Gems & Gemology

GIA

SUMMER 1968

Gems & Gemology

Volume XII — *Number 10*

Summer 1968

IN THIS ISSUE

Operation King Canute

Reprinted from Optima, *December 1967.*

The sign reads "King Canute Road." It stands 20 miles north of Oranjemund —the town built in the Namib desert by The Consolidated Diamond Mines of South-West Africa—in the midst of an arid waste of sand over which nature has grown isolated tufts of coarse grass and small, hardy shrubs. The track from the sign bucks over dune after dune until, quite suddenly, it is confronted by the sea — a sea that looks deceptively inviting in the sunlight, but that has claimed the lives of untold numbers of men and ships. For this is the notorious Skeleton Coast.

There are no wrecks in sight at this point of the coast but there are skeletons — skeletons of worked-out coffer dams, or mining paddocks: some intact, but others with their walls torn away or slowly crumbling and sliding under the sea's steady and relentless pounding. And why "King Canute Road"? Because this road leads to the spot where men successfully, although temporarily, turned back the tide to recover the most sought after gems in the world — diamonds.

First pointers to the existence of diamonds underneath the sand beaches came in 1945. Prospecting parties from Consolidated Diamond Mines (C.D.M.) were moving farther northwards from Oranjemund, discovering and proving the diamond reserves in the marine terraces.

At C.D.M., diamonds are found in a layer of gravel covered by a blanket of sand that is over 100 feet deep in places. Beneath the gravel is solid bedrock, pitted with crevices and gulleys in which rich pockets of diamonds are sometimes found. Geologists are not unanimous about the origins of these deposits, but a widely held theory is that the diamonds were formed in volcanic pipes or fissures in the hinterland millions of years ago. As the top of the pipes became weathered and eroded, the diamonds they contained were washed down to the sea by ancient rivers and concentrated on the beaches by wind and wave action. Recession of the sea or displacement of the land over many centuries caused a series of raised diamond-bearing beaches, known as marine terraces, to come into being.

In 1945, prospecting was carried out by digging trenches down to the bedrock and analyzing the diamond-bearing gravel revealed below the sand overburden. These trenches, about 550 yards apart, were dug at right angles to the coastline and stopped where the gravel petered out. As prospecting operations moved northwards, this point crept closer to the beach. Eventually, the time came when the bottom of a trench was below the water level and operations were stopped because of water, although there were indications that the gravel continued into the beach.

The beach area was not prospected at that time because operations were concentrated on outlining and proving the diamond reserves on land, which were so rich that there was no need for the company to tackle the beach area and its associated problems. But in October, 1963, De Beers concluded an agreement with Mr. S. V. Collins' Marine Diamond Corporation with a view to participating in its unique sea-diamond venture and the possible integration of C.D.M.'s coastal strip — the beach area between high- and low-water marks, stretching from the mouth of the Orange River to Diaz Point — with Marine Diamond Corporation's sea concession area. De Beers agreed to prospect and evaluate both areas.

The first task on the beach was to establish the contour of the underlying bedrock. Obviously, trenches could not be cut because they would be flooded by the tide. Yet it was essential to all future operations to know the profile of the bedrock down to the low-water mark, because this would show the most likely diamond-trap areas — the gullies, cavities and depressions.

Another company, called in to help solve the problem, was unable to offer any solution. There was literally no one in the world who could help, or offer any know-how, for the simple reason that an operation on these lines had never before been tried. Indeed, this was to apply to all the subsequent beach operations and their attendant problems. So C.D.M. had to tackle the problems alone and, by solving them, it became the pioneer in this field — on one of the world's most treacherous coastlines and its vicious sea.

Numerous ideas were put forward as to the best means of achieving the desired result. Some were discarded, others were tried with partial success, but eventually it became clear that time and mobility were the two main hurdles to be overcome: time because the period available for checking at the low-water mark was very short, and mobility because operations had to ebb and flow with the tide.

After much trial and error, the most suitable equipment evolved, which is still in use today, consisting of a flexible hose attached to a one-inch-diameter steel pipe. Compressed air was forced down the hose and blown through nozzles in the pipe. This allowed the pipe to worm its way through the overburden — which was found to be 70 feet deep in some places—until bedrock was reached. The depth was then recorded.

Once the profile had been outlined, the next task was to sample and evaluate all 187 miles of the coastline within the concession area. Again, there was no precedent for such an operation and again time and flexibility were the keys to success. But fortune and ingenuity favored the project, for it was found that a French company had designed a machine that would twist a 35-inch-diameter caisson into the sand and underlying gravel and that by means of a small grab operating within the caisson, could recover the core for analysis. In addition, the drill could "walk" from point to point on unconsolidated sand beaches by a series of pads.

Initially, one of these machines was bought and, together with ancillary equipment such as a bulldozer, a front-end loader and a small portable recovery plant, it started work in April, 1964. Later, another two machines were brought into operation.

Time was again becoming a factor: in terms of the agreement with Marine Diamond Corporation prospecting work on the foreshore had to be completed by the end of 1964. Slowly at first, the drills and their crews started the mammoth task of drilling three prospecting holes — one at the low-water mark, a second halfway up the beach and a third at the high-water mark — at intervals of about 2,200 yards. There were doubts at first that the program could be completed in time, but it was now a matter of pride; the crews lived in caravans alongside their drills, worked day and night and, as they became more experienced, the tempo of the operation quickened.

Work started in the south, where few difficulties were encountered in transporting the drills and equipment to their appointed beach areas. However, as the teams moved northwards the terrain became more difficult: there were isolated sandy coves surrounded by steep cliffs, whereas in other places they encountered massive dunes of soft, sliding sand. But pride won the day — heavy road-cutting machinery was called in that carved roads out of the faces of the cliffs. The drills would lumber down, complete their work, then move on to the next cove. If the machines bogged down in the soft sand dunes, rubber-tired tractors, crawler tractors and any other machines available were rushed in to help dig, push or pull them out. And so it continued until November 1 when the last hole was sunk, the gravel extracted and analyzed and the results plotted.

Thus ended the second phase and, with all the results to hand, an evaluation of the whole area was carried out. The samples showed beyond doubt that there were diamonds underneath the beach sands. In some places they were highly concentrated, whereas other areas were quite barren.

On May 18, 1965, De Beers and other concerns announced that C.D.M. would transfer to Marine Diamond Corporation its concession over the coastal strip in South-West Africa and pay R495,000 in exchange for 29 percent of Marine Diamond Corporation's issued share capital. In addition, De Beers made an interest-free loan of R615 million to Marine Diamond Corporation to finance the estimated capital expenditure required for the sea area and for the coastal strip, and Anglo American Corporation of South Africa agreed to become consulting engineers for the projects. By subsequent agreements De Beers, through C.D.M., acquired further direct and indirect interests in Marine Diamond Corporation, making that Corporation a subsidiary of C.D.M. This Company has now leased all the diamond-mining rights of Marine Diamond Corporation for the next three years.

Following the May agreement, the problem confronting the planners was to find the best means of recovering diamonds from the foreshore in payable quantities. There was no precedent for this operation either, and therefore a series of experiments was conducted by Anglo American Corporation's oceanographic research unit.

It was accepted, almost from the beginning, that the beach sands themselves would have to be used to hold back the sea, which at times has swells 30 feet high. At first, simple sand walls of varying thicknesses were built at various points between the high- and low-water marks and parallel with the breakers. The time taken to build them and the time they withstood the sea's onslaught were recorded.

During these trials the walls were gradually curved back towards the land, the corners being either sharply or shallowly angled. The effects of wave action (erosion, undercutting and scouring) were recorded day and night, as well as wave heights, wave lengths, ocean drift and wind speeds. In time it became apparent that the action of the sea was, to some extent, diminished by rounding the corners of the walls of a construction that, by this time, had developed into a small coffer dam, or paddock. It was also noted that the front wall of the paddock caused waves to rebound and this action, in turn, dampened the effect of other oncoming waves. This peculiarity led to further trials during which sand wings were built. These were angled out to sea from the paddock's front walls in an effort to encourage the dampening action of the waves.

Having established a fairly good shape for the paddocks—their life varying between a few hours and a few days, depending on their position and state of the sea – yet another series of experiments was conducted. This time canvas tarpaulins and sheets of vinyl were used to cover the outer walls, the edges being anchored and buried in the sand at the base of the walls, while the top edges were hung over the inside lips of the walls and weighted. Some of these paddocks lasted for many days, but their ultimate fate was always the same: the seas scoured away the sands covering the anchored edges or seeped underneath, causing the base to erode and a consequent sliding of sand within the walls, with the result that the tarpaulins were ripped and washed away. The breakers then started to demolish the walls.

The next experimental paddocks were built on similar lines and canvas and vinyl sheeting were again used, but, in addition, hundreds of tons of sand were dumped on the bottom half of the exposed face of the canvas. But no matter how quickly sand piled up, the rising tides swept it away and then proceeded to destroy the canvas and the wall behind it. Mining did take place in some of these experimental paddocks, but sometimes their size restricted the maneuverability of the heavy earthmoving machinery that had to be used.

Efforts were also made to create areas

of calm water by the construction of groynes extending well below the low-water mark. In one such construction, two rows of old telegraph poles were placed in fairly close proximity and the intervening space filled with boulders. In another experiment old iron bedsteads were used, also with boulders.

Even a small dredge was tried. Fitted with three suction pumps, the dredge was floated on small ponds of water to remove the sand overburden through a dredging head attached to the hoses of the pumps. But advancing tides continuously swept back more and more sand into the areas that had been partly cleared.

Seepage was another problem. Even if the sea was not reaching the wall, the excavations behind it filled with water once they were below sea level. Not only did this water hinder overburden removal, it also weakened the solid sand foundation of the wall, causing the sides to collapse. Numerous pumps were installed in the excavations to remove the water and, although they kept the working area fairly dry, they did not stop the walls from sliding. This time an invention known as a well point – suitably modified by the mine – came to the rescue. Consisting of a long perforated steel tube, the well point allows water to collect while the sand is excluded by means of a very fine screen. The tubes are connected to pumps that suck up the water and eject it into the sea. Whole series of these well points were sunk deep into the paddock side of the walls at close intervals and effectively overcame seepage.

All the experiments met with some measure of success, but when the costs of the individual operations were studied they proved to be uneconomic.

Today's method, which is really continuous beach mining, came about almost by accident. The sea had started scouring the toe (the point where the front wall curved back towards land) of a crescent-shaped paddock after ripping away its canvas covering. Earth-moving machinery was brought in to reinforce the weak spot. The battle was quite a long one, but suddenly it became evident that the wall was holding and, what was more, it was holding without any canvas protection. The men on site then realized that in reinforcing the toe they had gradually extended the front wall and that the side wall had tailed away far more gradually than hitherto. This set the pattern for the present operation.

Massive scrapers strip most of the sand overburden from the top half of the beach and use it to build up a continuous wall, normally sited about half way between the high- and low-water marks, with the end swinging in towards the land. At the beach level these walls are about 40 feet thick on the average; some have been almost 100 feet thick. If seepage is encountered, well points are sunk and attached to pumps. Any remaining overburden is cleared by front-end loaders and, if water is found above the bedrock, more dewatering pumps are started.

Bulldozers and front-end loaders are used to stockpile the diamond-bearing gravel exposed, while teams of African miners clean out the remaining gullies

(continued on page 323)

A Descriptive Catalog of the Drift Diamonds of the Great Lakes Region, North America

by

Christopher B. Gunn*

The occurrence of diamonds in the glacial drift of North America is a fascinating curiosity, and the possibility of tracing them to an original source or sources has long been a vexed question. There have been numerous attempts since the turn of the century to locate the source of the stones, and a number of papers speculating on their directions of travel and ultimate sources have appeared in print (Hobbs, 1899; Blatchley, 1902; Bell, 1906; Kunz, 1931; Smith, 1950; Schwarcz, 1965; Gunn, 1967).

A prerequisite to any mineralogical or provenance study must be the possession of a carefully compiled record of the reported discoveries, and provenance hypotheses should take account of each and every one of the occurrences, which are more numerous than is generally supposed. In this respect, the standard published works (e.g., Hobbs, 1899) are unsatisfactory, inasmuch as they have not included all the material that was available at the time of publication and, of course, they take no account of subsequent finds.

The present writer has been researching into the problem of provenance for several years. The catalog presented here is a by-product of this work and it is hoped that it will answer the need for a convenient reference work, which has hitherto been lacking.

The fact that many of the published reports are conflicting (or even contradictory) has been a serious difficulty in compiling this information. The problem was tackled by cross checking as far as possible and discarding the obvious errors. In spite of this, however, there

*Duncan R. Derry, Ltd., Consulting Geologists, Toronto, Ont.

remains a residue of doubtful cases. Although only the most reliable references are given, even these can be found to disagree in some instances, particularly over the weights of the stones. It also is possible that some factual mistakes have been included here through their constant repetition in the literature.

The references attached to each entry are not intended to be exhaustive but they are, in the writer's opinion, the ones that are the most informative and important because they contain original references, descriptions, or illustrations.

The catalog is arranged by state and by chronological order within the state. The numbers correspond to the locations on the accompanying map.

INDIANA

No. 1. 1863. One stone, 3 carats. Greenish. Flawless. Found by Peter Davis at Gose (Goss) Creek, Washington Township, Morgan County. Sold by a Peter Davis to a Mr. Maxwell of Martinsville, Indiana. This is the *Maxwell Diamond*. Mentioned by Cox (1878); Brown (1883); Blatchley (1902).

No. 2. 1878 (or before). One stone, 4 carats. Found in Brown County. Mentioned in Geol. Surv. of Indiana, 1878, p. 116; Blatchley (1902). Possibly the same stone as: one stone, 4 carats. Found in Brown County by gold panner, date unknown. Cut to a matched pair of brilliants of 0.87 carat each. Mentioned by Wade (1949).

No. 3. 1878. One stone, 3 carats. Found in drift or stream gravels while gold panning in Little Indian Creek Valley, near Morgantown, Morgan County. Owned by a Harry Craft in 1883, and was cut and set. Mentioned by Brown (1883); Blatchley (1902); Sinkankas (1959).

No. 4. 1883 (about). Two stones, weights unknown. Found by a George Tutterow in Lick Creek, Brown County, while gold panning. One stone was sold to a jeweler named Butler in Indianapolis for $15, and is said to have been resold for $75. Mentioned by Blatchley (1902).

No. 5. 1885 (or before). Several small stones. Found by a John Merriman, a gold panner, in Brown County. He sent them to New York about 1885, where they were certified and returned. He then gave them to a Harry Craft, an Indianapolis jeweler.They were too small to cut. Mentioned by Blatchley (1902).

No. 6. Several years before 1890. Two stones, each of two carats. Elongated hexoctahedra. Locality unknown. They were on display in 1890 in Indianapolis, at the store of a Fred N. Herron. Mentioned by Blatchley (1902).

No. 7. 1898. One stone, $1\frac{21}{32}$ carats. Silver cape (white, with yellow tinge). Oblong dodecahedron. Flawless stone. Found in stream gravels while gold panning by a W. W. Young, in Lick Creek, Brown County, $4\frac{1}{2}$ miles south of Morgantown. This is the *Young Diamond*. It was seen by W. S. Blatchley and is almost certainly the stone in the U. S. National Museum, Washington, D.C. (in 1935), which is cited by Eugene W. Blank (1935) as a 1.7-carat stone from Brown County. Mentioned by Blatchley (1902); Blank (1935).

No. 8. 1885 to 1902. One stone, 5/32 carat. Light brownish yellow. Hexoctahedron. Found by John Merriman in Lick Creek stream gravels, Brown County. In 1902, it was in the possession of a Mr. R. L. Royse. Mentioned by Blatchley (1902); Blank (1935).

No. 9. Also: one stone, 11/16 carat. Blue. Rhombic-dodecahedron. Found by John Merriman in Gold Creek, Morgan County, near the site of the *Stanley Diamond*. In 1902, it was in the possession of Mr. R. L. Royse. Mentioned by Blatchley (1902); Blank (1935).

No. 10. Also: One stone, 1/8 carat. Pink. Almond shaped. Hexoctahedron. Found by John Merriman while gold panning in Lick Creek stream gravels. Sold to a Charles Nordyke. Mentioned by Blatchley (1902); Blank (1935).

No. 11. Before 1902. One stone, 3/16 carat. Yellow. Hexoctahedron. Found by John Merriman while gold panning in stream gravels in Lick Creek, Brown County. In 1902, it was in the possession of Mr. R. L. Royse. Mentioned by Blatchley (1902); Blank (1935).

No. 12. 1900 (September). One stone, 4 7/8 carats. Yellowish-greenish white, with small black spot just off center. Rounded octahedron. Found by a Calvin Stanley while gold sluicing on a branch of Gold Creek, Morgan County, three miles west of Brooklyn and three miles northwest of Centerton. It was taken from stream gravels lying on shale at the base of a blue-shale cliff. This is known as the *Stanley Diamond*. Sold indirectly to a Charles E. Nordyke of Indianapolis. It was cut in Cincinnati into two stones of 1 1/8 carats and 1 1/6 carats in 1903. Mentioned by Blatchley (1902); Blank (1935); Sinkankas (1959).

No. 13. Before 1902. One stone, 3.06 (or 3.08) carats. Silver cape (slightly yellowish). Elongated, flattened, 12 x 6 mm., 24 principle curved facets and an ingrowth in one of the flattened sides. Showed considerable wear. Found by a Mr. Blevin in the headwaters of Salt Creek, northeast Brown County. It was sold for $50. Frank B. Wade had it cut to a shallow marquise brilliant of 1.33 carats. Mentioned by Blatchley (1902); Blank (1935) (with illustration); Wade (1949) (with illustration).

No. 14. 1903 (May). Two stones, less than 1/8 carat each. Pinkish. Found by Mr. R. L. Royse while gold sluicing on a Dr. Cook's farm near Brey, Morgan County. Mentioned by Blatchley (1902); Blank (1935).

No. 15. 1904. Two or three small stones found while gold panning in Morgan County. Mentioned by Sinkankas (1959).

No. 16. Before 1911. One stone, about 1.05 carats. Yellowish appearance; may have been superficial. Found by gold miner (Merriman?) in Brown County. Bought by W. S. Blatchley while he was State Geologist, presumably after 1902. Mentioned by Wade (1949).

No. 17. 1908. One stone, 1.0 carat. Found in Morgan County. Mentioned by Sinkankas (1959).

No. 18. 1911. One stone, 0.135 carat.

Found at the junction of Gold and Sycamore Creeks, Morgan County. Mentioned by Sinkankas (1959). Possibly the same stone as: one stone, undated, probably about 0.1 carat. Dodecahedron. Found in stream gravels of Gold Creek, Morgan County, while panning. Mentioned by Wade (1949).

No. 19. 1912. One stone, 2.28 carats. Colorless. Found near junction of Gold and Sycamore Creeks, Morgan County. Mentioned by Sinkankas (1959).

No. 20. 1913. Five stones, including: one, 0.20 carat, greenish; one, 0.73 carat, colorless; one, 0.69 carat, yellowish, twinned. Found in Gold and Highland Creeks, Morgan County. Mentioned by Sinkankas (1959).

No. 21. 1916. One stone, 1.48 carats. Yellowish. $\frac{3}{16}$x$\frac{1}{4}$x$\frac{3}{8}$ inch. Rounded dodecahedron. Panned from Lick Creek, Brown County. Mentioned by Sinkankas (1959).

No. 22. Undated. One stone, 3.64 carats. Yellowish with dark speck. Tiny cracks. Shows a little wear. Found northwest of Martinsville, in Morgan County. Mentioned by Blank (1935) (illustration); Wade (1949).

No. 23. Also: one stone, 2.5 carats when cut. Fine white. Mentioned by Wade (1949).

No. 24. 1949. One stone, 3.93 carats. White. 14 x 9 x 3.2 mm. Triangular macle. Pits on surface. Found in field by farmer near Peru, Miami County. Described by Wade (1949) (illustrations).

No. 25. Undated (before 1935). Three stones: 0.125 carat, fine white; 0.625 carat, fine white; 0.75 carat. Found by a Dr. Kelso, of Mooresville, in Gold Creek, Morgan County. Mentioned by Blank (1935); Wade (1949).

No. 26. Undated (before 1935). One stone, sand-grain size. Dodecahedron. Found by Frank B. Wade in tributary of Gold Creek, Morgan County. Mentioned by Blank (1935); Wade (1949).

WISCONSIN

No. 27. 1876. One stone, 15.37 carats. Cape color (faintly yellow). Rhombic-dodecahedral and other faces. Rounded edges. Triangular elevations and circular markings. Found at Eagle, Waukesha County. It came from hard, ferruginous gravel and clay at a depth of about 65 feet while drilling a well in kettle moraine. It was noticed at the site by a Charles Wood, who gave it to his wife. She sold it to a Colonel Boynton in 1883 for $1, believing it to be a topaz. A court case ensued when it was found to be a diamond. It was sold to Tiffany's for $850 and later to J. Pierpoint Morgan, who subsequently presented it to The American Museum of Natural History. Most useful reference: Hobbs (1899); description and photographs by Vierthaler (1961a, 1961b).

No. 28. About 1880 or 1881. One stone, $6\frac{13}{32}$ carats (also reported as 6.57 and 6.375 carats). White with two yellow stains. Flattened, distorted trisoctahedron. Uneven with octahedral impression. Unfrosted surface. Found by a Condrad Schaefer on his farm while searching for arrowheads, on the surface of kettle moraine, Saukville, Ozaukee Co. For descriptions and other references see Hobbs (1899) and Vierthaler (1961a, 1961b) (with photographs).

No. 29. 1880. Several small stones; the largest was 3/4 carat. Found on the banks of Plum Creek, Pierce County. Mentioned by Vierthaler (1961a). (This reference might intend to refer to some of the stones found later on Plum Creek.)

No. 30. 1886. One stone, 21.25 carats. Separation plane through stone separated an almost colorless half from a yellowish half. 3/4 x 1/2 x 3/8 inch; little trace of crystal faces. Found by a Louis Endlick, who lived at Kohlsville, on his farm near Theresa, on the Green Lake Moraine. This stone, known as the *Theresa* or the *Kohlsville Diamond,* was found in hard ferruginous well diggings. The stone stayed in the family and in 1918 it was sent to New York where it was cut into 10 stones, totalling 9.27 carats, the largest of which weighed 1.48 carats. The great loss in weight was due to the fact that it was a poorly colored elongated rhombic-dodecahedreon, with all the faces pitted. See Hobbs (1899); Vierthaler (1961a, 1961b).

No. 31. 1887. One stone, 25/32 carat. White with slight gray-green tinge. Hexoctahedron, rounded faces, L-shaped depression on side, sand-grain inclusions. Found by a C. H. Nichols of Minneapolis while sluicing for gold in stream gravel in Plum Creek, Rock Elm Township, Pierce County. It was sold to Tiffany and Co., N.Y.C. See Hobbs (1899); Sinkankas (1959).

No. 32. 1888. One stone, 7/12 carat. Cape color (pale yellow). Elongated hexoctahedron; many small surface markings. Found by a W. W. Newell and a C. A. Hawn of Rock Elm while sluicing stream gravels in Plum Creek, Rock Elm Township, Pierce County. It was sold to Tiffany and Co., N.Y.C. See Hobbs (1899); Sinkankas (1959).

No. 33. 1889. One stone, 3/32 carat. White, tinged with yellow. Elliptical hexoctahedral twin; dull surface. Found by Newell and Hawn in same circumstances as above. Sold to Tiffany and Co., N.Y.C. See Hobbs (1899); Sinkankas (1959).

No. 34. 1887 to 1889. At least eight other stones, ranging from 16/32 to 2 carats. Some colorless, some blue, and some yellow. Found by a Nichols, Newell and Hown while sluicing for gold in Plum Creek, Rock Elm Township, Pierce County. See Hobbs (1899); Sinkankas (1959).

No. 35. 1893 (or before). One stone, 2 1/6 carats. Greenish white or greenish gray; possibly coated. Elongated, flattened tetrahedral twin. Found by a Mrs. G. Pufahl (?) of Burlington, Racine County, by chance on the surface of a kettle moraine. Mrs. Pufahl sold it to Bunde and Upmeyer, Milwaukee jewelers, in 1893. See Hobbs (1899); Vierthaler (1961a, 1961b) (with illustration).

No. 36. 1893 (October). One stone, 3 14/16 (3.87) carats. White, slightly gray-green coating. Distorted rhombic-dodecahedron, with pits, circular and reniform markings. Found by the five-year-old son of a Charles Devine by chance among pebbles of quartz in a clay kettle morain, at a place on the farm of a Judson Devine, 12 miles south of Madison, near Oregon, and 2½ miles southwest of Cane County. It was sold to Tiffany and Co., N.Y.C., for $50 and later obtained by G. F. Kunz, who added it to the collection of the American Museum of Natural History. It was this stone that led a W. H. Hobbs into a 7-year enquiry into the drift diamonds. See Hobbs (1899); Sinkankas (1959); Vierthaler (1961a, 1961b) (with illustrations).

MICHIGAN

No. 37. 1894. One stone, 10⅞ carats. 13 x 9 x 11 mm. (½ x ⅜ x 7/16 inch). Hexoctahedron. Found by a Frank B. Richmond (or Blackmond?) on the surface of gravelly kettle moraine near Dowagiac, Cass County. See Kunz (1894); described in 16th. Ann. Rept. U.S. Geol. Survey, Pt. IV, p. 596, 1895. Mentioned by Blank (1935); Sinkankas (1959); Vierthaler (1961a, 1961b).

No. 38. Undated. Reports of many diamonds gathered from a place in gravels south of Grand Rapids. Oral reports from several sources, but no reliable evidence obtained.

No. 39. 1954 (about). One stone, about ½ carat. Yellowish. Rough and dull surface; equant. Found by Dr. S. G. Bergquist of Michigan State University, by chance in sands and gravels of the Mason esker at Mason, south of Lansing. Oral communication, R. B. Brigham.

ILLINOIS

No. 40. 1911 (or before). One stone, 7.0 to 7.75 carats. Found in gravelly soil in Illinoisan drift, or outwash, in Jefferson County, 3½ miles east of Ashley, Washington County. Reported by Sterrett (1911). Mentioned by Sinkankas (1959) (who doubts the truth of the report).

No. 41. 1911 (or before). Twenty-two stones, no other details. Described as being found "near Macombe," McDonough County; therefore, probably taken from Illinoisan drift, or washout. They were sent to jewelers in St. Louis. Reported by Sterrett (1911). Also doubted by Sinkankas (1959).

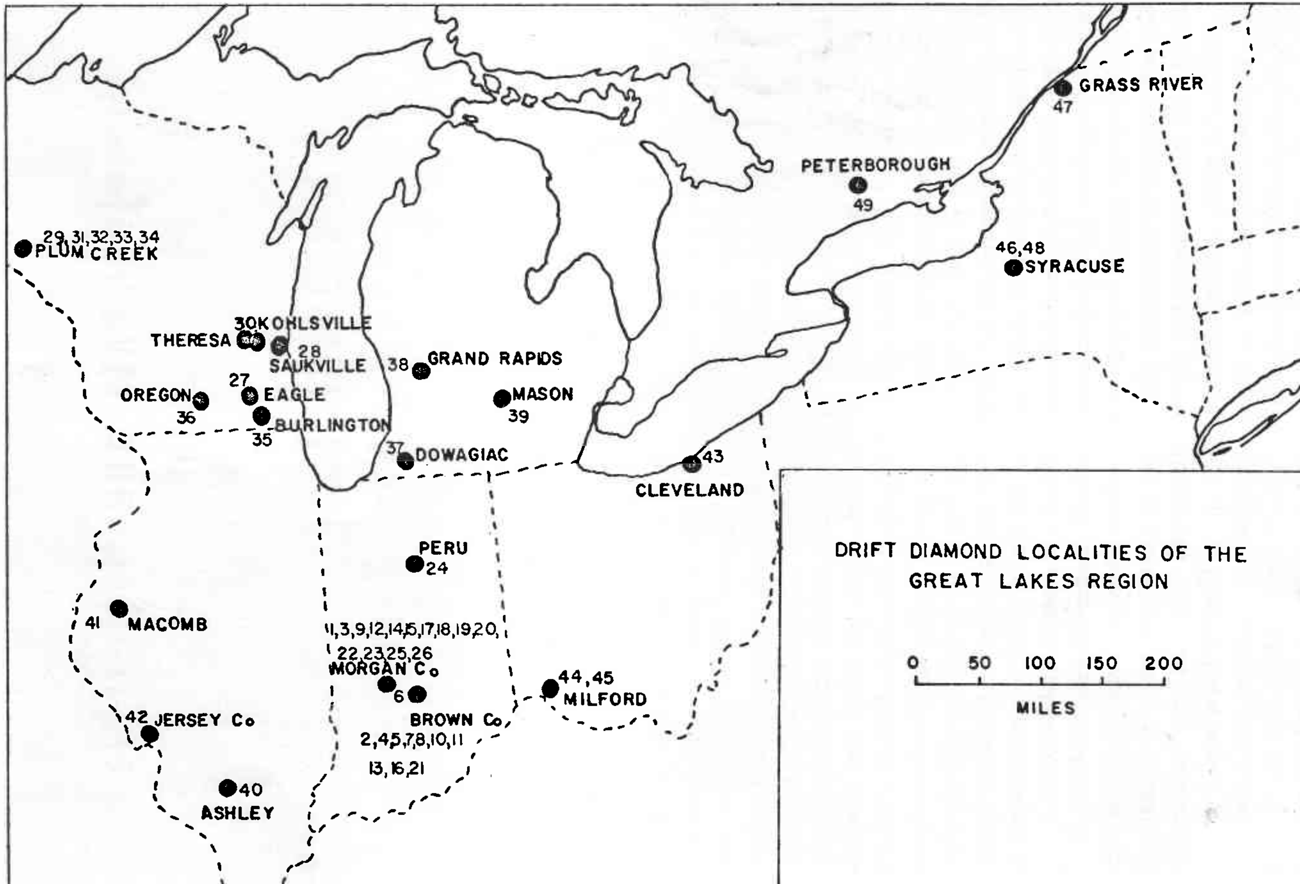
No. 42. 1958. Several stones, too small to cut. Found at a depth of 155 feet by the Jersey Quarry Co., which operates in Jersey County. The matrix and circumstances of discovery not revealed. Reported by Hartwell and Brett (1958).

OHIO

No. 43. 1870 (about). One stone, fine quality. Found a few miles south of Cleveland, in a creek bed. It was cut and sold for $40,000 in Boston. Mentioned by Blatchley (1902).

No. 44. 1880 (or before). One stone, over .80 carat. Fine quality. Reportedly found by a laborer in Cincinnati while working a boulder-crushing machine. It was thought that it might be the stone lost by a Mrs. Clark in 1806 at Blennerhasset Island. A rather dubious report. Mentioned by Kunz (1890).

(Continued in Fall Issue)



DRIFT DIAMOND LOCALITIES OF THE GREAT LAKES REGION

Developments and Highlights at the

Gem Trade Lab in New York

by
Robert Crowningshield

Radium-Treated Diamond

A very large green diamond was submitted recently for determination of color origin. The Laboratories cannot always determine color origin of green diamonds, since they may or may not show distinctive absorption spectra. Therefore, unless a green diamond exhibits green to brown spots on naturals, it is assumed that it must be treated. This particular diamond did not show colored naturals, nor did we at first see evidence of the blotchy surface associated with radium-treated diamonds. Nevertheless, we placed it on a film over a weekend with the amazing result seen in *Figure 1*. We decided to expose a plate for a much shorter period of time. *Figure 2* is the result of 18 hours exposure, whereas *Figures 3* and *4* are the crown and pavilion exposed to separate plates for three hours. *Figure 5* is the result of a one-hour exposure. Some darkening of the film, not reproduceable for printing, was secured in 15 minutes! When the stone was checked with a portable radiation survey meter (Geiger counter), the reading was almost the limit of our unit: 40 milliroentgens per hour. For comparison, a yellow-orange cabochon of carnotite gave a reading of 30 milliroentgens per hour. With very careful examination and lighting, we finally were able to see the blotchy surface we expect to see on a radium-treated diamond.

Elongated Gas Bubble

Figure 6 is an "exploding" gas bubble in a synthetic ruby, looking for all the world like a futuristic space craft.

Double Girdling

Figure 7 illustrates one attempt to "erase" the beards in the girdle of a round, otherwise flawless diamond. This double girdling did not remove the bearding, and the girdle was subse-

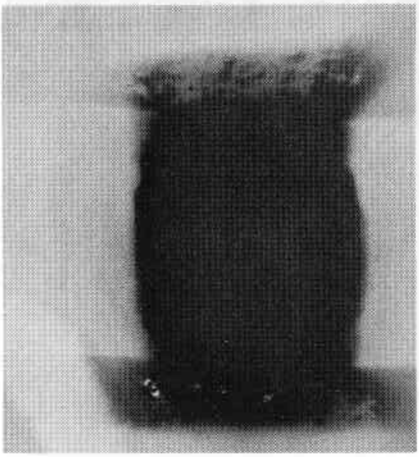


Figure 1

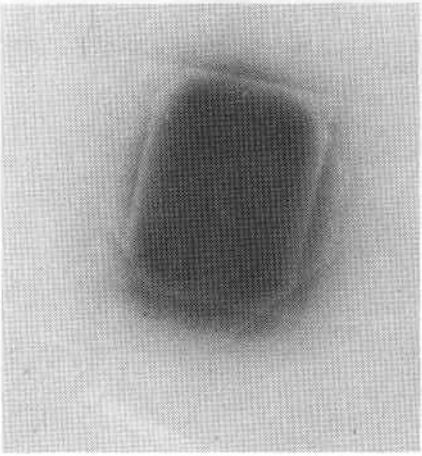


Figure 2

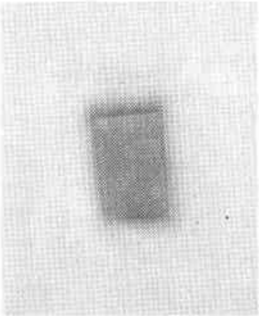


Figure 3

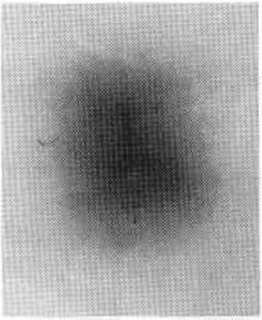


Figure 4

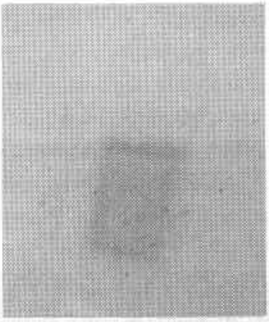


Figure 5

quently faceted in order to earn a flawless certificate.

Unusual Doublet

Figure 8 illustrates a rather effective doublet of synthetic spinel and medium-blue color cemented to a flat base of natural star sapphire. The lens effect of the synthetic spinel picks up the star and makes a reasonably convincing stone.

Coated Beryl

Figure 9 is a photograph of what was assumed to be natural beryl of unknown color with a green plastic coating. The stones appeared red in the color filter and were set in expensive drop earrings. No chromium could be detected in the spectroscope; therefore, if the plastic were removed, it was predicted the stones would be virtually worthless beryl.

Emerald Inclusion

That one can distinguish Russian emeralds by the presence of rhomb-shaped crystals in the three-phase inclusions, as contrasted with the square-

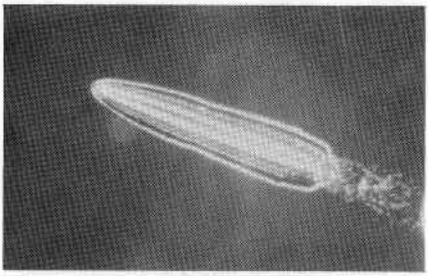


Figure 6

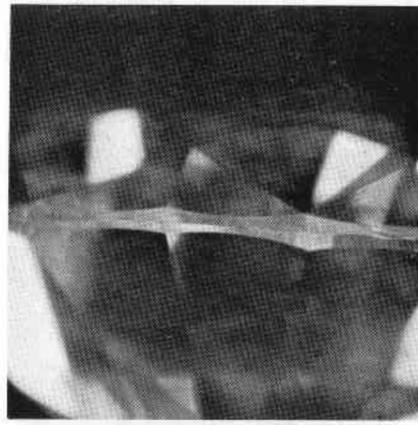


Figure 7

shaped crystals in Colombian is a myth in our opinion. The three senior gemologists in the New York Laboratory, having a combined experience of more than 50 years of looking at stones in the microscope, have yet to see such an inclusion! As a matter of fact, we have never knowingly examined a Russian emerald, though, of course, many must have passed through the Lab. One emerald recently examined and sworn to be of Russian origin contained the usual three-phase inclusion with a square crystal, but, in addition, it had a most unusual row of inclusions (or structural faults) that resembled barbed wire *(Figures 10 and 11)*. Incidentally, we are awaiting the opportunity to examine a known Russian diamond, although, again, we may well have done so already.

Uranium Glass

Following our experience with the

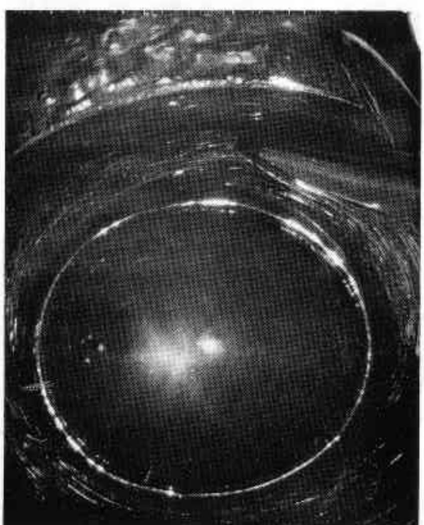


Figure 8

Figure 9

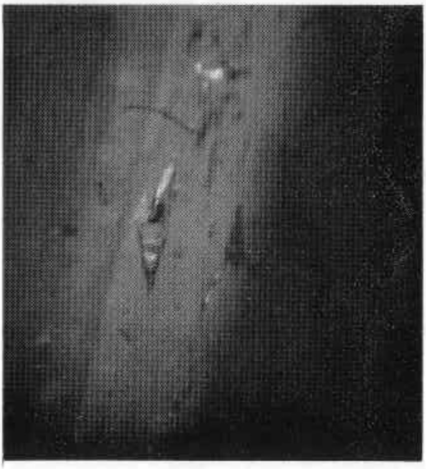


Figure 10

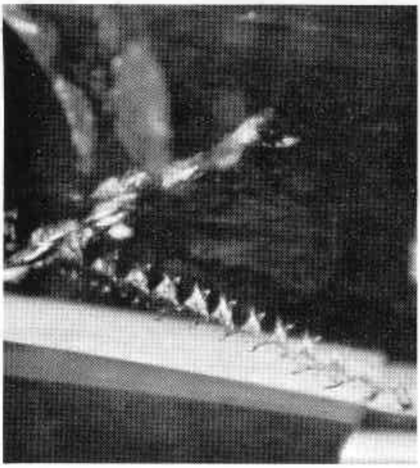


Figure 11

radium-treated diamond, we checked a piece of uranium glass with the radiation counter. It gave a reading of approximately .2 milliroentgen per hour, which is just above the background radiation in the normal environment. However, placed on a film for several weeks we did obtain some darkening by a fragment *(Figure 12)*, indicating some, but not dangerous, radiation.

Unusual Absorption Spectrum

Figure 13 illustrates an unusual absorption spectrum of a strongly yellow-fluorescing brown diamond. To see the 4155 AU line in a brown diamond is very rare, though we know the stone is of natural color.

Rare Doublets

By coincidence, we had the occasion to identify, and in certain cases add to our collection, examples of assembled stones heretofore never encountered. The following are in addition to the unusual synthetic spinel and natural-sapphire doublet mentioned above.

Figure 14 shows a rock-crystal-and-green-glass doublet. The joining plane is well below the girdle, as can be seen in the picture. We were unable to determine if a cementing agent had been used or if the two parts were fused. A clue might be the crazed condition of the surface of the glass *(Figure 14A)*.

Another unusual emerald imitation *(Figure 15)* was made of two sections of synthetic colorless spinel with a thick sandwich filling of green glass. Heretofore, we have encountered this type of assembled stone only resembling peridot in color.

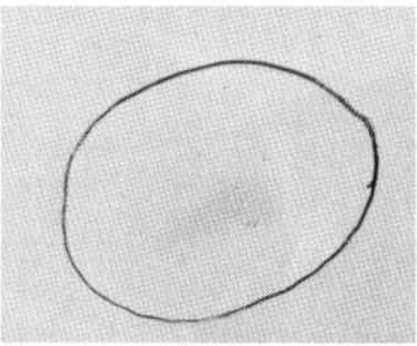


Figure 12

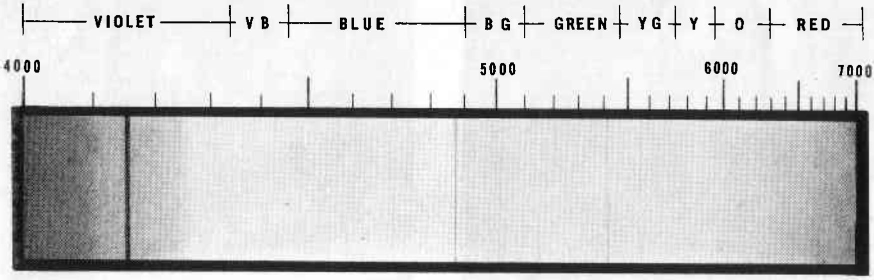


Figure 13

Another emerald imitation that we discovered in a package of gift stones was made up of a flawed aquarmarine top and green-glass base. The crown view *(Figure 16)* illustrates the nature of the aquamarine, and *Figure 17* shows the two parts clearly.

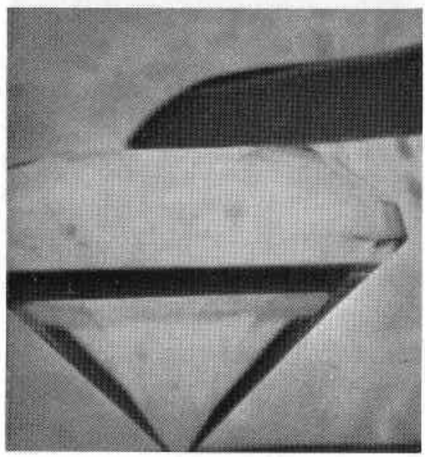


Figure 15

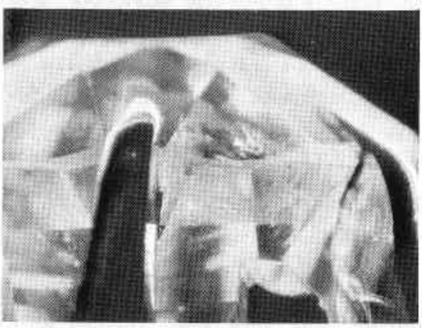


Figure 14

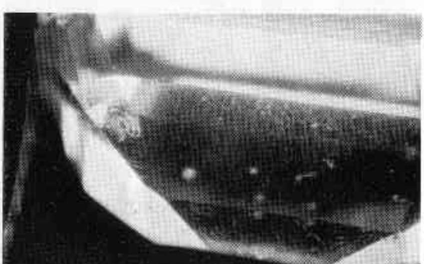


Figure 14A

Figure 16

Synthetic-Emerald Inclusion

Figure 18 shows an unusual, undulating, wisplike inclusion in an otherwise very clear Chatham synthetic emerald.

Odd Faceting

Figure 19 shows unusual faceting on the pavilion of a marquise brilliant. The stone lacked a culet and had only four pavilion facets.

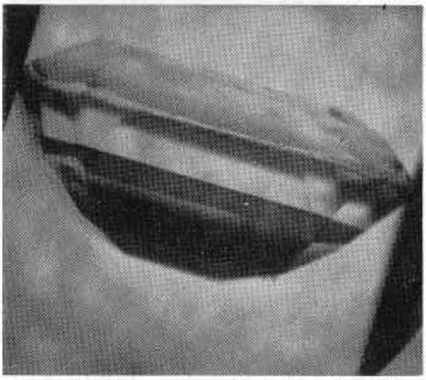


Figure 17

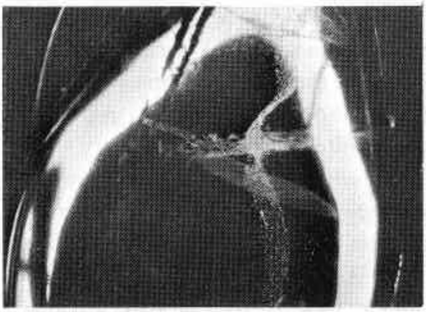


Figure 18

Acknowledgements

We are indebted to student **Walter Bauscher** of Haddon Heights, N. J., for several specimens for our collection.

A large cabochon of the North Carolina emerald in matrix is especially welcome for our cabinet.

A most unusual specimen of what has been called belemnite is thought to be a fossilized horny process of an extinct cuttlefish. The refractive index, specific gravity and birefringence suggest calcite, and the cut stone shown in *Figure 20* shows a strong orange fluorescence under long U.V.

Another specimen from Mr. Bauscher is welcome: a bright, light-green williamsite (translucent serpentine) with a few black spots, reminding the writer of a round-bead williamsite necklace worn by a former member of the staff of the U. S. Geological Survey. She had collected the material herself over many years and had the beads carved in Germany. The completed necklace approached the beauty of many jadeite necklaces we have seen.

A final welcome specimen from Mr. Bauscher was a flat disc of the more usual dark-green williamsite.

Through the good offices of **Mr. Ed Coyne** and **Mr. Lucien Gruensweig** of Created Gemstones, Inc., we received several faceted Chatham synthetic emeralds and a crystal group of flux-grown synthetic rubies – the form in which we understand they are to be marketed. These specimens will be of great value for student study.

From student **Joel Hurley,** A. W. Creations, NYC, we received a much appreciated gift of black star diopsides.

From student **Murray Darvick** we received a nice cabochon of Finnish labradorite, sometimes called spectrolite.

During an enjoyable visit with **Mr. and Mrs. George Bruce,** International Import Co., Stone Mountain, Ga., the writer saw a large lot of this material

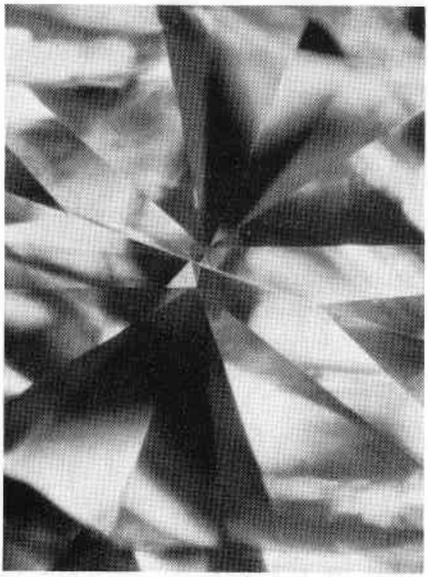


Figure 19

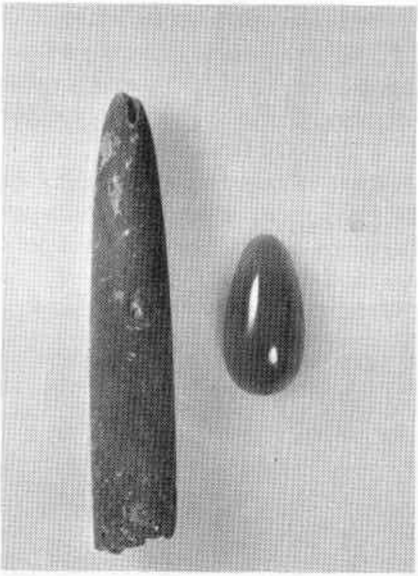


Figure 20

and received a gift of several that exhibit unusual colors at the apex of the cabochon.

From **Maurine Price Harvey,** now an Illinois resident and formerly of New Jersey, we received a valued copy of the monumental work *Engraved Gems,* by Maxwell Sommerville. The book was a part of the extensive library of her late husband, GIA student Edwin A. Harvey. It will make a handsome addition to our library.

From precious-stone dealer and neighbor **Jean Naftule** we received a fine cut specimen of the Tanzania chrome (vanadium?) tourmaline. The stone had the normal constants for tourmaline, though it did appear red under a color filter.

We are very happy with a diamond-point stippler for use with the automatic hammer and Flexshaft. It is the gift of GIA student **William Wood,** of Quincy, Florida, who recently attended the Diamond-Setting Class in Atlanta.

Developments and Highlights at the Gem Trade Lab in Los Angeles

by

Richard T. Liddicoat, Jr.

Unusual Ruby Characteristics

One particularly interesting identification made recently involved a ruby. It was semitransparent to short-wave ultraviolet; fluoresced strongly under both long- and short-wave UV; and under low magnification inclusions were seen that strongly resembled the minute gas bubbles one would expect in a synthetic. However, under high magnification, other inclusions were present that were angular and of low relief. There were no characteristics of a flux-fusion synthetic. There was no phosphorescence to X-rays, even after prolonged adjustment to dark-room conditions. Under immersion it was possible to detect an angular color zoning, which is apparent in the upper left-hand corner of *Figure 1,* taken when the stone was immersed in methylene iodide; this furnished proof of natural origin.

Different Sapphire Identification

On at least two occasions we have encountered synthetic yellow sapphires that showed rather odd whitish inclusions, such as those indicated in *Figures 2* and *3.* As is frequently the case with such stones, no bubbles were evident and, of course, no curved straie would be expected. The stones were pale in color, but the absence of lines in the blue near 4500 AU, 4600 AU or 4700 AU and a total absence of the kind of fluorescence expected in a Ceylon yellow sapphire (of an apricot color under long-wave ultraviolet), would lead one to expect these to be synthetic yellow sapphires. Their identity was confirmed by the Plato method.

New Peridot Occurrence

A pair of photographs, together with some description of the occurrence, was submitted by graduate John Furbach of Amarillo, Texas, and student Colin

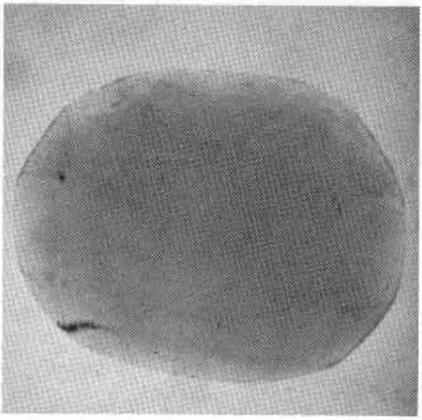


Figure 1

Figure 2

Figure 3

Curtis of Lookout Mountain, Tennessee, of a find of peridot in North Carolina. This is the easternmost occurrence of peridot we have had reported. These gentlemen submitted several small samples of the material. They described it as having inclusions quite similar to those of Arizona material, but with some distinctive inclusions as well (especially "negative cavities" with rounded edges, indicative of resorbed crystals). *Figure 4* shows a view of one of the stones under low magnification and *Figure 5,* a section under high magnification. These were found at Corundum Hill, North Carolina.

Opal With Two R.I.'s

We were quite interested to receive a glass imitation of opal that showed simultaneous readings of 1.62 and 1.64 when placed on its flat back on the refractometer. One end of it is shown in *Figure 6.*

Layered Opal

Figure 7 shows a stone that was sent in because the person submitting it believed it was a doublet. The photograph shows clearly why he was suspicious of the stone, but actually it was just a layered opal, and not a doublet.

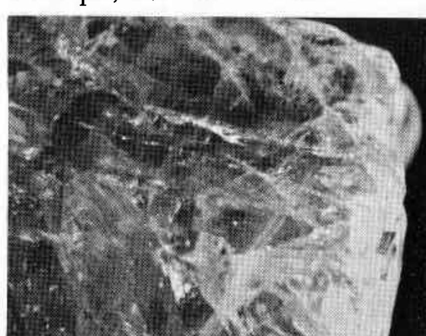


Figure 4

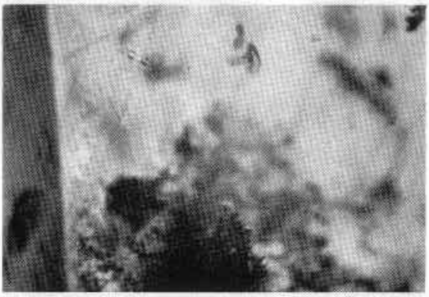


Figure 5

Zincite?

Occasionally, we receive materials for identification that are not really in the gem field, and on which we feel that we are not qualified to render a decision. One particularly interesting specimen submitted not long ago was translucent milky white in color, quite soft and rather intricately carved. When touched by a hot point, we noticed an odor akin to that of camphor. Putting it over a bright light source—in effect candling it—we saw an irregular layered pattern we would not expect in an artificial organic material. Purely out of curiosity, we scraped a bit off one edge and Chuck Fryer ran an X-ray diffraction analysis of it. Since it was obviously an organic material, we thought the chances of getting a good pattern were rather slim, but we obtained an excellent pattern that conformed exactly to that of zinc oxide. Line for line and intensity for intensity, it was a duplication of zincite, which is a zinc-oxide mineral. However, the physical properties of zincite are in no way similiar to this material. We hope that some reader might be familiar with the material and be able to enlighten us on what we have encountered in this odd case.

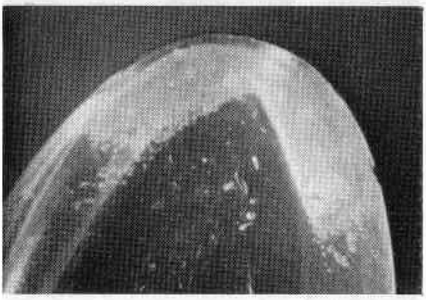


Figure 6

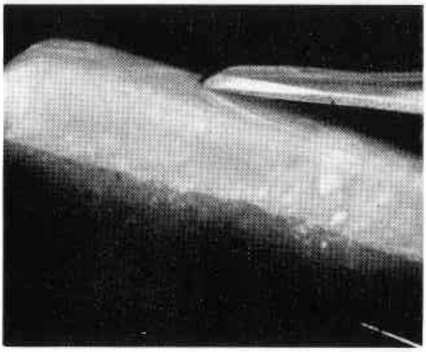


Figure 7

Chatoyant Quartz

Anyone in a testing laboratory has often received telephone calls or letters describing fantastic materials with unbelievable properties that, when examined later, proved to be just some ordinary material with a very imaginative observer. Not long ago we received such a letter describing a quartz specimen with a multiplicity of stars. We gave this the same kind of reception we usually accord such letters, but we asked that it be sent to us for verification. We received the rather remarkable specimen, pictured in *Figure 8.* A definite six-rayed star can be seen just to the right of center, but another line crosses away from the center of the star to the lower left. There were such extraneous

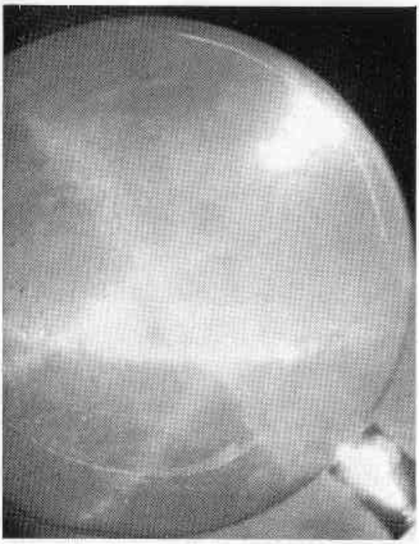


Figure 8

Figure 9

rays to be found all over the sphere that was submitted. Under magnification, one could see the usual hexagonal pattern, but there were additional needlelike crystals in other orientations within the stone—a rather remarkable specimen. Our correspondent tells us that this appearance is typical of the product of his new find.

Cuprite

Figure 9 is a photograph of a stone we identified recently—cuprite. It is rarely transparent enough to facet a stone. When transparent enough to see into, cuprite is usually filled with a multitude of tiny inclusions. This is shown in the illustration.

Natural Glass vs. Tektite

One of the more difficult identifications we are called upon to make occasionally is to distinguish between natural glass and tektite. If the stone is completely cut, it is an exceedingly difficult identification, in our opinion, because, after all, a tektite is a glass. However, if a tektite is received in an only partially polished state, it is possible to recognize the expected surface characteristics. If the internal characteristics are also typically those of a tektite and the properties are within the expected range, an identification can be made. *Figure 10* shows a typical wrinkled surface texture of a tektite and *Figure 11,* the large bubbles and the swirl marks that typify this stone.

Figure 10

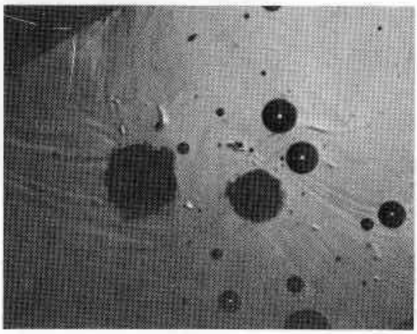


Figure 11

Aventurine-Quartz Inclusion

Figure 12 shows an inclusion within an inclusion in aventurine quartz. The large fuchsite-mica inclusion that shows dark in the left center of the illustration has a black inclusion within it—a rather rarely encountered condition.

Irradiated Spodumene and Morganite

Not long ago we received a 69-carat bright-green spodumene that the purchaser was sure was the largest and finest specimen of this mineral. He was sure it was the variety hiddenite. After examination, we were convinced that it had been submitted to intensive irradiation by X-rays, and that the color would last only a short time. We gave him an identification to that effect. Only two days later we received as a gift from Dee Parsons, lapidary of Burbank, California, an identically colored stone of several carats that had been irradiated by a radioactive isotope of one of the important metals. We put this stone under the bright lights of our display case, and in less than two weeks it was an attractive kunzite. We then put a kunzite in front of the collimated beam in our X-ray diffraction unit; in eight hours, we had a beautiful green spot in the stone. Under ordinary lights the green color faded away in about a week. At the same time that we received the several-carat spodumene, we received a deep grayish-blue beryl that we learned had been a morganite that had been subjected to the same irradiation by the same isotope. The spectrum for the treated morganite is shown in *Figure 13.*

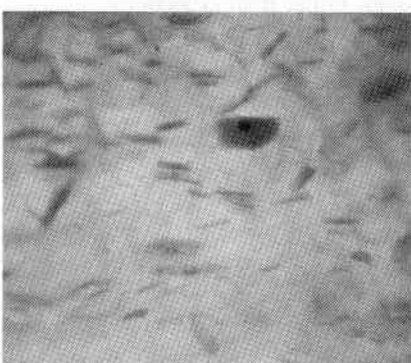


Figure 12

Damaged Star Sapphire

We received a star sapphire for a damage report. The jewelry shop that submitted it was of the opinion that the stone was not actually cracked, but that a large fingerprint inclusion was responsible for the rather obvious line that was visible at the surface. After lighting the stone carefully, we took the photograph shown in *Figure 14.* The photograph shows that in reality the so-called fingerprint inclusion was a film of cement. Light reflection from the surface of the break shows a contrast between the two sides too great for anything but a complete separation of the two pieces. This was borne out by a photograph, taken at high magnification, of the line of demarcation where it reached the surface. The photograph shows clearly where the cement was discovered when the pieces were pushed together *(Figures 14A* and *B).*

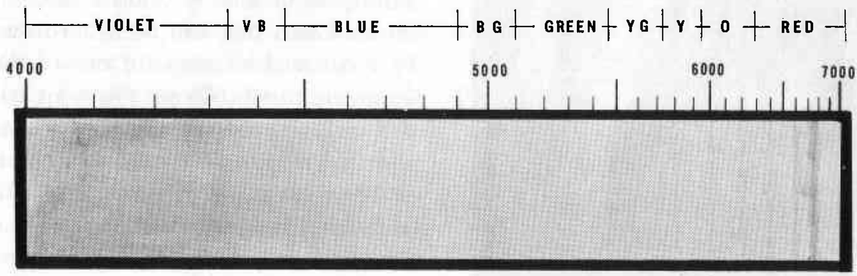


Figure 13

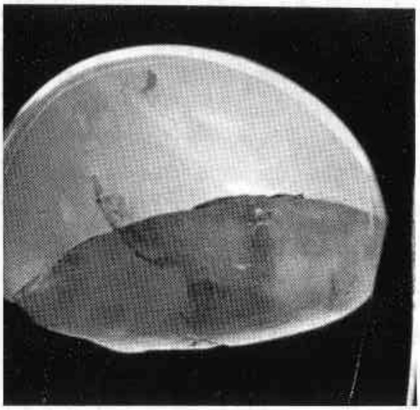


Figure 14A

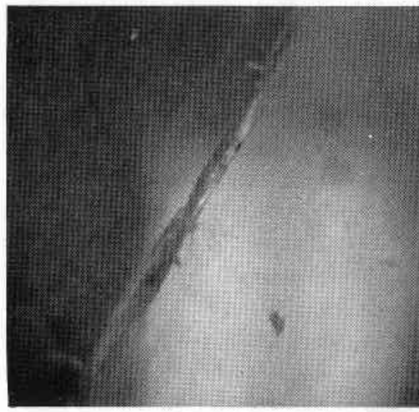


Figure 14B

Trapiche Emeralds

We received from Hugh Leiper, editor of the popular *Lapidary Journal,* some excellent photographs of Trapiche emerald crystals. These are shown in *Figures 15* through *17*. Trapiche emeralds, when first reported in this country, were usually in rather small sizes, but recently somewhat larger ones have been coming in in the form of cut stones. These may reach sizes of several carats each. They are usually very attractively colored but translucent, rather than transparent, so they have a rather sleepy appearance. On a number of occasions they have been confused with green chalcedony, but actually they are richly colored by chromium oxide. To our eyes, they are considerably more attractive than the usual green chalcedony. They usually come in the form of faceted stones, rather than cabochons.

Banded Serpentine

We seem to have been encountering more and more carvings of serpentine in recent months. *Figure 18* shows a serpentine statuette that was unusual in that it was very strongly banded, as can be seen in the photograph. Even though the properties corresponded nicely with those of serpentine, we felt it necessary to scratch a bit of powder from the base of the stone to confirm the identification by X-ray diffraction.

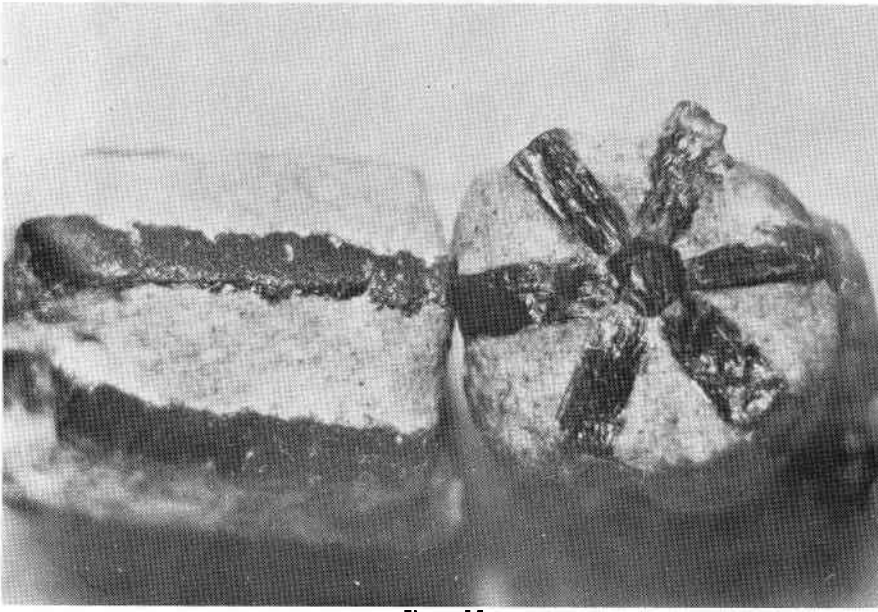


Figure 15

Figure 16

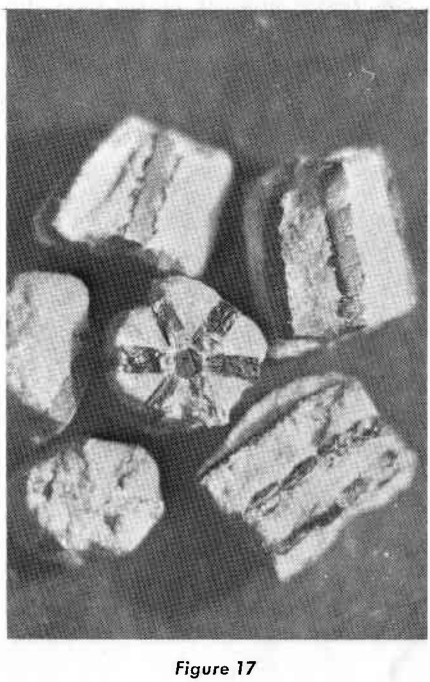


Figure 17

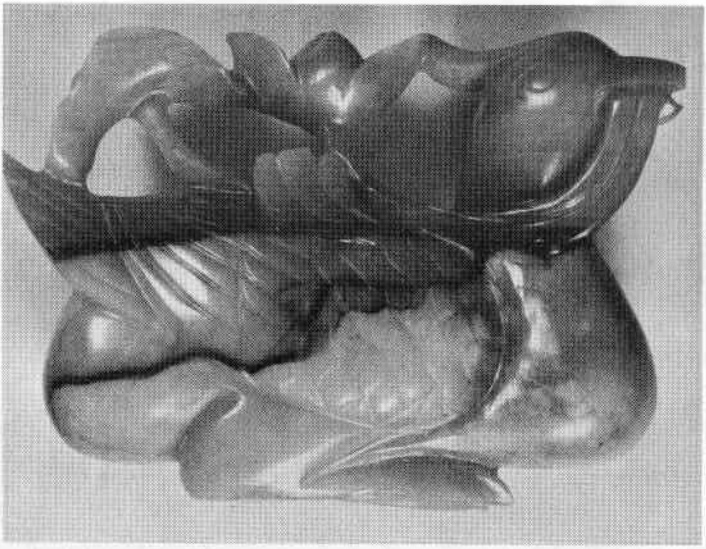


Figure 18

Double-Culet Diamond

A rather unusual pear-shaped diamond had a double culet *(Figure 19)*. A faint white line representing the facet junction between the two sides of the culet is visible from the bottom side.

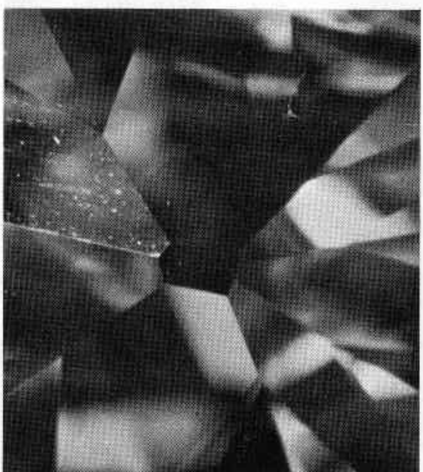


Figure 19

Amber Fraud?

Recently, we were called upon to identify a very large amber piece with a huge spider imbedded in it *(Figure 20)*. The piece was approximately three inches long by an inch and a half wide. The top was very obviously amber but the back was unpolished, making it impossible to get an R.I. The top portion was rather heavily crazed, but it was possible to see into the piece rather easily and clearly. There was no evidence of struggle, as might be expected from a spider or an insect trapped in an exudation from a pine tree. All around the edge of the back of the specimen was a slight rim that suggested that an amber material or a copal in a softened state had been poured in to hold the spider in position after it had been placed in the hollowed-out shell of the upper piece of amber. However, checking on the authenticity of amber pieces

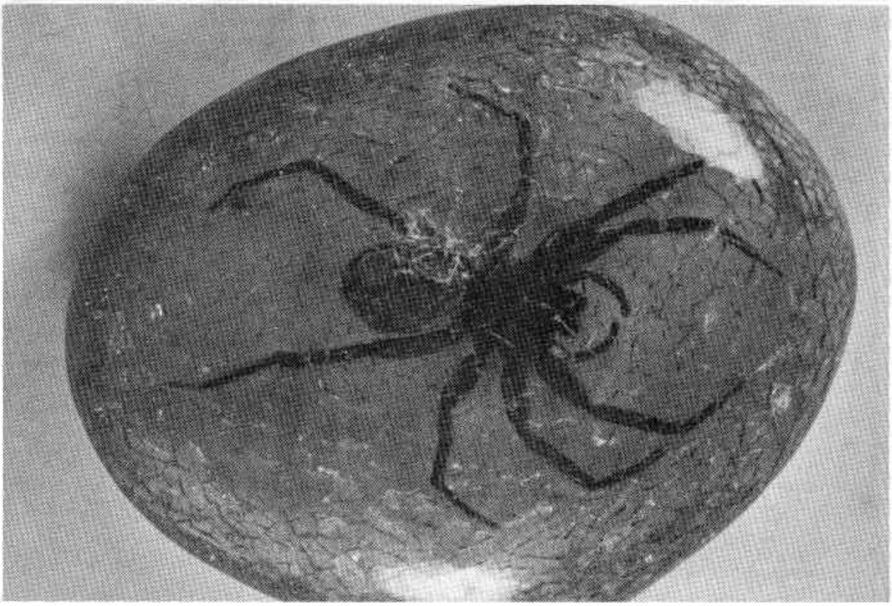


Figure 20

of this type is slightly out of our field, so we did not feel qualified to judge whether this was actually a piece of fakery. We felt that it was.

Unusual Diamond Spectrum

In a treated greenish-yellow diamond we encountered an unusual spectrum *(Figure 21)* similar to one described by Robert Crowningshield in *Gems & Gemology* some time ago. There were the typical strong 4980 AU and 5040 AU lines, plus a 5920 AU line, as would be expected in a treated yellow stone, but there were faint echo lines slightly above the 5040 line at approximately 5070 AU, 5130 AU and 5180 AU.

Incomplete Diamond Brilliant

At the top of *Figure 22* is a star facet

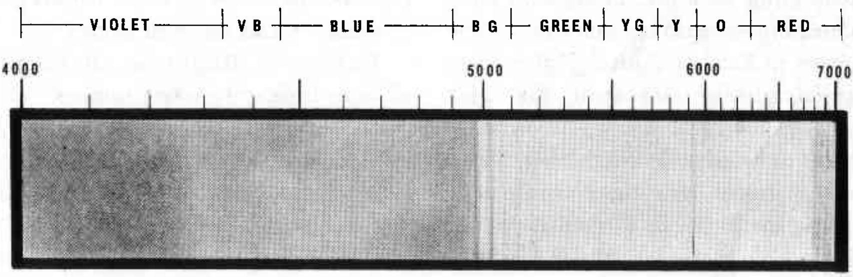


Figure 21

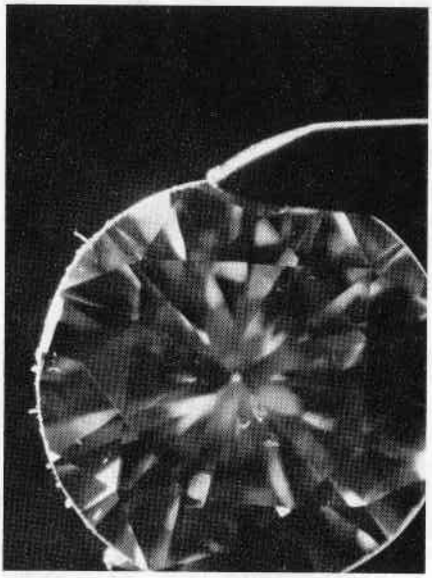


Figure 22

pointing to just to the right of 12 o'clock. From this a facet junction runs to the girdle. The two upper-girdle facets on each side of this facet edge were not completed; therefore, the bezel facets are open to the girdle on both sides of the star. Unfinished brilliants of this description are unusual.

Zambia Emeralds

Campbell Bridges, a South African prospecting geologist, brought us some interesting emerald crystals from a new deposit in Zambia. Although they were not completely transparent, the color was very good and they would certainly appear to be saleable in cabochon form. Bridges hopes that more transparent material will be forthcoming as the prospecting continues. The R.I. of the stones tested was 1.582-1.591; thus, the birefringence, at .009, was rather high for emerald. He also had some very attractive iolites with the usual properties for this gem material. They were also from East Africa.

Acknowledgements

We wish to express our sincere appreciation for the following gifts:

To **Jack Haney,** Registered Jeweler, of Haney Jewelry Co., Calhoun, Georgia, for two garnet-and-glass doublets.

To Graduate Gemologist **Jo Morrison** of the Candlestick Shop, Hollywood, California, for an ivory bracelet.

To **George Blanchard** of Burbank, California, for two green-jasper cabochons.

To **John Westphal,** C.G. of Volkmann Jewelers, Kankakee, Illinois, for assorted stones for practice sets.

To **Loyd Stanley,** of North Little Rock, Arkansas, who donated a selection of synthetic and glass faceted stones.

To **Wm. F. Kraemer** of San Marino, California, for a large selection of stones including zircons, imitations, aquamarines and chalcedony.

To **Arthur Schwemmer** for seven diamonds to be used in practice sets.

To Graduate Gemologist **John Haynes,** Haynes Bros., Jewelers & Optometrist, Newark, Ohio, for his gift of doublets and assorted stones.

To **Elvin M. Bright,** Sr., for his gift of three Incolay (plastic) cameos.

To **Ben Gordon,** of Gordon's Jewelers, Houston, Texas, for an assortment of stones to be used for the Gem Identification Course.

To **Gus Farber,** San Francisco, California, for several hundred emerald crystals and three quartz crystals given as a gift.

Book Reviews

CREATIVE ENAMELING & JEWELRY MAKING, by Katharina Zechlin. Published by Sterling Publishing Co., Inc., New York City, 1968. 104 pages. Clothbound. Illustrated with black-and-white photographs and line drawings and seven color plates. Price: $3.95.

Creative Enameling & Jewelry Making is an excellent book of instruction for the novice on this fascinating and ancient art. The book emphasizes how the beginner can make beautiful and useful *objects d'art* from the start, with little or no artistic talent; and how enameling will allow one the freedom to express his own taste and develop his own creative spirit, limited only by his imagination and enthusiasm.

Miss Zechlin guides the reader in step-by-step demonstrations through all phases of this hobby, from the selection of equipment and the first simple exercises through the more complicated enameling techniques on delicate objects. Text and pictures tell how luxurious-looking jewelry, bowls, coasters, ash trays, tiles for table insets, etc.—almost anything for the home or for gifts—can be made at little cost. Clear and concise directions are given, together with more than 100 photographs and drawings. The author fully explains what to do and what common errors to avoid, giving the novice the confidence needed to create handsome and lovely articles.

Although other books have been written on enameling, this one has the advantage of a simplified and lucid writing style, together with a profusion of illustrations, making it particularly useful for the uninitiated.

DIAMONDS IN THE SALT, by Bruce A. Woodard. Published by Pruett Press. Boulder, Colorado, 1967. 200 pages. Clothbound. Illustrated with black-and-white photographs. Price: $6.75.

This book relates the frequently repeated story of one of the biggest and most ambitious frauds in the annals of mining: the infamous diamond hoax of 1872.

Briefly, for those not already familiar with the tale, the hoax was perpetrated by one Philip Arnold and a partner, John Slack, by "salting" an area in northwestern Colorado with diamond crystals, as well as ruby, sapphire, emerald and amethyst crystals. The scheme was so successful that it eventually resulted in the formation of at least 25 companies with a total capitalization of $23,500,000, before the fraud was finally exposed accidentally by a U.S. Government surveyor, Clarence King. Participants who unwittingly played key roles in the drama included such well-known personalities as C. L. Tiffany, head of the famous New York jewelry firm; General George B. McClellan, the one-time Union commander; William Gilpin, first territorial governor of Colorado; John Marshall Harlan, later an associate justice of the Supreme Court; and Baron Rothchild, of the world-renowned Rothchilds.

The author claims that his book is the first entirely accurate and complete account of this daring scheme, having taken eight years to research. It is absorbing reading, particularly for those who enjoy the history and lore of the Old West.

DICTIONARY OF APPLIED GEOLOGY, MINING & CIVIL ENGINEERING, by A. Nelson, Dip. Min., CCM, FGS; and K. D. Nelson, B.Sc. (Eng). AMICE, AMIE Aust. 421 pages. Clothbound. Illustrated with black-and-white line drawings. Price: $17.50.

This dictionary, although intended primarily for students and engineers in the geological, mining and civil engineering professions, includes many definitions of gemstone species and variety names.

However, the book is *not* recommended for students of gemology, because the gem definitions are often misleading, incomplete or inaccurate. Following are a few of the more obvious errors: adularia is said to be *related* to moonstone; orange is given as one of the colors of alexandrite and its perfection colors are not mentioned (it is never orange); the word asteria is confined to *ruby only* (asteria refers to *any* gem that, when cut cabochon, displays a rayed figure); the red spots in bloodstone are not mentioned as an essential part of the color description; the most valuable color of sapphire is given as *light blue* (the most prized variety is a velvety, medium-dark, slightly violetish blue); misnomers are not indicated by quotation marks (e.g., "Brazilian emerald," "Balas ruby"); *karat* (gold) is spelled with a "c" ("k" is correct when referring to the fineness of gold); chrysoberyl is listed as occurring in shades of green only (the brownish and yellowish hues, for example, are not mentioned); the only colors given for corundum are red, blue, green, gray and colorless; *fire* (of diamond) is defined as a measure of a crystal's purity; white opal is described as a pale, bluish-white, iridescent variety of that mineral (correctly, it refers to any opal with a white or any light body color showing play of color); *sunstone* is defined incorrectly as a variety of orthoclase (it is usually a variety of albite); *succinite* (a variety of amber) is called a variety of garnet (the term *succinite garnet* is a correct, although little-used, term for light-yellow, amber-colored andradite); "spinel ruby" is listed as a variety of red spinel (the word "spinel" is never used correctly as a color designation).

From these few random examples, it can be seen that the gem portion of the dictionary could be more detrimental than beneficial to the student. Another major disadvantage is the seemingly unwarranted high cost for a moderate-sized book such as this with only a modest number of illustrations.

JEWELRY MAKING STEP BY STEP, by E. E. Joachim Published by Precision Press, Atlanta, Georgia, 1967. 263 pages. Softbound. Illustrated with black-and-white photographs and line drawings and two color plates. Price: $7.95.

Jewelry Making Step by Step is a welcome addition to the literature already available on the subject of amateur jewelry making. Mr. Joachim's detailed and mechanically valid approach is geared to the layman who wishes to make jewelry with limited equipment and no prior knowledge of this art and craft. His insight in presenting the basic concepts clearly and graphically reflects his own background of learning about jewelry as an avocation. The intention of this book is, of course, summed up best by the author's own words: "This book is written primarily for those who wish to make some of the better pieces of jewelry, not trinkets, tableware, etc. It is intended for those who expect to work with a propane torch instead of oxygen or the outdated blowpipe, and who will purchase the essential but inexpensive tools."

In reading through Joachim's book, this reviewer was repeatedly impressed by the careful attention given to the details of technique that are so often overlooked in a book of this type. Along with being technically accurate, Mr. Joachim does not lose sight of good taste and the artistic. JEWELRY MAKING STEP BY STEP is an excellent guidebook for the beginning jewelry craftsman, and could be quite enlightening for many already involved in jewelry making.

OPERATION KING CANUTE

continued from p. 296

in the bedrock by hand. The diamond-bearing gravel is treated in a field screening plant that removes a high percentage of the waste. The remaining gravel is transported to a central heavy-media separation plant that rejects further waste, the final product being sent to C.D.M.'s central diamond-recovery plant.

Even while the gravel is being mined in the paddock, the earthmoving machinery is busy removing more overburden and extending the retaining wall. If well points have been used, they are left until operations have moved well away from the vicinity. They are then withdrawn and, at the same time, a protecting wall is built from the high-water mark to the retaining wall at the end of the worked-out area.

The men responsible for this unique form of mining have created a fine art out of a nearly impossible task. They have succeeded where King Canute failed, by working day and night. Teamwork overcame some of the problems, and a determination born of desperation overcame the others. Since the end of 1965, the sea has been held at bay over a distance of more than five miles in nine separate areas and diamonds worth about R5 million have been recovered.

Now, armed with the knowledge and experience gained from this operation, the technical consultants are preparing to deal with the more formidable lower half of the beach.