this reason is that every transparent medium has certain powers of absorption.

Absorption may in some cases be a disadvantage but we owe all color to this property in matter. Indeed were it not for their power to absorb part of the incident rays we would have no beautiful colors in our gems. This matter was touched upon before in the chapter on reflection.

As light proceeds through an isotropic mineral the absorption is the same in all directions and consequently if the mineral reflects or transmits only the red spectra to our eye then the mineral will look red and it will look the same color and shade no matter what direction we look through it. This property is known as selective absorption. In the event that two or more colors of the spectrum are transmitted then they will blend to produce the color which we see.

In anisotropic minerals, however, the absorption of light will vary as does the velocity of light, in the different directions of the crystal. It is quite obvious now that we may see two or even three colors or shades of color in some crystals by viewing them in different directions. This property of variation in color is called pleochroism. Pleochroism is the word used in a collective way and embraces both those minerals showing two and those showing three colors.

Crystals which are uniaxial usually show two colors sometimes called "twin colors." Such minerals are said to be dichroic and the property is called dichroism. Crystals usually show three colors or shades of the same color. These minerals are trichroic and the property is called trichroism.

Pleochroism is detected and studied best with a dichroscope which is discussed in a later chapter. Also see table of twin colors.

(To be continued)

GEMOLOGICAL GLOSSARY

(Continued from last issue)

(The key to pronunciation will be found in the January, 1934, issue)

Chlorite (kloe'rite). Any of a group of monoclinic minerals of extensive occurrence associated with, and closely resembling the micas, and ordinarily characterized by a green color.

Chloromelanite (kloe"roe-mel'a-nite). A gem mineral. Dark-green, nearly black jadeite.

Chloropal (klore-oe'pal). Green opal from Silesia.

Chlorospinel (klore"oe-spin'el or spinel'). Green spinel.

Chromatic (kroe-mat'ik). Of or pertaining to color or colors.

Chrome Garnet (krōm). Uvarovite (garnet).

Chromic Abberation. See aberration.

Chromite (kroe'mite). Occasionally cut into beads. Black and opaque. Heavier than jet. Hardness, 5½; Specific Gravity, 4.3 to 4.6.

Chrysoberyl (kris'oe-ber"il). A beryllium aluminate. Orthorhombic system. Hardness, 8½, R.I. 1.74-1.753. Specific Gravity, 3.73; Transparent to translucent. Gem varieties: golden chrysoberyl, chrysolite chrysoberyl, cat's-eye or cymophane, and alexandrite.

Chrysocolla (kris'oe-kol"a). Hydrous copper silicate. Amorphous or crypto-crystalline. Hardness, 2-4; specific gravity, 2.0-2.2. Green and blue-green to turquoise blue. Translucent to opaque; resembles turquoise in color. Of gem interest only as a coloring impurity of chalcedony when it is known as chrysocolla quartz or blue chrysoprase.

Chrysocolla Quartz. In California sometimes called blue chrysoprase. It is a rare stone and in its most transparent quality is of exceptional beauty. See also Chrysocolla.

Chrysolite (kris'oe-lite). Olivine or peridot; also improperly applied to any light greenish-yellow to yellowish green transparent gem except when used as a prefix.

Chrysolite Chrysoberyl. Chrysolite colored chrysoberyl, or incorrectly "Oriental Chrysolite," "Brazilian Chrysolite." Yellowish-green.

Chrysolithus (kris'oe-lith-us). Pale yellowish-green beryl.

Chrysoprase (kris'oe-praze). A variety of the chalcedony group. Apple-green. See also Blue Chrysoprase.

Cinnabar (sin'a-bar). Only important ore of mercury occurring in brilliant red crystals and used in China as a coloring pigment for a red lacquer. See also Vermillion Opal.

Cinnamon Stone (sin'a-mun). Hessonite garnet.

Citrine (sit'rin). Yellow to yellowish-red transparent quartz. See "Saxon Topaz."

Clam. Word often incorrectly applied to fresh water mussels in which pearls are found. Clam is properly a different species.

Clam Pearl. Not true pearls. Found in oysters and clams. Light drab, purplish red or blue, almost black. Sometimes sold as black pearls (deceivingly). The word "clam" is often used incorrectly for the fresh water pearl mussel of the Mississippi basin.

Clastic (klas'tik). Composed of fragments.

Clatersal (kla'ter-sal"). Small diamond splints from which diamond powder is produced by crushing.

Clay. Fine, soft, aluminous sediments that are plastic.

Clean. Free from noticeable flaws.

Cleavage (kleve'aj). (1) The process of splitting a mineral in a definite direction or directions to produce smooth planes. (2) Diamond crystals which require cleaving, also pieces cleaved and large fragments.

Cleavage, False. See Parting.

Close Goods. Diamond crystals requiring no preparation for cutting.

Clouds. Flat semi-transparent patches, usually brownish or blackish, along the cleavage planes (grains); often finely powdered with "carbon." See also Diamond Glossary.

Cloudy Agate. Name is self-explanatory.

Cloudy Amber. Includes Bastard Amber and pearl-colored amber. Cloudy appearance due to multitude of small bubbles.

Cloudy Texture. This refers to "milky" appearance of some diamonds, which may result from infinitesimal inclusions or from peculiarities of crystallization. See also Diamond Glossary.

Clusters. Groups of small diamonds (melée) set closely together and to give the effect of a single (round) brilliant cut diamond.

Coated Stones. When a diamond is completely coated with blue a strong microscope will detect the surface coating. Mounted diamonds are often painted blue on or around the culet, or when set in flat top mountings around the girdle. Coating temporarily improves the color and is, of course, deceptive. See also Altered Stones.

Cocoanut Pearls (koe'koe-nut"). Pearls from the oyster or clam of Singapore.

Cohesion (koe-hee'zhun). All substances are considered to be made up of small particles or atoms. These minute particles are held together by force of attraction called cohesion, which tends to resist any separation between the atoms.

Collet (kol'et). Same as culet. Also the metal portion of a finger ring in which a stone is set. Seet Culet.

Colloids and Gels (kol'oids and jels). Masses which do not crystallize. Amorphous. Opal is an example.

"Colorado Ruby" (kol"oe-rae'doe). Pyrope (garnet). Same as "Arizona Ruby."

"Colorado Topaz." Citrine (yellow-quartz); also, correctly, topaz from Colorado.

Color-Play. Usually refers to colors produced by dispersion and not to play of color.

Color Range. The various colors exhibited by different varieties of a mineral.

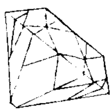
Columnar (koe-lum'nar). Having slender prisms in close parallel grouping.

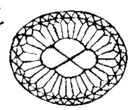
Combustibility (kom-bus"ti-bil'i-ti). Among gems is a quality possessed by the diamond only.

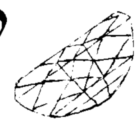
Commercially Perfect. Pique. (Very, very slight imperfections in a diamond.) See also Perfect.

(To be continued)

Important Diamonds of the World







Robert M. Shipley

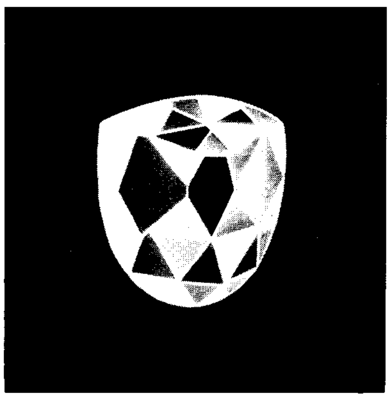
THE SANCY

Fine jewels, perhaps more than any other commodity, retain their value with singular equality. Great diamonds have been given as security in far-off days of Eastern history; security for safety of goods and of life itself. In European history they have been pledged for men and money. The Sancy is a singularly interesting illustration. From the days that legend tells us Fugger, the Nuremburgh banker, secured the diamond with other Ducal jewels from the Bernese government, to the day when poor James Stuart, exiled king of England, parted with it to Louis XIV, the Sancy was invaluable as a money raiser. Henry III, Henry IV, and the Stuart Kings of England profited by the possession of the stones, to say nothing of Sancy himself.

The Sancy Diamond has had a most confusing history owing to the old legend that it was one of the great diamonds lost by Charles of Burgundy after his defeat at Nancy or Granson. Its history is well confused with that of the Florentine. Authorities are now in perfect agreement that the Sancy was never in the possession of the Duke of Burgundy, but the story still lingers on in newspapers, magazines and in the stories of many "pretended" diamond experts. This commonly accepted but now disproved story was that the Sancy was owned by the Great Moguls, that it was brought to Europe at some date, not known, and came into the hands of Philip, Duke of Burgundy.

The truth is that the gem had been purchased in Constantinople about 1570 by Nicholas Harlai, Seigneur de Sancy, who had evidently a passion for jewels. It was a fashion more extravagantly indulged in during the sixteenth and seventeenth centuries in Europe than at any other time or in any other place save the East.

M. de Sancy was a prominent figure at the court of Henry III, the unfortunate, vicious, weak son of Catherine de' Medici. With his dogs in a basket about his neck, his sweetmeat balls, his powder and rouge, his whole body reeking with scent, Henry III was a pitiful figure. He was bald when very young and was most sensitive because of this defect. He always wore a small cap decorated with the Sancy diamond which was either loaned or sold (probably loaned as de Sancy came in possession of the diamond after the death of the Valois) to the king by the owner. Henry III was assassinated in the war of the Three Henrys, and Henry IV ascended the throne. Henry IV was gallant in love and war and the husband of the greatest royal woman fool in history, Marie de Medicis. Henry made de Sancy superintendent of finance. Henry borrowed the gem from de Sancy to give as security for a loan, by which he could secure hired soldiers. The messenger was dispatched with the jewel, but never



THE SANCY

Collateral of Kings and Queens

Weight, 55 Carats

reached his destination. Thieves had probably followed him. De Sancy, knowing that the man was loyal, had a search made, and the body was discovered, disinterred, and in the stomach of the faithful man the great diamond was found. Follow the fate of the owners. Henry IV fell by a dagger stroke even as in the same manner the last of the Valois—Henry III.

De Sancy sold the diamond to Queen Elizabeth, and in the Inventory of Jewels in the Tower of London, March 22, 1605, (James I) the jewel is described in the quaint language of the time—"A greate and ryche jewell of golde, called the 'Myrror of Greate Brytayne' conteyninge one verie fayre table dyamonde, one verie fayre table rubye, twoe other lardge dyamondes, cut lozengewyse, the other of them called the 'Stone of the Letter H of Scotlande,' garnyshed wyth smalle dyamondes, twoe rounde perles, fired, and one fayre dyamonde, cutt in Fawcetts, Bought by Sauncey."

The diamond was in England until 1669. Charles I, son of James I, lost his head, and his widow, Henrietta Maria, presented the jewel to Somerset, Earl of Worcester, from whom it passed again to the English Crown. Fortunate that Cromwell did not get his grasping hands on the stone, and "sell" it for a few shillings to some good Puritan friend. Later King James II owned it, and he lost his throne. (The Earl of Worcester may have given the diamond to him.) Poor James II lost all at the disastrous Battle of the Boyne and fled to France. Louis XIV was an affable host to his guest for a season, but mournful, shabby exiled kings bored him, and was not Cromwell, whose foreign policy he admired, eyeing him? In desperation, James Stuart sold the diamond to the grasping king whose fondness for diamonds was well known. Louis gave him, we are told, 25,000 pounds ($125,000) and James thanked heaven for diamonds that were always a security in a time of trouble. James showed a side of the Stuart character that must have been inherited from his canny Scotch father for he had held fast to the diamond as a last resort and "saved his face" in the courts of Europe. Louis XV inherited it and placed it in his Coronation hat. Much more decorative on the handsome head of the haughty Louis than the weak Valois. Louis XVI lost his head and the jewel was stolen from the Garde Meuble in Paris in 1792 with other Crown Jewels (the "French Blue" and the Regent).

This robbery was one of the most mysterious and dramatic robberies in history. It was more than a sordid theft according to some scandal mongers of the Radical party who saw the hand of the Legitimists in the robbery, and at the time of the law suit the Royal Bourbon name was dragged in, and an agent of the family accused of selling the jewel to the Demidoff family in 1835. This was quickly disproved by evidence that a French merchant, who could not possibly have been connected with the Bourbons, was later responsible for its sale in 1828. This robbery of the Garde-Meuble, so called from the building in which the Crown Jewels and regalia of France were kept, occurred in the year 1792.

In pre-Revolutionary days the jewels were displayed to public view during certain days of the year. After the dreadful days of September, 1792, the jewel cabinets were closed and sealed. A careful inventory was made. Not only did the Treasury contain jewels impossible to duplicate, but priceless golden vessels and other relics too numerous to list here.

The guards were either too trustful, or too careless or worse, for one morning they found the window open and the treasure gone—the seals broken, but the locks not picked. Many were arrested on suspicion and the police were in despair when an anonymous letter reached the Commune, telling where to search for a portion of the treasure. The letter was not a hoax—the Regent was recovered and the famous onyx vase, called "The Chalice of the Abbot Suger," but stripped of its splendid gold mounting. Fear of attempting to dispose of articles so unique as the Regent and the Chalice led to the sacrifice.

The Sancy Diamond reappeared and was sold by a French merchant about 1828 to Prince Demidoff for $100,000. The squabble and lawsuit that grew out of this sale would take too long to relate, but it was a celebrated case in the French law courts.

1865 the Sancy returned to the lands of its birth, having been purchased by a wealthy Parsee merchant, but it came back to Paris and was shown at the Exhibition of 1867. Again it returned to India to become the property of the Maharajah of Patiala. It was set in platinum and was a part of the state regalia of the Maharajah. Dr. Kunz is authority for the statement that the jewel is now the property of Lady Astor. There is, however, another stone quite similar in appearance to the Sancy, and there is a possibility that this is the jewel in the possession of Lady Astor. Indian Rajahs do not easily part with their dearest gems, which they regard with a devotion that approaches adoration.

The diamond is about the size and shape of a peach stone, and weighs 55 carats. Its form and cut show its Indian origin. It was originally faceted on both sides and is said to be of fine brilliancy and "water." The old story that it was one of the first stones to be cut with symmetrical facets is perhaps true, but that it was cut by Louis de Berquem for the Duke of Burgundy does not seem possible.

LARGEST RUBY-RED DIAMOND

Two of the finest diamonds of the world were on exhibit at the Chicago World's Fair. A five-carat ruby red diamond, valued at $150,000, is the largest and most valuable ruby red diamond in the world. The other stone, which brought thousands of visitors to the Diamond Exhibit, is "La Favorite" (50.28 carats) said to be the finest blue white diamond for its size in the world today. It is owned by a Parisian and is valued at $1,000,000.—*Note by G. Frederick Shepherd.*

Sapphires and Sapphire Bearings

B. W. St. CLAIR

Standardizing Laboratory, General Electric Company

Crystallized corundum has no cleavage. This is true of all of the natural varieties with which we have had contact and the synthetic corundums. Sapphire may exhibit parting due to repeated twinning. This is met with very infrequently in well-crystallized material and is almost completely absent in gem stock. Massive corundum very frequently shows parting, often in two directions at approximately right angles to each other (along the rhombohedron). When this is met with it is often thought due to excessive pressure changes after the formation of the corundum.

Many natural sapphires will have a shaley appearance due to alteration or to solution in one particular direction. This nearly always occurs parallel to the base of the prism (0001 plane). Such stones are frequently found in sapphire from Australia and Ceylon and probably also from Burma, and can be split into fairly thin laminae. This parting is quite distinct from the cleavage of mica in that the individual layers which can be split off appear to have definite thicknesses.

Internal Cracks Indicate Synthetics

In synthetic sapphire there is a breakage of the original boule parallel to the long axis of the boule when the surface is disturbed in any way. Most boules are sold as halves. The relationship of the plane of this split to crystal directions is inexact except that the C axis lies somewhere in this plane. Synthetic sapphire when highly polished will often exhibit minute sub-surface cracks known in the German literature as "Sprunge." These are very frequently seen along the edge of gem facets and apparently appear only in the synthetic stones.

In both natural and synthetic sapphire we are recognizing a pseudo-parting to which we have given the term "pressure parting." This appears as short, straight lines or cracks when the polished surface of the stone is put under excessive pressure. These cracks are parallel to the basal plane (0001) and can be brought out by rubbing a needle over the polished surface.

Polysynthetic twinning occurs fairly frequently in crystallized corundum and is present in synthetic sapphire despite statements to the contrary. Imperfect crystallization that has the appearance of twinning in polarized light is quite common in synthetic sapphire. Polarized sapphires very seldom give any external evidence of internal twinning although occasionally an abrupt change of color or hue will be found to coincide with the twinning plane. Twinned crystals occur fairly frequently in sapphire from Ceylon, Burma, and South Africa. They probably never occur in Montana sapphire and very rarely if ever in sapphire from Queensland. This refers to macroscopic twins. Polysynthetic twinning does occur fairly frequently in the Montana sapphire, but there is no external evidence of it in the crystal either before cutting or afterwards.

Genuine Sapphire More Serviceable

For all watt hour meter bearings where there is continuous rotation of the armature and where the bearing will probably be in service for many years before it is inspected we use only natural corundum and from selected sources. For some very light instruments where the armature weights are very small and where the service conditions are not very exact we have used some synthetic corundum. Our use of it for this purpose has been very restricted as it is generally possible to get the natural sapphire bearings for substantially the same cost as the synthetic.

It has been our experience that natural sapphire when used in bearings carrying considerable load (10 grams or more) has a much longer life than synthetic sapphire has. There are many factors which may cause the start of failure in a jewel bearing so that one finds some natural sapphire bearings which break down earlier than some synthetics, but when a sufficient number of bearings are examined so that statistical methods can be used the results are very much in favor of the natural sapphire. The reasons for this are probably related to the almost complete absence of strain in natural sapphire and the presence of relatively high strain in the synthetic.

Our experiences have been almost entirely with sapphire, but as ruby is only a minor modification of this material our results are believed to be true of ruby also.

And!

Has your subscription expired?

See article below.

FREE DETERMINATIONS TO NEW AND RENEWAL SUBSCRIBERS

Special Christmas, 1935, Offer

Aside from the change of policy as outlined in the EDITORIAL FORUM, *Gems & Gemology* is making a special offer in order to increase circulation.

Have You a Friend in the Trade?

The majority of the present subscriptions to *Gems & Gemology* began with the January-February, 1934, issue. Therefore, most subscriptions expire with this issue. In addition, Christmas is approaching and you may have a friend or friends in the jewelry business to whom you would like to present a subscription to *Gems & Gemology* as a Christmas gift. In order to fill both of the above needs, the *American Gem Society* makes the following combination offer:

Your renewal (or new) subscription..........................**$3.50**

Your renewal (or new) subscription and **one** additional *new* subscription..........................**$6.00**

Your renewal (or new) subscription and **two** additional *new* subscriptions..........................**$8.00**

Fill the blank below and mail with your check to the *American Gem Society*. An appropriate card will be sent to the recipients of your gift subscriptions advising them that you have supplied them with a subscription to *Gems & Gemology* for 1935.

Free Gem Stone Determination

In addition, each new and renewal subscriber is entitled to one determination of a facet-cut stone for himself or for any one of his customers. This determination will be made in the laboratory of the *Gemological Institute of America*. (You may pass the determinations on to your gift subscribers or retain them for yourself, as you like.) Remember, no determinations of unpolished or cabochon-cut gems will be made on this offer.

Send Your Order at Once!

This special combination offer is effective only until January 15, 1935. Mail your check or order at once. Payment may be made at your convenience between now and January 15, 1935. You may send the stone for determination any time before the end of 1935.

To
AMERICAN GEM SOCIETY,
555 SOUTH ALEXANDRIA,
LOS ANGELES, CALIFORNIA.

Please renew my subscription to *Gems & Gemology*.

Name..

Address..

City..

Enclosed is my check for **$3.50**, or
I will send check before January 15, 1935.

Please enter as my gift subscriber:

Name..

Address..

City..

Enclosed is my check for **$6.00**.

Also enter as my gift subscriber:

Name..

Address..

City..

Enclosed is my check for **$8.00**.