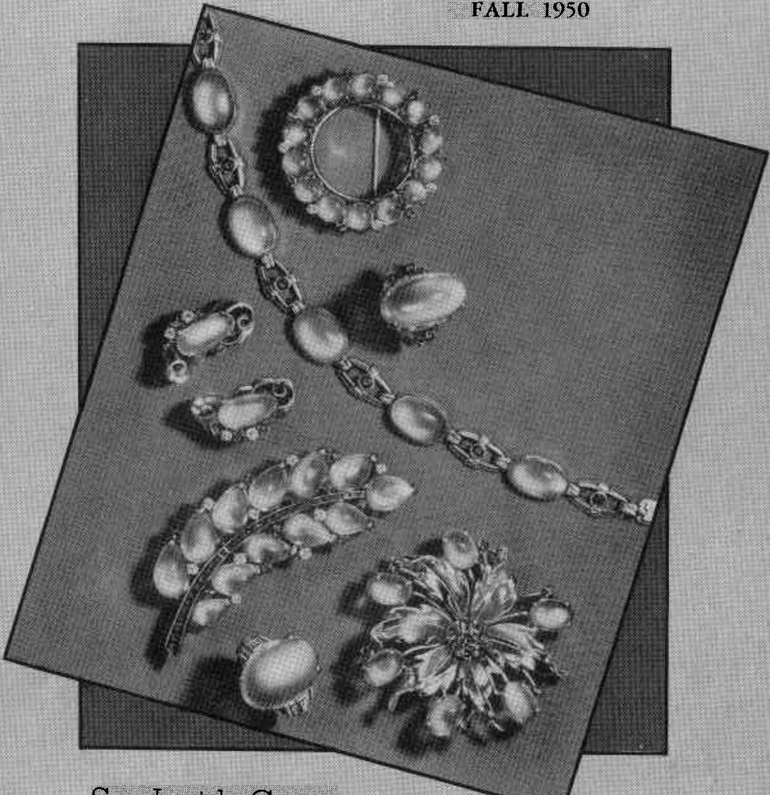
Gems and Gemology

FALL 1950



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On the Cover

The exquisite designs of the moonstone jewelry shown on the cover bring moonstones into the class of fine jewelry.

RAYMOND C. YARD
NEW YORK

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• The Diamond Research Laboratory.

The Diamond Research Laboratory

by

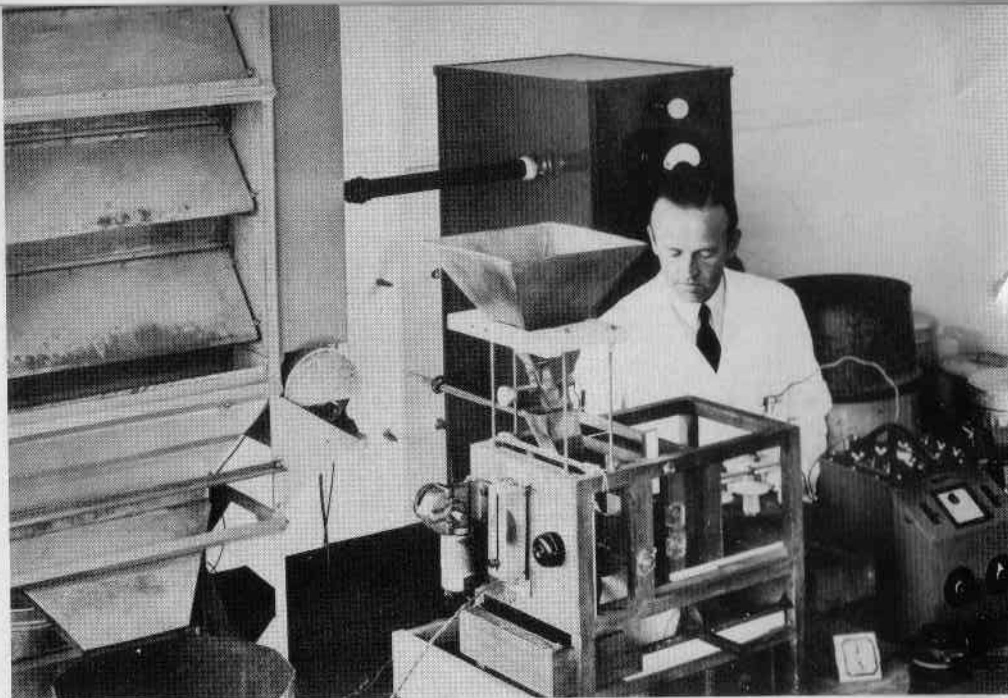
R. S. YOUNG
Director, Diamond Research Laboratory
Johannesburg, South Africa

THE DIAMOND Research Laboratory, established at Johannesburg three years ago by the principal diamond producers of the world, has continued to expand its services to its sponsors and to all who utilize diamonds. The Laboratory has two main functions: it assists the primary producers to improve their metallurgical processes and it acts as a research service center for all users of both industrial and gem diamonds. Most of the work of the Laboratory has been, and will continue to be, concerned with industrial diamonds. This is to be expected, since the industrial diamond, unlike its gem counterpart, enters into a large number of uses. The potentialities, moreover, of crystalline carbon in industry are much greater than in ornamentation. Nevertheless the Laboratory is actively concerned with gem investigations, and long range projects are underway to assist the producer, dealer, cutter, and ultimate purchaser of gem diamonds.

The progress of the Laboratory may perhaps best be described by briefly outlining the program of each section:

METALLURGICAL SECTION

This division is devoted to improving the methods of mineral dressing and recovery in diamond mining. The basic initial process for extracting diamonds from either kimberlite or pipe formations, or from alluvial gravels, is a gravity separation. It is dependent on the fact that diamond with its specific gravity of 3.5 is appreciably heavier than quartz and most silicate minerals, and can therefore be separated by gravity means such as jigging or the newer sink-and-float technique. Having obtained



• **The electrostatic equipment in the metallurgical section.**

a gravity concentrate, further recovery is usually effected in one of two ways. If the diamonds will adhere to a grease surface, a stream of the gravity concentrate is allowed to flow as a wet pulp over an inclined table coated with grease. The diamonds adhere to the grease whereas most gangue minerals do not stick and are washed down the table. Unfortunately the diamonds from many properties do not adhere to grease, and the entire gravity plant concentrate must be hand-sorted, a laborious, costly, and inefficient practice.

One of the important lines of investigation at the Laboratory has been into the reason for the non-adherence of some diamonds to grease and the means to overcome this condition. A process of imparting a water-repellent film to the diamond to make it adhere to grease, without affecting the gangue, has been developed at the Laboratory and is now being installed on a plant scale at one of the leading mines. To improve the recovery of the smaller diamonds an entirely new process, based on electrostatic separation, has been developed and is likewise now being installed at a leading producer. Other processes, such as froth flotation, are under close study to improve recovery, lower costs of production, and insure that future world demand for industrial diamonds can be met by the producers.

Several pertinent facts relating to the metallurgical problems of the diamond mining industry, which may not be realized even by gemologists, may be of interest. A medium grade copper property has one pound of copper in one hundred pounds of ore, a similar quality gold mine would have about one part of gold in 125,000 parts of rock, but in a good diamond mine one part of diamond is only obtained by working fourteen million parts of ore. The diamond property has always suffered from the fact that it, alone in the mining industry, has no means of determining by chemical analysis the value of its incoming ore or its outgoing tailings. There is obviously no way of differentiating the relatively small quantity of carbon, derived from diamond,

OPAL

Precious opal in matrix (boulder opal) from Queensland is seen at the top of the page (A) as well as a partly fashioned piece from Stuarts Range, South Australia (E) at the bottom of the page. (B) shows a black opal from the famous Lightning Ridge deposits, New South Wales; (D) a white opal from Australia; and (C) a fine specimen of Mexican Fire Opal which does not usually show play of color. Specimens from the collection of British Museum (Natural History), London.

PLATE XXX

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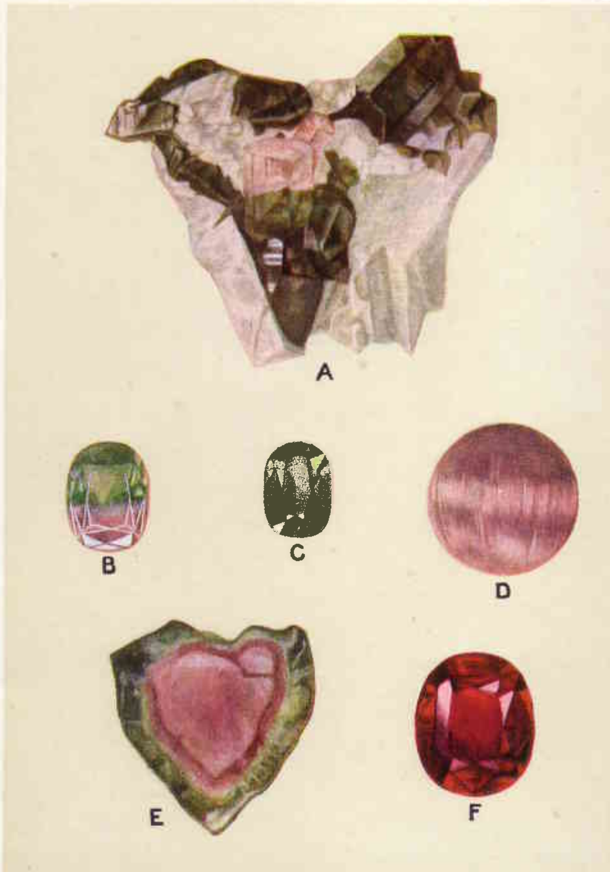
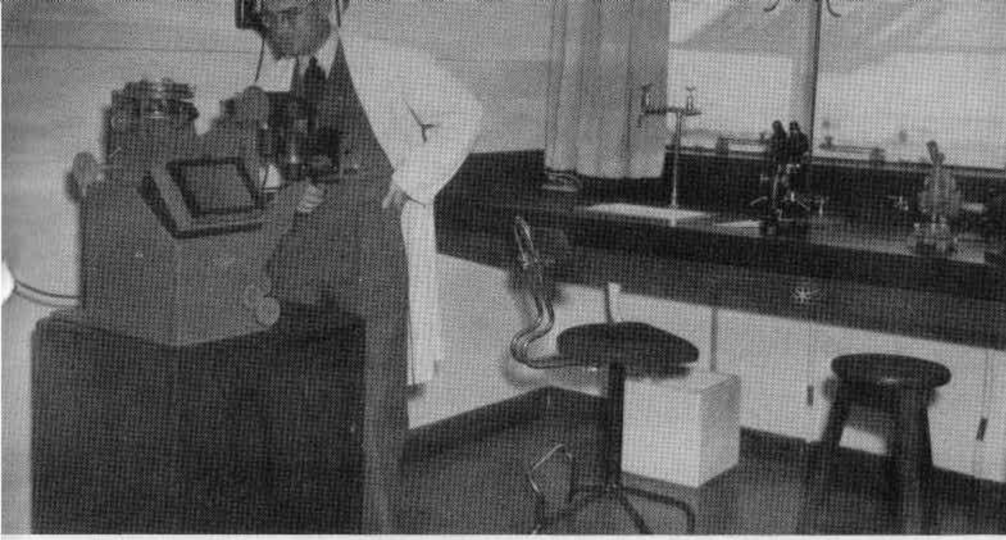


TOURMALINE

Figure (A) shows a pink hexagonal tourmaline crystal in pegmatite with smoky quartz from Elba. A fashioned gem from a parti-colored crystal from Maine is illustrated at (B). A green tourmaline (C) is often incorrectly sold as "Brazalian Emerald." The fibrous structure of a tourmaline cat's eye from California is shown at (D). Figure (E) shows a section of a tourmaline crystal exhibiting differently colored zones and a characteristic triangular cross section. The red stone at (F) is a fine colored Rubellite. Specimens from the collection of British Museum (Natural History), London.

PLATE XXXI

Printed in England.



• **A view of the microscopical room in the physics section.**

from the enormous amount of carbon found in the accompanying minerals.

PHYSICAL SECTION

In this section studies are carried out on the physical and mechanical properties of diamond and of materials used to hold or mount a diamond in industrial or gem uses. Microscopical, spectrographic, and X-ray equipment is available for investigations into such properties as hardness, color, light reflection, abrasion resistance, etc. of diamond and other crystals.

It may not be generally known to gemologists that there are two kinds of diamond, known as Type I and Type II. They differ only in their behavior towards ultra violet light and in certain other properties, but not in outward appearance, value, or source of origin. Some scientists believe the

• **A section of the chemical laboratory.**

• **The engineering section showing part of the machine shop.**

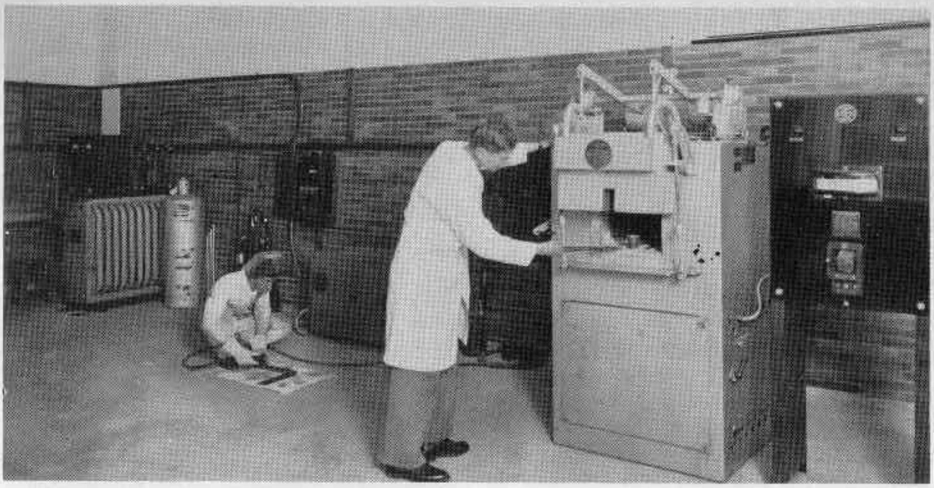
variations between Types I and II are due to fundamental differences in crystal structure, while other workers maintain that the explanation lies in the minute quantities of impurities present in diamonds.

CHEMICAL SECTION

The Laboratory has to cover a broad field of chemical analysis and chemical engineering for producers and users of diamonds. A great many of the metallurgical problems of the mining companies are essentially chemical, such as the properties of the minerals, waters, greases, and reagents used in recovery operations. In industry, diamonds are held in some form of matrix, which may be metal, ceramic, cemented carbide, plastic, or rubber. Gem diamonds, of course, are usually mounted in one of the platinum metals or gold. Since the selection of the proper matrix is often as important as the size or type of diamond, the Laboratory must be prepared to undertake investigations into a wide range of materials. Other work of this division, to illustrate at random, embraces methods of cleaning diamonds and diamond powders, recovering diamonds from used drill crowns or tools, improvements in effecting adhesion between diamond and a metal surface, nature of impurities imparting color to diamond and possibility of altering this color.

ENGINEERING SECTION

This division is concerned with improvements in existing diamond tools and with the development of new uses for diamonds in industry. Diamonds are used in lathe tools for cutting and turning, in grinding wheels, masonry saws, wire drawing dies, drilling tools, wheel dressers, glass cutters, hardness indenters, for polishing glass or metals, and for many other industrial purposes. Owing to its cost the diamond is constantly subjected to stiff competition for many purposes from synthetic abrasives. It is the function of the Laboratory to insure that potential customers make use of the best and most economical type of diamond tool, and to see that the production methods employed will lead to efficient and economical use of these tools. The introduction of new uses for diamond is an important task of this division, and frequently these cannot be advocated before a long period of testing competitive materials has indicated that dia-



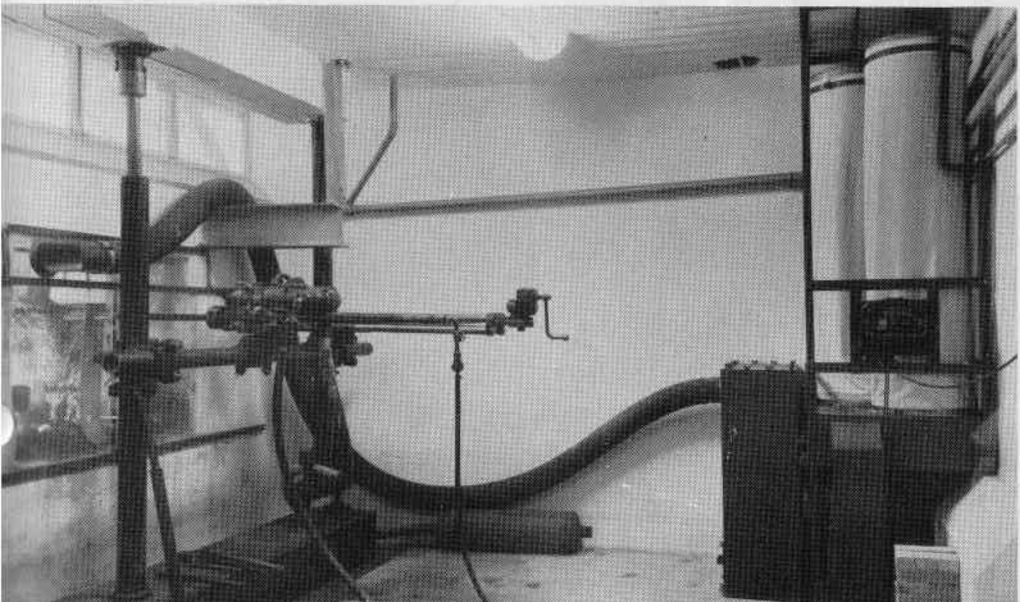
• **Another view of the engineering section.**

mond, in spite of a higher initial outlay, is clearly the best material for the job.

DRILLING SECTION

Though a diamond drill bit may be considered a tool, its great importance as an outlet for industrial diamonds, as well as the special problems of mining and geological exploration which have brought it into vogue, necessitate a separate section in the Laboratory devoted to diamond drilling investigations. Here are studied a variety of factors involved in drilling: type of diamond, size of stone, type of matrix, manner of setting stones, speed of drill, pressure on drill, sludge removal, and many others.

• **The test chamber of the drilling section.**

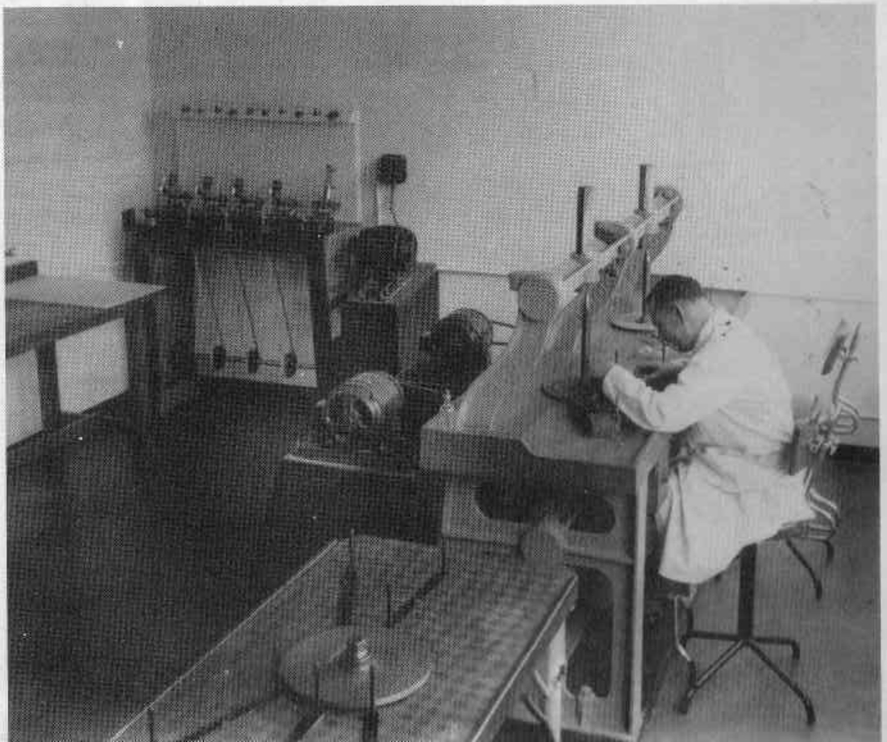


There are two types of diamond drill bits used in the mining industry. For geological exploration and examination of rock for foundations the coring bit is employed. In this the cutting diamonds are placed around the periphery of a hollow bit, resulting in the production of a core of rock which can be withdrawn for examination and analysis. Where the object is simply to drill a hole in rock for blasting purposes, a non-coring bit is employed, with diamond set in the end of a solid metal shank. In the petroleum industry there has in recent years grown up a demand for large coring diamond bits, up to 6-12 inches in diameter. It has been found that the increased cost of diamond bits does not represent a large increase in the over-all cost of these expensive drilling jobs, whereas the time saved is often considerable, and if oil is found the large exploratory hole can be later used for production purposes.

CUTTING AND POLISHING SECTION

This division performs several important functions for the Laboratory, and being more closely associated with the gem diamond than most other sections it is probably of most interest to the gemologist. A small but completely equipped diamond cutting and polishing shop enables these commercial operations to be duplicated in the Laboratory. Here are carried out investigations into possible improvements in the ancient art of diamond cutting. An examination of models of the famous historical diamonds leaves one unquestionably with the conclusion that the cutting practices of earlier days were inferior to the familiar present day brilliant cut of fifty-eight facets. Will further modifications in cutting technique improve the appearance of the stone? Is it possible to introduce further mechanization into the industry to reduce the cost of fabrication, especially for smaller stones? Would the introduction of electrolytic cutting and polishing speed up and thereby aid these operations? These and other questions are under consideration at the Laboratory, and there seems no doubt that in due course much valuable information on the gemstone side will be available to the diamond industry.

• **A view of the cutting and polishing section.**



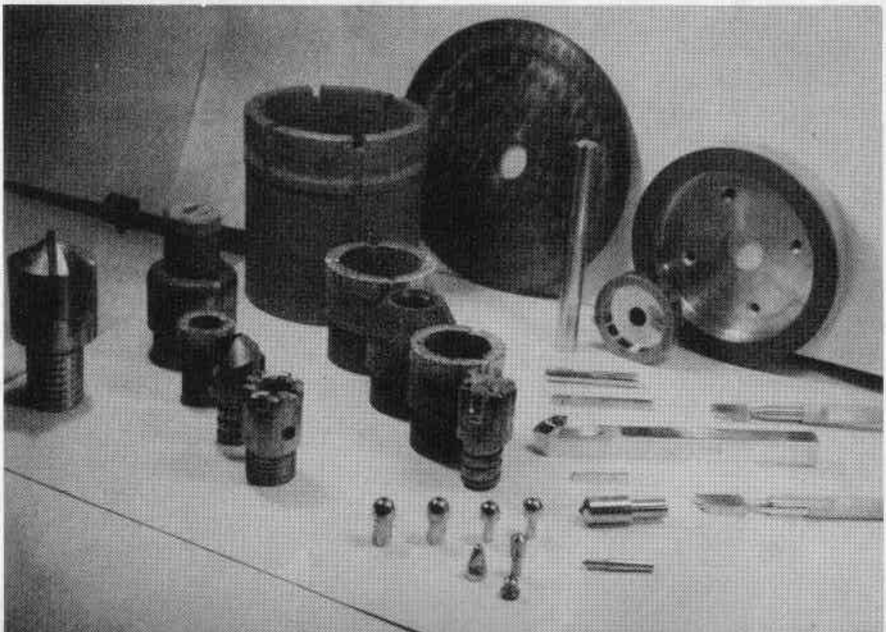
It should also be mentioned that another important task of the cutting and polishing section is to cut and polish diamonds for the research investigations of the other workers in the Laboratory. For example, if the engineering division wishes to try out a new orientation of a diamond lathe tool, or the physics section wishes to measure some property which requires the production of two parallel diamond planes, the cutting section can furnish the experimental material for such studies.

It has been mentioned that the field of diamond research includes studies on the wide variety of materials used as matrices for industrial stones or mountings for gem diamonds. The scope of diamond investigations is still further broadened by the necessary inclusion of many studies on competitive materials: the synthetic abrasives silicon carbide, aluminum oxide, and boron carbide; that great competitor in cutting, drilling, or wire drawing operations — tungsten carbide; synthetic sapphire, now so widely used in jewel bearings, knife edges, phonograph needles, gages, and other purposes where a hard non-metallic substance is required; synthetic rutile which can utilize the high refractive index of colorless crystalline titanium dioxide for gem purposes. In many cases these substances can be considered as complementary to diamond, rather than competitive. The extension of tungsten carbide, for instance, must be accompanied by an increasing demand for diamond, since the latter is the only material which can cut or grind tungsten carbide. In the same manner it is probable that for very severe service conditions in drilling or sawing, the diamond—impregnated tungsten carbide tool will be the answer.

Linked with the experimental facilities of the Laboratory at Johannesburg there are also available to users of diamonds throughout the world the services of the Information Bureau in London. Regular and special publications are issued, reviewing all aspects of the diamond industry and associated abrasive and gem fields. Literature and patent searches are undertaken, reprints or photostats supplied, and the information services of the Bureau are freely available to all interested in diamonds.

The Diamond Research Laboratory, a newcomer in the ranks of research centers established by industries to serve all those who utilize their products, is convinced that it will in due course render valuable assistance to all who use industrial or gem diamonds. The Laboratory invites gemologists to share its facilities and its aims.

• **Various types of diamond tools for drilling, grinding, machining, and sawing.**



The Opal Industry in Australia

Condensed by
KAY SWINDLER
Gemological Institute of America

***EDITOR'S NOTE:** Facts and figures presented in this article are based upon a bulletin released by the Australian Bureau of Mineral Resources, Geology, and Geophysics, and prepared by I. C. H. Kroll.*

FOR THE PAST sixty years Australia has held its place as the most prolific producer of opal in the world. Today, five fields are producing opal.

In the last few years there has been a marked revival of interest in opals, with 1946 value of production the highest recorded in forty years. Some of this is credited to the interest of American service men stationed in Australia during the war years, but perhaps the greatest factor affecting the increase in opal sales is that an important new field was discovered at Coober Pedy in South Australia in that same year. There has been a marked decline since 1946 and it is believed little improvement can be expected in output—and that further decline may continue — unless another accidental discovery of a new field is made.

HISTORICAL BACKGROUND OF INDUSTRY

Earliest discovery of precious opal was reported by a German geologist named Mingaye (or Menge) who claimed he found the mineral near Angaston, slightly northwest of Adelaide, in South Australia. Little credence was given to this report. However, many years later, at a meeting of the Australian Institute of Mining Engineers, a member presented a paper in which he stated that, in 1849, he had personally seen the site where Mingaye found opal. Since specimens from this region — sent to the London Mining Exhibition in 1890 — proved to be opal, it is possible that precious opal was discovered in Australia before 1849, and that Mingaye's report was correct.

The first recorded discovery of precious opal was made in 1872 at two localities in Queensland. One was at Listowel Downs, northeast of Adavale, and the other at Springsure. There are, however, no records of any commercial production of the gem prior to 1890. The Listowel Downs discovery was the forerunner of many others in Queensland over a region approximately 250 miles wide and 550 miles long. This extended from Hungerford in the south of the state, to Kynuna in the north. The only active mine in the state of Queensland today is the Hayricks Mine near Quilpie which has a comparatively negligible output.

Some time prior to 1877 opal was discovered in New South Wales to the south. The most significant finds in this state were made in the 1880s at Lightning Ridge and White Cliffs, both in the northern part of the state. Commercial production at Lightning Ridge started about 1905. The Grawin portion of the field, about twenty miles southwest, was opened in 1926. Both the Lightning Ridge and White Cliffs fields have produced opal continuously since their discovery—the White Cliffs region being the oldest of the recognized fields in Australia at this time.

Another important discovery was made in 1915 when opal was found at Stuart's Range in northern South Australia. The district's present name of Coober Pedy is the aboriginal word meaning "white man in a hole." This name is applied from the practice of miners to live in dugouts. This type of dwelling is common as it protects from the heat, requires little timber—which is scarce—is comparatively fly-proof, and is cheap and easy to construct.

The Coober Pedy field has produced opal continuously since its discovery. In 1946 a rich patch of opal was found about eight miles from the original center of the camp and this was substantially responsible for the production boom that year.

Most recently discovered field is that found at Andamooka Station, about eight miles west of Lake Torrens, South Australia, in 1930. Opal from this district is generally darker than that obtained in Coober Pedy or White Cliffs, and it is said some specimens are dark enough to compare favorably with the Lightning Ridge black opal.

PRESENT OPERATIONS

In the sixty years of opal production in Australia practically no advancement has been made in mining techniques. The miners continue to use the same type of antiquated equipment and follow the same general procedures for recovery of opal as did the early prospectors. Approximately 150 miners are now engaged in mining opal, with 100 of these in the South Australia fields.

The ultimate aim of the miners is to gouge as much stone as possible, regardless of quality. Most of the recovery is made by the sinking of shafts to obtain access to an opal level. However, time is not taken to test the quality of the mineral removed and it is, for the most part, a wasteful, but common, practice to abandon a level without thoroughly testing it. Systematic underground development is needed and essential if the industry is to be placed on a more lucrative basis through increased output. However, although modern equipment might be used to remove much of the overburden covering the veins in some fields, it would still be necessary to gouge for the opal itself in order not to destroy it with machinery.

Ninety-three per cent of the opal produced in 1948 came from Coober Pedy and Andamooka. The remainder was recovered at the Hayricks Mine in Queensland, and Lightning Ridge and its subsidiary field, Grawin.

Many physical difficulties discourage greater activity at the mines. The most important single factor which affects production is the climate. The principal fields are located in extremely arid sections of the country. Heat in these desert-like areas is almost unbearable in summer and many miners leave the fields during those months, migrating to localities nearer the cost. Rainfall is meagre, and living conditions are most primitive In periods where prolonged drought may extend over two or more years, the miners often establish themselves in other industries and never return to the fields.

Supplies must be carted in over long distances, mail service is unsatisfactory in most instances, medical assistance is provided only in those communities where a "flying doctor" is available, and water shortage is a distinct disadvantage. Living quarters must be erected by the miners and, with the almost complete absence of timber, dugouts are often used or a combination of dugout and sheet metal structure.

In an attempt to alleviate the disadvantage of water shortage on the fields, the government has provided storage tanks which have been helpful in keeping men on the fields for longer periods of time. Technical services are also provided by the Mines Departments for each state. Often, however, advice from these departments is not sought, or is disregarded when given.

Some have pointed out that the present level of taxation is proving to be a restrictive factor as they claim it induces miners to limit production so that they will remain in a lower income group. It is doubtful if miners individually have deliberately restricted operations for this reason.

Present demand for opal is said to be keen although buyers claim the bulk of the material is of an inferior grade. Few men at the fields are engaged in cutting and polishing. Most of the rough opal recovered is sold to buyers who visit the fields from time to time, or to resident agents who act for city buyers. All business is transacted on a cash basis.

PRODUCTION AND EXPORTS

In discussing production figures it is pointed out in the governmental bulletin that statistics are not complete and that difficulties in obtaining even reliable estimates are almost impossible. This is attributed to the reticence of miners regarding their discoveries and production; their reluctance to register mining claims; and the difficulty of valuing opal in the rough state. For these and other reasons it is emphasized that the values of production given are comparative rather than absolute, and that it may safely be assumed that they are all underestimated.

From 1890 when commercial production of opal was first recorded, through 1948, estimated value of opals produced in Australia was valued at £2,254,360. More than half of this came from the New South Wales fields. Graphs of the fifty-eight years analyzed show that World War I — prior to which large quantities of opal were exported to Germany — and the economic depression of the thirties reflected low periods in the industry's history. Conversely, discovery of new fields precipitated rapid rises in production. This was particularly true with the rich find at Coober Pedy in 1946 about eight miles from the center of the old field. The greatest boom period of all was in the early days of opal production, with an all time maximum established in 1902. Lowest production was recorded in 1932.

From 1890 to 1895 more than half of the output came from Queensland; from 1896 to 1927 New South Wales was in the lead. Since 1936 the South Australian fields of Coober Pedy and Andamooka have supplied the major portion of opal produced.

The conditions under which miners must live and work in order to procure the stone have much to do with activity on any one field. Naturally, the easier the opal is to obtain, the more miners will flock to that locality. The decline in Queensland's production was due to persistent drought conditions which induced miners to transfer to other fields. Today's production compares favorably with the temporary revival experienced in 1919-1920 following the slump after the beginning of World War I.

CUTTING AND POLISHING

Comparatively little opal is cut or polished at the fields. Sydney is the principal cutting center of the Australian opal industry although some lapidaries are found also in Melbourne, Brisbane, and Adelaide. In cutting each piece of stone individual treatment is required. Wastage during cutting may amount to fifty per cent.

Solid stones have been largely replaced by the doublet in recent years. Potch, colored glass, etc., are used with a thin piece of precious stone cemented on with shellac. The stone is then shaped and polished. Where opal occurs in such a thin film that it cannot be separated from the matrix, the gems are cut with the matrix left to form the backing. This is really a natural doublet but is known as the "boulder cut." The term "matrix opal" is used when the finished stone consists of a piece of the matrix transversed by thin veinlets of opal.

QUALITIES AFFECTING VALUE

Four factors affect the value of the cut opal, namely; color, pattern of colors, fire or flash, and soundness. The most prized opals show perfect blending of color and no shade predominating. Also streaks of colorless materials should not be present. Harlequin and pinfire patterns are most desirable. In the former, colors are arranged in small squares; in the latter they resemble pinpoints. Flashes of red, or combinations of red with yellow, blue, or green are considered best. Plain blue is of very low value, and plain green needs to be very vivid and have a good pattern if it is to be of value.

MAP SHOWING TOWNS AND LOCALITIES

Soundness is determined by the absence of any inclusions of common opal, portions of matrix, or foreign material, or any internal fracture. Any or all of these will lessen the value of the gem.

MARKETING OF AUSTRALIAN OPAL

Australia's export market is reported firm but tending to slump. In the United States, which has been its best customer for opals, the demand has fallen off and American buyers are reported more exacting in their requirements. From 1942 through 1948, at ruling rates of exchange, American sales totaled $438,000. Since uncut stone is duty free, major United States sales are for rough opal. The United Kingdom was formerly the next best market but there has been no trade there since 1939. Germany and Ceylon also purchased a fair amount of opal prior to that time. Since 1940 there has been no trade with Germany and only a small amount in 1947 and 1948 with Ceylon where heavy import duties exist. Canada and South Africa have a complete embargo on the importation of opals. Most foreign trade is done on a consignment basis.

In the domestic market opals are sold either unmounted—principally for the tourist trade – or in rings, bracelets, pendants, and earrings. Sales tax on finished gemstones is twenty-five per cent, but there is no tax on the uncut stone.

FACTORS AFFECTING TRADE

Foremost among the factors affecting trade is prejudice. For many years the superstition that opal is unlucky affected its sale. The ancients believed it the luckiest of gems and Pliny states in the first century that no stone is more desirable except the emerald. However the tale of the unlucky opal – accredited to a fictional tale written by Sir Walter Scott—has persisted since that time among certain people. Fortunately, the belief is gradually dying out.

As is true with any item used for dress, or a costume accessory, fashion has a great bearing on the popularity of the opal.

Opals displayed in the jewelers' windows in Australia are usually of inferior quality set in mediocre designs. Although better stones are available, the public has been greatly influenced by the wide display of this inferior quality and has a tendency to regard the opal as a second rate or "cheap" gem. This has definitely not been good for the industry. Others feel that the introduction of the doublet has weakened the demand for opals.

TRADING METHODS

Exportation of opals – if the transactions are small – is considered unprofitable due to the time and money necessary to comply with regulations for export and currency control. In order to export a parcel of opals to the United States, it is pointed out that at least four separate permits are necessary. Most export trade is done on a consignment basis and this too is bothersome and often unprofitable if the shipment is not sold by the foreign buyer.

PROPOSALS FOR IMPROVEMENT

Since opal is to a great extent ordered by importers in the rough, some have proposed that an embargo on rough stone would increase value of the export trade in Australia. Others hold to the belief that since so many American buyers wish to have stones cut for certain planned pieces of jewelry, such an embargo would reduce sales instead of helping the situation.

Other factions have insisted that government aid should be given to miners to encourage greater activity at the mines. Inasmuch as total opal production constitutes only 0.05 percent of the mineral production of Australia, the government has felt financial aid to individuals is warranted only when the country itself may expect profitable returns for the public funds expended. Assistance has already been given through the provisions of water storage facilities and other improvements in the mining communities.

AUSTRALIAN OPAL FIELDS

The following information on the individual opal fields in Australia has been given only for those fields actively engaged in the production of opal at the present time. It is to be remembered also that the production figures are as nearly accurate as it has been possible to compile them due to the generally unorganized condition of the industry. They are, however, believed to be largely underestimated.

COOBER PEDY, SOUTH AUSTRALIA

Discovery of this field, which was originally called Stuart's Range Opal Field, was first reported in 1915 in the South Australian *Mining Review*. Coober Pedy field is located approximately 125 miles north of Tarcoola and 96 miles west of William Creek railway station. In traveling to the field from Adelaide, it is necessary to travel the last 163 miles by road.

Stuart's Range constitutes an insignificant divide between two drainage systems. These are dry most of the year as average rainfall is six inches yearly. The field extends about forty miles, with a width of six to eight miles. The most extensively worked area is known as Big Flat which was discovered in 1946 and largely occasioned the boom in production that year.

There is no standing timber on the field and firewood has to be carried about twelve miles. Despite the inhospitable nature of the country, and the isolation of the field, the living conditions are not unduly severe —especially since the installation of a water tank around 1925. Some miners bring their families to the field but those with children usually manage to leave during the worst of the summer.

There are few surface indications to guide miners in selecting sites on the Coober Pedy field although scattered fragments of weathered opal lying at the surface may indicate the nearness of a seam. Most miners believe there is only one opal level on the field. The main level is at a depth of about seventy feet below the top of the plateau. Most veins are not continuous although it is recorded that one vein was traced horizontally for more than fifty feet. This is exceptional, however and most are much shorter. The opal bearing sandstone is the lowest formation exposed in the mining shafts. Its thickness cannot be accurately determined but total thickness of beds below the quartzites exceed sixty feet. The seams range from about two inches to a fraction of an inch in thickness, and are irregular in occurrence.

At the time the field was discovered — during the first World War — the market was disorganized and very little work had been done at the field. The postwar years, however, were marked by an influx of miners. After two years production again fell due to an acute drought and depressed market, and recovery was not noted until 1925. A large water tank was then installed by the government and conditions have greatly improved since that time. Value of production from 1916 to 1946 is given as £222,-000. This varies from as little as £500 in 1917 to £55,000 in 1946 when the new Big Flat district was opened.

WHITE CLIFFS, NEW SOUTH WALES

This field was discovered in 1884, sixty miles by road north, northwest of Wilcannia and approximately 120 miles northeast of Broken Hill. Production was undertaken on a large scale in 1890 and nine years later the field was flourishing. The highest recorded value of production, £140,000, was in 1902. From the following year until 1914 there was a sharp decline in output. The miners' morale was undermined and much illicit or stolen opal was sold. This meant cheap opal and the large quantity and low price frightened London buyers. Next, poor qualities called "potch" and "color" were thrown on the market and tons were shipped to Germany. This was the beginning of the end for White Cliffs and the beginning of the war in 1914 ended it — since Germany was the chief buyer. The value of the output since 1933 would amount to only a few thousand pounds and no production at all was recorded for 1948.

In the White Cliffs fields, the depth from the surface to the sandstone ranges from twenty-five to forty feet, according to the topography. The sandstone in which precious opal is found is fine grained, thinly bedded, and shaley in structure, with a claylike matrix. The beds contain abundant marine fossils, silicified woods, and erratic boulders of quartzite considered to be of glacial origin. The precious opal is usually found in minute veinlets of common, or potch, opal. Typically, the opal is developed very irregularly. It has also been found in vertical or sub-vertical joints or cracks and some has replaced fossil remains, mostly shells and wood.

The usual method of recovering the opal here is to sink a shaft. When veins or streaks of potch opal are seen, they are followed laterally in hopes of obtaining precious opal. These shafts are very close together on the White Cliffs field and very little ground remains untouched on the known areas.

LIGHTNING RIDGE AND GRAWIN, NEW SOUTH WALES

Discovery of opal at Lightning Ridge was first recorded in 1880 but commercial production did not start until about 1905 or 1906. The Grawin portion of the field was opened in 1926 and is actually part of the same field, being located approximately twenty miles west of the principal mining center.

The Lightning Ridge field is reached by rail from Sydney to Walgett—a distance of 460 miles — then by road for fifty more miles. The skyline is broken by long, low, sub-horizontal ridges rising about forty or fifty feet above the black soil and reaching an extreme height above the general level of approximately 100 feet.

The ridges and slopes are covered with loose pebbles of quartz and ironstone gravel. In some places there is an outcropping of conglomerate and a hard rock known as "Grey Billy." The quartz pebbles are small and well rounded of transparent, translucent, or milky types. On some a reddish color, or varnish, is seen. The black opal of this district is found in the sandstone underlying the Grey Billy.

The combined depth of the conglomerate and the quartzite is variable. On the summits and upper slopes the thickness varies from one to fifteen feet. Holes or shafts are generally sunk to a depth of forty to fifty feet to reach the opal although opal layers may outcrop on the slopes. Existence of opal appears to depend upon the general character of the sandstone and the sandy clay bands with which it is associated. The opal obtained at the Grawin area is good quality but not quite up to the Lightning Ridge standard.

Estimated value of the production to the end of 1923 was £359,196. Since that date possibly less than £80,000 worth has been recovered and only a few miners are working there at the present time. Aggregate value of the opal recovered through 1948 is valued at £440,000.

ANDAMOOKA, SOUTH AUSTRALIA

The Andamooka field was discovered in 1930 situated about eight miles west of the northern end of Lake Torrens. The region is a dissected tableland with gently rolling hills and low topographic relief. The surface of the tableland is about 600 feet above sea level with a gradual slope of 300 feet over a forty mile distance. The field is reached by rail from Adelaide to Pimba and then about eighty-five miles by road.

Full extent of the field is not known but it is at least four and one half miles long and approximately three miles wide. Operations, however, are carried out in less than half of this area.

Opal bearing conglomerate is usually found about seventy feet below the plateau level although sometimes exposed on hillsides where streams have cut below that level. It also occurs as seams within the clay which underlies the conglomerate band. Miners have preference for shaft sinking at this field and this method is used to the exclusion of all others at the present time.

Living conditions are less attractive at this field than at Coober Pedy, with the water supply limited and barely sufficient for essential needs. Average rainfall here is six inches and surface water is virtually absent. Homes are principally semi-dugout and there is weekly mail service.

Andamooka opal varies in color and is generally darker than that obtained in Coober Pedy or White Cliffs. It is said some specimens are dark enough to compare favorably with Lightning Ridge black opal.

First recorded value of production was made in 1933 and was given as £962. The following year the value fell even lower but from 1939 to 1945 value recorded was consistently higher than Coober Pedy's. The highest value of production from Andamooka was in 1946 when it was recorded as £17,292. Aggregate value of opal recovered to the end of 1946 was £86,088.

HAYRICKS MINES, QUEENSLAND

In Queensland, opals are mined only at the Hayricks Mine near Quilpie in the western part of the state at the present time. This is the largest of an isolated group of mesas which are named Hayrick because of their striking outline against the horizon. These mesas rise to a height of approximately 200 feet above the surrounding plain country.

Opal deposits worked here are of the sandstone boulder type. The boulders occur irregularly in a bed of light colored kaolinic sandstone some 120 feet below the top of the mesa. Opal—in part precious—is deposited as an infilling in cracks and fractures of boulders, which occur irregularly. Some

Continued to page 346

The Diamond Industry in 1949

by

W. F. FOSHAG, Ph.D., and GEORGE SWITZER, Ph.D., C.G.
(Condensed by **GENE JONES**, *Gemological Institute of America)*

EDITOR'S NOTE: In reporting on the activities of the diamond industry during 1949, the authors Dr. Foshag and Dr. Switzer of the Smithsonian Institution, continue a service which was provided in previous years by the late Sydney H. Ball.

IN THE 25th *Annual Review of the Diamond Industry,* published by the JEWELERS CIRCULAR KEYSTONE, W. F. Foshag and George Switzer present a comprehensive picture of interest to every wholesaler and retailer in the United States.

One new agency in the diamond marketing syndicate to be established in 1949 is the Diamond Purchasing and Trading Company, Ltd. which presumably acts as the middleman between the Diamond Producers Association and the two diamond selling agencies in the transfer of diamonds.

Sales for the Diamond Trading Company and Industrial Distributors Ltd. amounted to £28,446,000 in 1949 — a decrease of about £10,000,000 as compared to the previous year. Of this total, industrial diamond sales totaled £8,470,000 in comparison to £11,300,000 reported for 1948. The industrial sales decline was due to the smaller purchases for stockpiling by the United States and not to a decrease in the industrial trade demand.

MARKET CONDITIONS

From September through December 1949, prices of one-quarter and one carat stones were higher in the United States than at any time since August 1947.

The market for British polished goods was, for the greater part, an export market to Sterling areas. Due to the higher prices obtainable from Sterling area countries, fewer diamonds were exported to the United States.

The market in Britain showed great improvement after the devaluation of the British pound on September 18, 1949. While the new price schedule was necessary for diamond values to remain stable, it resulted in little change in diamond prices in the United States, although in other European diamond centers there were increases in prices up to forty per cent.

UNITED STATES IMPORTS

As the largest single market for diamonds, America normally uses about seventy-five per cent of the world's total production. For the year 1949, the United States imported $69,727,517 in gem diamonds . . . the lowest figure for the past five years. Rough or uncut stones in the amount of 651,150 carats at $43.46 per carat were imported in addition to 335,487 carats of cut, but unset, stones at $123.49 per carat.

CANADIAN IMPORTS

Canada showed a marked increase over previous years in diamond importations for 1949 with 46,697 carats of cut diamonds. Industrial diamonds in the amount of 808,070 carats were also imported.

WORLD PRODUCTION

Continuing as the world's largest producer of diamonds in quantity, the Belgian

Congo is second to South Africa in value. The Congo still produces about three-fourths of the world's crushing bort.

SOUTH WEST AFRICA—Under exploitation in 1949 were three areas—Bogenfels,* Area G,* and Area U.* Figures for 1949 show that 243,818 carats were produced, an increase of 54,298 carats over the previous year. An increase in the average size of all diamonds recovered was noted—0.91 to 1.07 carats. Because Bogenfels production had fallen off to about 600 carats per month, it was decided to suspend mining operations in that area early in 1950. Further prospecting, to determine the extent of areas which could be worked profitably with mechanical equipment, was planned.

ANGOLA—Diamond production in 1949 amounted to 769,980.75 carats. Approximately fifty-six per cent of this amount was gemstone quality and forty-four per cent industrials.

TANGANYIKA—Continuing as one of the important diamond fields in the world because of its excellent quality of the average diamond, Tanganyika produced only about twenty per cent industrials. A stone weighing 114 carats was reported recovered during the past year.

Production was 192,787 carats during the year 1949. This represents an increase over 1948 of approximately forty per cent.

GOLD COAST—Although the deposits in this section are extensive, the Birim River Valley area produced ninety-five per cent of the colony's total. With four companies operating in this area, 972,976 carats were exported from April 1, 1948 to March 31, 1949. The four companies are: Cayco (London), Consolidated African Selection Trust (CAST), the Holland Syndicate, West African Diamond Syndicate Ltd., liquidated in September 1948 to form Akim Concessions Ltd.

SIERRA LEONE — Operating as the sole exploiter of this colony, The Sierra Leone Selection Trust, Ltd., a subsidiary of "CASTS" recovered a total of 494,119 carats in 1949, an increase of 28,601 carats over the previous year. Of this total thirty-four per cent were gem quality and sixty-six per cent were industrials.

*Locality not identified.

FRENCH AFRICA — French Africa produced a total of 94,966 carats in 1949, while French Equatorial Africa produced 132,897 carats.

The principal production in French Equatorial Africa comes from the Carnat-Berberati-Nola region in the Haute Sangha, where the diamonds are alluvial.

BRAZIL—Although little authoritative information comes out of Brazil because many diamonds are sold to unauthorized buyers, it is known that diamonds are produced in almost every state in Brazil.

Alluvial deposits are found in all the rivers and streams near Diamantina, in western Minas Geraes, and in the state of Matto Grosso, where the alluvial area stretches from Goyaz across the state.

The state of Minas Geraes produced seventy per cent gemstones and thirty per cent industrials.

VENEZUELA—Venezuela has four alluvial districts which produced 382,455 stones weighing 56,361.54 carats.

BRITISH GUIANA — The Mazaruni and Puruni Rivers are the greatest source of diamonds in this country. Prospectors work the deposits by using small pans, but since the grade of diamondiferous gravel is low, the washers recover only about one half of the contained diamonds. 34,790 carats were recovered in 1949.

INDIA—Production of diamonds in India from 1943 to 1947 was 7,433 carats. No figures have been received for the years 1948 and 1949.

UNITED STATES — After a shut-down of many years, mining operations were started in October 1948 at Murfreesboro, Arkansas. The diamond-bearing kimberlite pipes were worked until September, 1949, after mining approximately 120 thousand tons of various surface rocks across the sixty acres where peridotite appeared. Two reasons were given for closing this operation: 1) recovery was insufficient to meet the cost of operations, and 2) sufficient moneys were not available to permit underground mining or opening new areas. The corporation abandoned the field in March, 1950.

Approximately 840 diamonds were recovered during the operation, weighing a total of 246.15 carats. The largest stone was four and one half carats. Production consisted of ten per cent very imperfect distorted pieces of mixed color, five per cent seconds of dark brown tint, twenty per cent of small size mixed industrials, and sixty-five per cent crushing bort.

DIAMOND CUTTING

During the early part of 1949 cutting activities in the United States were at a high level, approximately seventy per cent of the wartime peak. However, considerable unemployment later in the year resulted from the unsettled market outlook and various disturbing trade practices. The Diamond Manufacturers and Importers Association negotiated a wage readjustment during the summer whereby several shops reopened, operating on a reduced basis. Cutting costs in the United States were substantially higher than in other cutting centers. When the foreign currencies were devalued, the difference in wage rates was further widened.

Surrounded with serious difficulties, the Antwerp cutting industry began the year with sixty-three per cent of its 11,000 unionized workers unemployed. When, in September, currencies were revalued, cutting activities were restored. Great activity, both in rough and polished stones, was noted in December.

Belgian exports for 1949 totaled 244,165.87 carats with the United States receiving seventy-two per cent of this figure.

In the Netherlands, the Amsterdam industry employing 1500 to 1600 workers remained satisfactory.

The Israeli diamond cutting industry had many difficulties during the year. No supplies of rough diamonds were available from the Syndicate from April to September. When Syndicate supplies were resumed in October, the amount and quality — eighty per cent melees and twenty per cent chips—was unsatisfactory. An exportation ban on rough from Israel was stipulated by the Syndicate. The cutting industry, employing from 800 to 1600 cutters, worked principally on melee the price of which the Syndicate raised fifteen per cent.

During 1949, 69,641 carats were exported by Israel with the United States receiving eighty-five per cent of this amount.

A shortage of skilled workers and a lack of suitable material from which to train apprentices, limited the expansion of the South African cutting industry. All factories worked steadily with no unemployment. General market conditions by the end of 1949 were good.

In spite of stringent Belgian regulations making it unlawful to export rough diamonds to Germany, rough from Belgium and Israel found its way into Germany. Thrown on the international market after cutting and polishing, the stones were invoiced as having been cut in Belgium or Israel. Of an estimated 1500 workers in Germany, about one half were unemployed.

INDUSTRIAL DIAMONDS

The United States continued to control the exportation and conservation of the industrial diamond, accumulating a stockpile against emergencies.

Improvements were made in the fields of diamond dressing and trueing tools; diamond drills; diamond boring and turning tools and minor applications.

Reportedly well organized and ready for any national emergency were the diamond tool production plants. The industrial diamond industry is prepared, from the standpoint of techniques, manpower, and government stockpile, again to do an outstanding job for National Defense.

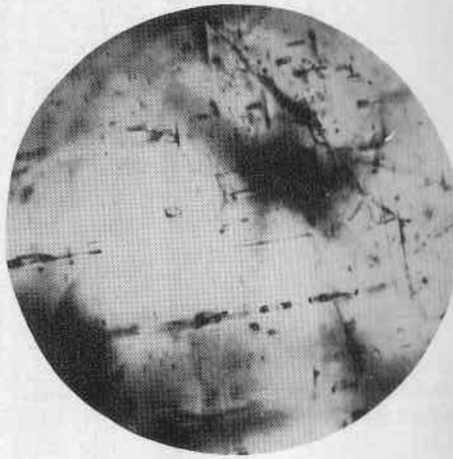
Some Notes on Indian Emeralds

by

ROBERT WEBSTER, F.G.A.

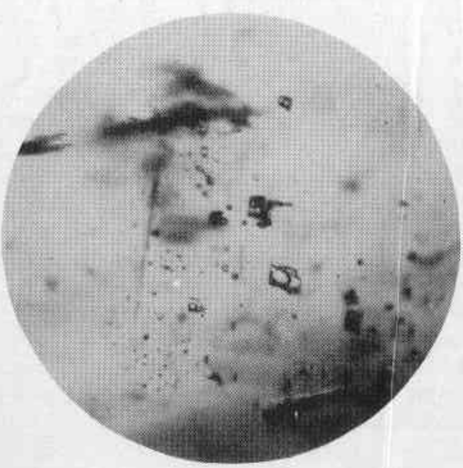
RECENTLY the writer had the opportunity to examine a number of rough and cut emeralds from the mines of Central India, and some observations on the characteristics of these emeralds may be of interest.

Microscopic examination of the internal structure of these Indian emeralds, which, in general, are of a good grass-green color, showed that the inclusions are oriented in two directions. One of these is parallel to the basal plane and the other at right angles to this, i.e. parallel to the vertical crystal axis. The inclusions themselves consist of rectangular or square cavities containing, usually, a gas bubble. The inclusions are further characterized by a projection parallel to one side, thus the square-shaped cavities appear like "commas," and are a type of inclusion which seems typical of emeralds

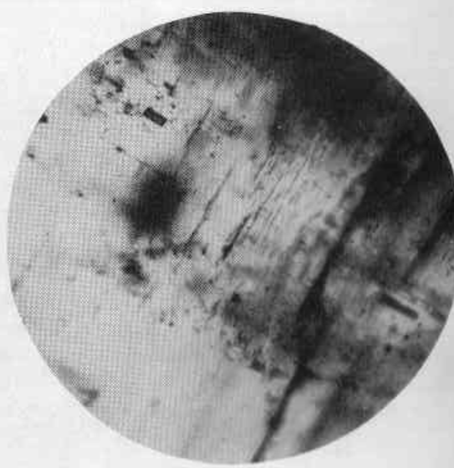


• Inclusions in an emerald from the Kaliguman mines.

• Two-phase inclusions in an Indian emerald.



• Inclusions in two directions at right angles in an Indian emerald.



from this locality, and do not appear to occur in the stones from other sources.

The refractive indices of a cut specimen of Udiapur emerald weighing .20 carat, taken by my colleague, C. J. Payne, using an Abbe-Pulfrich refractometer, were found to be ω 1.5927; ϵ 1.5853, with a birefringence of .00745. The density of Indian emeralds has been found to be commonly 2.73 to 2.74, from values recorded by B. W. Anderson on these specimens.

Under the influence of ultra-violet light (3650 A) the stones showed no fluorescence, while under X-rays some were found to show a very dull red glow although a few were quite inert.

The stones examined came from the Bhilwara and Kaliguman mines in the Udiapur district and from the mines at Amjer.

• Typical inclusions in an Indian emerald.

Book Review

"Chinese Jade Carving," ***by S. Howard Hansford. Published by Percy Lund, Humphries & Co., Ltd., London.***

THE AUTHOR has made a very comprehensive study of the jades and jade carving and has inspected his studies and findings in a very thorough and pleasing manner.

Hansford attempts to prove by an original survey of historical Chinese writings and, where possible, observation at archaeological sites and museums that jadeite was not worked in China prior to the 18th century; that material prior to this time was nephrite. Further, he attempts to prove that some of the original sources of Bushell's and Kunz's *"Investigations and Studies in Jade, the Heber R. Bishop Collection"* and Laufer's *"Jade, Study in Chinese Archaeology and Religion"* were indeed frauds, and that some of the resulting conclusions of these works are innocently inaccurate.

The chapters on jade carving, both historical and modern, are very thorough. Hansford's academic approach to all the problems involved is intense and his interpretations are lucid and detailed. He has included an excellent bibliography on jade in the book and seventy halftones illustrate the subject matter, plus a fine color reproduction as the frontispiece. The author has also included fine photographs of modern tools for jade carving.

Hansford has done an outstanding piece of work on this book and it represents many years of profound study on his part. An author who prepares his text by studying the language of its source material (in this case Chinese—both ancient and modern), in addition to allied scientific studies and expeditions to archaeological sites in China and to museums and private collections throughout much of the world has indeed prepared himself for the task at hand. His keen insight, scholarly handling, and finally, his interesting and most informative style of conveying his findings to the reader are commendable.

James Small, C.G.

Reports on Brazilian Heated Green Quartz

DETAILS concerning the production of heat-treated green quartz in Brazil were given to G. R. Crowningshield, Acting Director of the Gemological Institute's Eastern Branch, during a recent interview with the owner and operator, Gregorio de Azevedo.

Approximately a dozen men are now employed by Sr. Azevedo in mining the quartz which is found near Montezuma (formerly Aqua Quente) in the district of Rio Pardo, state of Minas Geraes. For thirty years this area, situated in a rolling terrain, sparsely wooded, at an altitude of 3500 feet, has been worked intermittently for amethyst exclusively. Rarely are natural greenish stones seen, and those that are found appear milky and have no great beauty. The possibility of producing green quartz was discovered accidentally through the prevalence in Brazil of applying heat treatment to all types of stones.

Varying in thickness from a few inches up to three feet, about six prominent veins comprise the diggings in an area heavily covered with white quartz float. In places, the veins may be followed on the surface for a distance of from sixty to seventy feet. Pockets of amethyst crystals, which although quite defective have clear areas which can be recovered by careful sawing, are found here and there in the veins. Some larger crystals yield stones up to twenty carats.

In one of these veins, pockets of a partially opaque quartz with a yellowish cast are found. This material, upon proper heat treatment, turns various shades of green. Only small clear areas of these opaquish crystals are, however, suitable for cutting.

Sr. Azevedo reported that the bulk of the heat treated material is a rather dark peridot green. Some, however, resembles green beryl, and a few stones resemble green tourmaline. The color, so far as known, is just as permanent as the color in heat-treated citrines.

Although no name has been established for the material, in the Rio de Janeiro market it is called "Prasiolita." It is now being cut in Rio in sizes up to twenty carats and has been enjoying an increasing popularity. It is especially popular used in bracelets with alternate amethysts. The stones sell for about the same price as good quality amethysts.

Sr. Azevedo claims that there is a good supply of the rough material, hence no danger at present — if the gem is widely accepted — that it will go the way of hiddenite, benitoite, or other gems where only one source is known.

Continued from page 340

boulders contain no opal; others contain inferior opal. The better quality opal usually occurs at the lower ends of the boulders which are slightly tilted in the sandstone. Mining is done by means of tunnels and drives and is confined largely to a horizon some eight feet thick.

A great variety of opal is present in the Hayricks boulders. Smaller stones showing the much prized red fire are obtained, but much of the opal in the vertical veins is banded so much that it is valueless as a gem. Most of the larger size pieces of value are taken from horizontal veins. Pattern varies from flash to harlequin and pinfire, while some opal recovered carries numerous inclusions of sand or opaline impurities.

Production figures for this field are not given. It is noted, however, that no production for Queensland is recorded in the years 1940, 1941, 1942, 1943, or 1945. Total production for 1946 through 1948 is valued at £4,382.

Observations on the Slijper Diamond

by

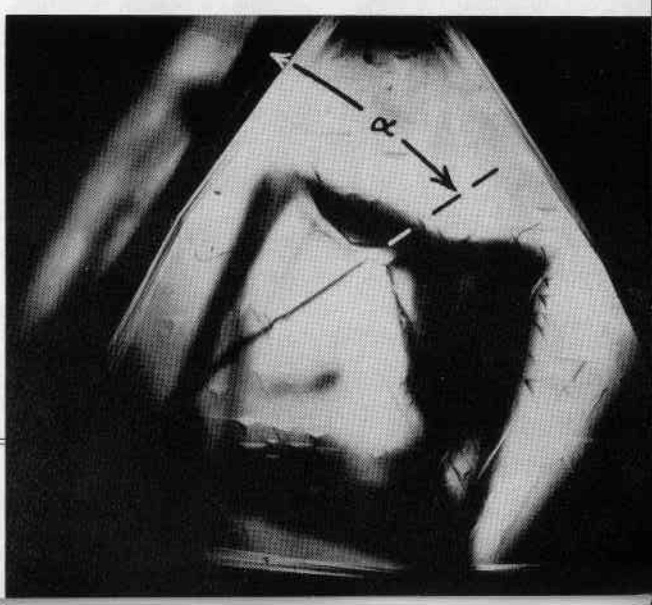
J. A. KOHN, Ph.D.
University of Michigan

DURING the Spring of 1950, the "Slijper Diamond" was kindly loaned for study to the Mineralogical Laboratory, University of Michigan, by its exhibitors and owners, the N. V. Diamantmaatschappij H. E. Slijper of Amsterdam. The diamond weighed 7.25 carats and consisted of a large octahedron within which could be clearly discerned a second octahedron, the latter having a good outline and quite sharp edges. The physical characteristics of this rather unique crystal have been described by P. Grodzinski[1] and by Richard T. Liddicoat, Jr. The latter author has published his results in a previous issue of *Gems and Gemology*.[2]

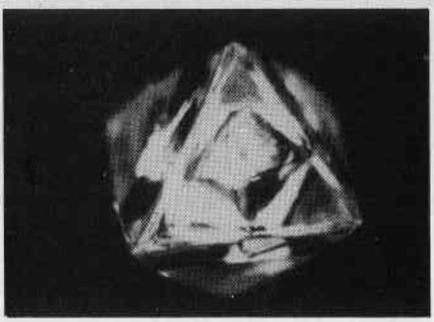
The crystal was studied at this laboratory for the purpose of determining whether the included individual could be related to the larger, enclosing crystal by means of twinning. Accordingly, a photomicrograph was taken normal to one of the octahedral faces of the outer individual. The face used was that through which the edge-directions of the included crystal could be most clearly seen. Angle α was measured from tracings of the photomicrograph and found to be 23.5°. α represents a projected angle, the true angle between the edges concerned having been projected onto the octahedral plane of the photomicrograph.

All cases of primary, secondary, and tertiary twinning[3], i.e., twinning involving two, three, and four individuals, respectively, were investigated. The procedure consisted of determining visually, with the help of wooden models, those cases in which the indicated projected angle approached in magnitude the angle α measured from the photomicrograph. Only three cases were found, one involving secondary and two involving tertiary twinning, in which there was any correlation at all.

Use was made of the indices given by Professor C. B. Slawson[4] for faces of a secondary twin when referred to the axes of

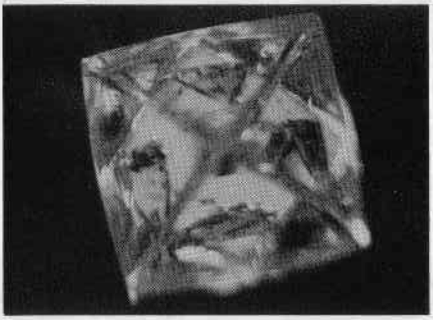


• The "Slijper Diamond" taken normal to an octahedral surface of the outer individual. (Magnification about 10x.)



• **The good outline and sharp edges of the included octahedron are seen here.**

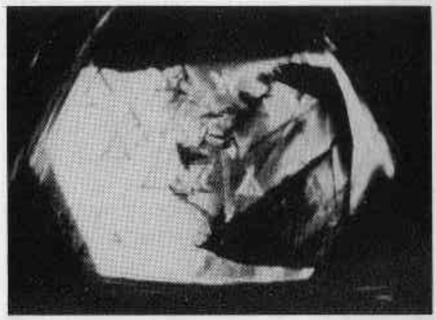
the first individual, and the values were extended where necessary to include tertiary twinning. Having this information, it was possible to determine by methods of analytical geometry the direction components of the lines concerned. By construction the lines were projected on the desired octahedral plane and the projected angle measured. Through this method, the angle was found to be 33.3° in the case involving



• **The included crystal shown in all four octahedral faces.**

secondary twinning, a difference of 9.8° from the angle α measured on the photomicrograph. For the two tertiary twins, values of 30° and 14.9° were obtained, differing from α by 6.5° and 8.7°, respectively.

On the basis of this information, it was concluded that as far as primary, secondary, and tertiary twinnings are concerned, the mutual orientation of the included and enclosing individuals of the "Slijper Diamond" must be described as one of random overgrowth. This is in agreement with the statement of Liddicoat[2] that the included crystal "is not in crystallographic orientation with the enclosing crystal." This author, however, was probably referring to a relationship involving only primary twinning. Of course, it is possible to consider twinnings involving five or more individuals, but in such cases the number of possible arrangements



• **Plane octahedral faces with typical triangular depressions and rounded edges.**

becomes enormous and the intended proof loses its significance.

The author is indebted to Jack F. Slijper of New York to whom the diamond was sent from Amsterdam and who kindly forwarded it to this laboratory for study, and to Dean Edward H. Kraus, of the University of Michigan, who was influential in having the specimen brought to Ann Arbor. Thanks are due to Alfred A. Levinson, of the University of Michigan, who made the photomicrograph shown on the preceding page.

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2. Liddicoat, Jr., R. T., *An Unusual Diamond Crystal,* Gems and Gemology, Vol. V, number 12, 1947, pp. 492-493.
3. Slawson, C. B., *Twinning in the Diamond,* Am. Mineralogist, Vol. XXXV, 1950, pp. 193-206.
4. Loc. Cit., p. 205.

Gemological Digests

PRODUCTION FIGURES RELEASED ON GEMSTONES

Significant production figures of six of our most important gem materials have recently been made available to the Gemological Institute of America by officials of the countries involved.

COLOMBIA — From the famous Chivor *emerald* mines in Colombia it has been reported that the 1949 output totaled 91,656.08 carats, an increase over the 82,369.75 carats produced in 1948 and one of the best years on record.

JAPAN — Although still behind prewar production the office of the U. S. Commercial Attaché in Tokyo reports the 1949 cultured *pearl* output to be approximately 2,093 pounds, with a 4,130 pound estimate for 1950.

BURMA — Also behind prewar level, but gradually increasing, is the production of gemstones in Burma. According to officials in Rangoon, the latest figures (1948) are as follows: *rubies,* 5,306 carats; *sapphires,* 10,228 carats; *spinels,* 4,160 carats. *Jadeite,* compared to its 1939 production of only 767 carats, showed the greatest increase with a total of 4,847 carats.

L. L. C.

REPORT NEW GOLD COAST DIAMOND DISCOVERY

General world wide distribution given to a report carried in the *Trader and Canadian Jeweller,* May, 1950, of an "important" new diamond find in the Gold Coast was the cause of a certain amount of consternation within the diamond controlling organizations. The article, which quoted the Secretary of the Chamber of Mines at Tarkwa, described the new find as "phenomenal," and intimated that the deposit had great potentialities.

However, in an official communication to the Gemological Institute from the Director of the Gold Coast Geological Survey, the report was branded as a gross exaggeration, and it was explained that the deposits, confined to an area not exceeding 150 feet wide and one-third of a mile long, were being worked quite unsystematically by independent native laborers and entirely without governmental control. Because of this, production figures have not been compiled, although a weekly output of 500 carats has been estimated by inspecting geologists. Quality of the material was indicated as being generally fair, having less boart than that of certain other diamond-producing areas in the Gold Coast.

Although of considerable importance to the local economy, it was emphasized that the new field was not of the importance suggested by press reports and that it was not worthy of large scale development. The Geological Survey officials did say, however, that production could be increased with some coordination of effort and pooling of resources instead of the present chaos which is ruining the deposit.

Lawrence L. Copeland, G.I.A.

GROWTH OF AUSTRALIAN ASSOCIATION

In its second annual report, issued earlier this year, the Gemmological Association of Australia indicates steady growth and considerable progress in spreading the gemological movement in that country.

Both Preliminary and Diploma classes are conducted in all states and the Association announced sixty new fellowships awarded during 1949. All of these title holders are residents of Australian states. At the close of 1949 a membership total of 577 was shown, representing the states of New South Wales, Victoria, Queensland, and South Australia.

Gemological Digests

ROBERT M. SHIPLEY, JR. MADE HONORARY RESEARCH MEMBER OF G.I.A.

At a meeting of the Board of Governors of the Gemological Institute of America, held in New York City in August, 1950, Robert M. Shipley, Jr., was appointed Honorary Research Member of the G.I.A.

He began his work in gemological research early in 1933 when he joined his father, G.I.A. Founder Robert M. Shipley, in the early years of establishing the Gemological Institute. He coauthored the scientific portions of the advanced Correspondence Courses used by the Institute and later assumed the duties of Director of Education and Research. His contribution to the development of American Gemology has been considerable since most of the noteworthy progress made by the Institute in gem testing technique, gem testing methods, and gem testing instruments have been outgrowths of his study and labor.

Some of his early work included perfection of the first gem testing polariscope, and the design and development of dark field illumination used in such instruments as the Diamondscope, Gemolite, and Diamondlite.

As a reserve officer in the United States Army, Robert M. Shipley, Jr. was called to active duty one year before Pearl Harbor. His gemological work was interrupted during the almost six years he served as Engineering Officer before being retired with a rank of major.

Since his discharge he has continued his work of developing and perfecting gem testing instruments for the Gemological Institute, and for the trade. Some of his latest contributions to the advancement of gemological science, through research and the development of new and more effective gem testing techniques and equipment, include

Robert M. Shipley, Jr.

the new simplified gem refractometer, the analyzing refractometer, gemological microscope, stock record camera, and other modifications of existing instruments which has resulted in lower cost and increased efficiency.

The only other person accorded the distinction of the title Honorary Research Member of the Gemological Institute of America is Dr. Edward J. Gubelin of Lucerne, Switzerland.

EDUCATIONAL ADVISORY BOARD OF G.I.A.

Nine men important in the development of gemological progress throughout the world were designated Honorary Members of the G.I.A.'s Educational Advisory Board in 1950. These are B. W. Anderson, London Gemmological Laboratory, England; George Engelhard, Publisher *National Jeweler*; P. M. Fahrendorf, President, *Jewelers' Circular-Keystone*; Dr. R. P. D. Graham, Professor of Mineralogy, McGill University; Paul

Grodzinski, Industrial Diamond Information Bureau, London; Dr. John W. Gruner, Professor of Geology and Mineralogy, University of Minnesota; Dr. Paul F. Kerr, Chairman, Department of Geology, Columbia University; G. F. H. Smith, President, Gemmological Association of Great Britain, London; and Alpheus W. Williams, Author and Mining Engineer, Cape Town, Union of South Africa.

Active members of the Board, under the chairmanship of President Edward H. Kraus, Ph.D., University of Michigan, are Dr. W. F. Foshag, vice-chairman, Smithsonian Institution; Fred E. Belsham, Canadian Jewellers' Association, Toronto; R. D. Edwards, National Wholesale Jewelers' Association, Kansas City; Dr. Harry H. Hess, Princeton University; Dr. Ralph J. Holmes, Columbia University; Dr. Cornelius S. Hurlburt, Harvard University; Oscar Kind, Jr., Philadelphia; Lloyd V. Lassner, American Stone Importers' Association, Inc., New York; Dr. George Switzer, Smithsonian Institution; and G. H. Niemeyer, Jewelers' Vigilance Committee, New York.

AQUAMARINE FROM BRAZIL WEIGHS 2000 CARATS

Ray Orcutt recently returned from a gem collecting trip into the Brazilian interior, with a 2000 carat aquamarine crystal, which he found in the possession of a native in Minas Geraes.

Orcutt, a G.I.A. student, was able to fashion one large emerald cut gem of 420 carats from the complete terminated crystal. The stone is flawless and of a beautiful bluish green color. Orcutt understands that there is only one larger flawless aquamarine in this country, and it is in a private collection.

G.I.A. EXECUTIVE COMMITTEE SUPERSEDES OPERATING COMMITTEE

Charles H. Church, Church & Company, Newark, was appointed chairman of the newly designated Executive Committee of the Gemological Institute of America at the last meeting of the Board of Governors.

Other members of the committee, which supersedes the Operating Committee of the Institute, are Frank Davidson, Los Angeles, and Fred L. Cannon, Slaudt-Cannon Agency, of the same city.

To this committee the G.I.A. Board of Governors has delegated most of its powers, to be used during the interims between the less frequent regular meetings of the Board.

58 DIPLOMAS AWARDED BY G.I.A.

Since last reported in the summer issue of *Gems and Gemology,* fifty-eight students have completed the correspondence and residence courses of the Gemological Institute of America. The following eleven have received diplomas in the Theory and Practice of Gemology:

Charles Boros, Braddock, Pennsylvania
Elaine Cooper, Bryn Athyn, Pennsylvania
Robert D. Franklin, Clatskanie, Oregon
Leonard W. Friedman, Los Angeles, Cal.
Donald W. Green, Mt. Clemens, Mich.
Frank J. Holmes, Peoria, Illinois
Samuel Koulish, New York, New York
Donald J. Lund, Bismarck, No. Dakota
Leonard Olkowski, Dearborn, Michigan
Edgar F. Strother, Louisiana, Missouri
Adolph L. Westlind, Clatskanie, Oregon

Diplomas in the Theory of Gemology from the Gemological Institute of America awarded upon completion of correspondence courses were received by the following persons:

Calvin R. Baker, Las Vegas, New Mexico

John W. Bartlett, Napa, California
Douglas MacDougall Beall, Toronto, Ontario, Canada
William H. Bell, Los Angeles, California
Joseph M. Borejko, Providence, R. I.
Leslie Branson, Jr., Wichita, Kansas
Roland A. Cadoret, Woonsocket, R. I.
Joseph A. Carr, Jr., Bemidji, Minnesota
Leonard H. Cooper, Revere, Mass.
Alfred Dana, Brookline, Mass.
Samuel J. De Marco, Rochester, N. Y.
Bruce A. Fisher, Elmwood, Connecticut
Morris Fisher, Los Angeles, California
Walter M. Genuit, Stockton, California
Herbert W. Gluckman, Fort Myers, Fla.
Leonard Gordon, Chicago, Illinois
Neal H. Guffey, Washington, D. C.
Rolland P. Gustafson, Minneapolis, Minnesota
Gene T. Hassett, Orlando, Florida
J. Edwin Henderson, Greensboro, North Carolina
Hidemasa Higuchi, San Jose, California
John H. Kent, Toronto, Ontario, Canada
Richard G. Kent, Bahama Beach, Florida
Fred H. Kieval, Danville, Illinois
Robert J. Kitson, Belen, New Mexico
Morris Labovitz, Pittsburgh, Penn.
J. Kenneth Lucas, Chicago, Illinois
Virgil L. Luke, Arcadia, California
Sydney A. Lurie, Canton, Ohio
Ralph R. McGee, Jr., Franklin, Indiana
Guy R. McVay, Florence, Alabama
Earl W. Meier, Milwaukee, Wisconsin
Darrell L. Miller, St. Paul, Minnesota
Douglas T. Myers, Richmond, Virginia
George W. Norton, Jr., Wheeling, West Virginia
Harry C. Ogden, New York, New York
Norman L. Osborne, Wichita, Kansas
Robert F. Rugh, Oil City, Pennsylvania
Joseph H. Sanders, Seattle, Washington
Lawrence A. Smith, Portland, Oregon
Millard Smithson, St. Louis, Missouri
William A. Spring, Cleveland, Ohio
Roderick C. Stevenson, La Porte, Ind.
Kenneth A. Sturm, Milwaukee, Wis.
Earl W. Tomlinson, Hawthorne, N. J.
John W. Walcott, Grosse Point Park, Michigan
Zane C. White, Hot Springs, N. M.

TOTAL OF ELEVEN BRITISH TITLES AWARDED IN U.S.A. IN THIRTY-SEVEN YEARS

Announcement by the Gemmological Association of Great Britain of fellowships awarded this year shows four of these given to men in the United States. These are C. E. Heighes, Joe Phillips, Jack Schunk, and Jim Coote. The latter three, all of whom qualified with distinction, were on the staff of the Gemological Institute of America at the time the examinations were taken.

The recognition given the four Los Angeles men last month brings to the United States a total of eleven such titles. Others in this country having qualifiied for fellowships in the past are Richard M. Pearl, Grant Miller, Robert M. Shipley, Virginia Hinton, Wm. Collison, Lester Benson, and Robert Crowningshield. All but the first two have been, or are, on the staff of the Gemological Institute of America and with the exception of Robert M. Shipley, founder of the G.I.A., all have completed the courses of the Institute.

Diploma examinations have been given by the British Association since 1913. In the thirty-seven years, 587 candidates have qualified for fellowship. 160 have been awarded the F.G.A. titles with distinction since that grading was introduced in 1928.

In the recent British examinations twelve countries—Holland, South Africa, Scotland, Ceylon, Norway, Australia, China, Rhodesia, Egypt, India, Canada, and the United States—were represented.

Gemological Digests

REVERSE PATTERN NOTED ON HALF DRILLED BLACK PEARLS

During examination recently of a pair of half-drilled black pearls in the Gem Trade Laboratory of the Gemological Institute of America a radiograph cultured pattern was secured. This is the reverse of the usual ones in that the conchiolin ring showed up white on the film, rather than black.

This effect was reported by Robert Webster in the *Journal of Gemmology* for April 1949. In that article he states that it was assumed that the pearls they were testing had been stained, probably by silver nitrate. The silver presumably concentrates in the conchiolin layer during the process and because of the opacity of the heavy atoms of silver, the film is unaffected and the "reversed" pattern appears. The two pearls tested in the New York laboratory failed to fluoresce under X-ray due presumably to the heavy deposit of dye.

G. R. Crowningshield, G.I.A.

MIRIDIS: A NEW NAME FOR SYNTHETIC RUTILE

Based on the premise that the jeweler will not promote the sale of synthetic rutile—and that he is "less skilled in merchandising"—department stores and women's specialty shops have been selected instead to market the stone under the name of "Miridis."

Wholesale prices of individual pieces will range from $65 to $250. All retail prices are to be controlled by the originators of the merchandising plan.

Final details are expected to be completed and the jewelry to be placed on the market in time for retail Christmas buying. Elaborate plans for a publicity campaign, to be released both nationally and locally, have been prepared.

AUSTRALIAN ASSOCIATION OFFERS NOMENCLATURE HELP

In a letter to G.I.A. president, Edward H. Kraus, dated September 19, 1950, Arthur A. Wirth, president of the New South Wales Branch of the Gemmological Association of Australia, suggests all organized gemological groups in the world be invited to submit reports on gemstone nomenclature and that these be carefully considered when the matter is again placed on the agenda of the annual American Gem Society Conclave to be held early in 1951. At the same time he offers the cooperation and assistance of the Australian Association in clearing the many matters dealing with this contentious problem.

Further, he pointed out the inadequacies and dissimilarities of the current birthstone lists and recommended that these be examined by all countries in the light of new advancements in the synthetic fields. It is President Wirth's opinion that sufficient gemstones of beauty exist to provide alternates for each month rather than just in a few instances as is now the case.

ARTIFICIAL PEARLS MADE BY NEW PROCESS

According to T. C. Usher, a Johannesburg manufacturer, artificial pearls are now being made in South Africa. The new process resulted from postwar research and precision engineering and may soon find a wide market.

The pearls — about 85 to a string — are made behind closed doors due to the secret processes and recipes. Made by a combination of synthetic resins, the pearls are "unbreakable" according to Usher. He also said that this technique is displacing French, Japanese, and Czech producers in the world markets because of its low cost and efficiency.

Gemological Digests

QUEBEC DIAMOND FIND NOT SUBSTANTIATED

Investigation by the Gemological Institute of the reports of a diamond find in Vassan Township of northern Quebec, have resulted in a statement from the Province's Department of Mines which leaves some doubt of diamond bearing kimberlite in that district.

According to B. T. Denis, Chief of the Mineral Deposits Branch of the Quebec Department of Mines, a small sample of sludge was sent to the Province's laboratories in the spring of 1949. This sample was examined and a concentrate prepared with methylene iodide. Examination revealed that in addition to pyrite this concentrate contained a few small grains of black brilliant material that proved, on X-ray analysis, to be diamond.

In further explanation of the presence of diamond grains in the concentrate, Denis explains that the material examined was obtained with a chopping bit from a depth of about sixty feet in a diamond drill hole that was being sunk for water. The drilling had proceeded normally to sixty feet and then encountered difficulty which occasioned the curiosity of the drillers as to the content of the sludge. In the opinion of Denis, the possibility that the few small grains of diamond found may have come from the drilling bit has not been eliminated.

Since examination was made in 1949, a sixty-foot shaft has been sunk on the property located about fifteen miles north of the gold mining town of Val d' Or, and a sample has been submitted to the pilot mill there. The resident geologist of the district has been down the shaft and reports that the rock appears to be a fine grained, partially serpentinized, periodite which does not present the features usually associated with kimberlite.

Any further developments of a favorable nature will be reported in later issues of *Gems and Gemology.*

Kay Swindler, G.I.A.

FOIL BACK SYNTHETICS AGAIN CREATE CONFUSION

Recently it has come to the attention of the Gemological Institute that foil back synthetic material — incorrectly sold as true synthetic star or cat's-eye — is causing more confusion among both jewelers and the public.

This material, which is not new on the market, is correctly described as synthetic foil back as the star is produced by ruled lines on the metallic back rather than from inclusions within the stone. Such stars do not possess the well defined lines characteristic of the true synthetic star or cat's-eye.

NEW PURCHASING COMPANY HOLDINGS CLARIFIED BY SECRETARY OF DE BEERS

In the summer issue of *Gems & Gemology*, announcement was made of the newly organized Diamond Purchasing and Trading Company. In a letter from C. H. Beck, Secretary of the De Beers Consolidated Mines, Ltd., a clarification of the extent of De Beers' holdings is given.

"The position is," writes Secretary Beck, "that the Diamond Purchasing and Trading Company, Ltd., was formed with a share capital of £2,500,000 pounds in one pound shares, of which 500,000 shares have been subscribed for in cash at par.

"De Beers took up 190,000 of these shares and Consolidated Diamond Mines, 47,500. Since then the remaining £2,000,000 of capital has been subscribed for at par and De Beers has taken up 760,000 shares and Consolidated Diamond Mines, 190,000 shares."

Contributors in this Issue

ROLAND S. YOUNG is a graduate of the University of Alberta and Cornell University. For some years he was research chemist with International Nickel Company of Canada at Copper Cliff, Ontario. He then went to Northern Rhodesia as Chief research chemist for the large base metal properties of the Anglo American Corporation of South Africa. For the past three years he has been director of research of the Diamond Research Laboratory in Johannesburg. Dr. Young has contributed a number of papers to technical publications in chemistry and metallurgy, and is the author of the American Chemical Society's monograph on COBALT.

WILLIAM F. FOSHAG, Ph.D., co-author of "The Diamond Industry in 1949," is Head Curator of Geology of the United States National Museum (Smithsonian Institution), a position he has held since 1919. Vice Chairman of the Educational Advisory Board of the G.I.A., Foshag is also an honorary member of the Sociedad Geologica de Mexico; a fellow of the Geological Society of America and Mineralogical Society of America; a member of the American Geophysical Union and the Washington Academy of Science.

GEORGE SWITZER, Ph.D., C.G., received his A.B. degree at the University of California and his doctorate at Harvard. Formerly the Research Director for G.I.A., Dr. Switzer is now the Associate Curator of Geology and Petrology at the United States National Museum. In addition to being a member of the G.I.A. Educational Advisory Board, he also serves as secretary to the Examinations Board of the Institute. Switzer is a fellow of the Mineralogical Society of America and a member of the Stanford Chapter of Sigma Xi, honorary scientific fraternity.