Gems & Gemology

GIA

FALL, 1970

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IN THIS ISSUE

Summary of 1970 International Gemmological Conference

by
Richard T. Liddicoat, Jr.

One of the basic ideas of the International Gemmological Conference is to give the conferees the opportunity to discuss matters of mutual interest, sometimes before the speaker has enough information on the subject to print an article or to be quoted fully. As a result, many ideas can be brought forward for discussion that are not ready for publication. It is not considered acceptable to publish detailed coverage of the talks and discussions that take place at a conference. For this reason, I will just give a short summary of the speeches with a few comments about them.

Dr. V.B. Meen of the Royal Ontario Museum, author of *The Crown Jewels of Iran,* started the Conference by showing a number of the beautiful slides he had made of that incomparable collection that makes up the display at Iran's Royal Treasury Museum. Dr. Meen and some of his colleagues had an opportunity to look at the Iranian collection once again a short time ago, so he discussed that return visit and their first cataloging venture to Tehran. He showed selected slides from both visits and recounted some fascinating anecdotes from them.

Professor Doctor Font-Altaba was unable to attend the meeting. In his place, Professor Bosch-Figuera discussed the Spanish Gemmological Association. Since Professors Font-Altaba and Bosch and Mr. Masso established the gemological training program in conjunction with the British association several years ago, they have graduated quite a number of students, particularly in the Barcelona area.

Dr. Pieter Zwaan talked on *More Data on the Tanzanian Gemstones.* Most of his remarks were related to electron-microprobe analyses of inclusions of Tanzanian gemstones. In the corundum found in Tanzania, he identified pyrrohtite, graphite, apatite and rutile; and in garnet he identified apatite inclusions.

While examining the causes of color in sapphire, he made some interesting observations regarding the relationships between the valences of iron and the color. Bivalent-iron impurities cause yellow and trivalent iron a blue color, but he showed that laminated structures of bi- and trivalent iron caused green colors in sapphire. Laminated structures rich in chromium and iron had similar effects in orange and violet sapphire. He also related garnet properties to unit-cell size. Dr. Zwaan is the mentor of the Dutch gemological group and has a laboratory at the Rijkmuseum in Leiden, Netherlands.

Dr. Jan Kanis of Salisbury, Rhodesia, is engaged in gem mining throughout East Africa. In the course of his work, he recently traveled to Mozambique, and he had some interesting things to say about many gem materials he had seen. Among other items, he mentioned an emerald-cut, 427-carat pink tourmaline. He said the brown helmet shell used by Italian cameo carvers is found off Mozambique. He also mentioned attractive almandite, epidote, rose quartz, aquamarine and brown zircon.

Dr. H.J. Schubnel of the French government's mineralogical and geological research laboratory studied natural emerald crystals and Gilson synthetics by an X-ray topographic technique. To quote Dr. Schubnel, (with minor abridgement), "The natural crystal is characterized by zonings following the a directions and bound to the growth spirals appearing on the surface. The steps are made visible by rather strong disorientations, probably due to the embellishment of impurities at each resumption of

Left to right: Mr. Chikayama, Mrs. Frederick H. Pough, Dr. Pieter Zwaan, Dr. Frederick H. Pough.

Left to right: Mr. Charles Schiffmann, Professor Bosch-Figuera, Mr. Gordon Andrews, Dr. Jan Kanis.

growth. The artificial crystal, much less regular than the natural, shows a mosaic of disoriented grains. Between the grains the walls are very dislocated."

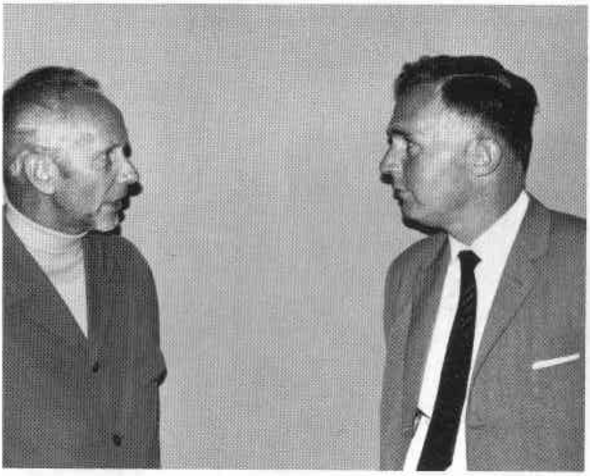
Since my flight to Brussels was delayed more than 24 hours, Robert Crowningshield, GIA's Eastern Laboratory Director, scheduled for the next day, filled in for my scheduled talk with an extra about a most remarkable emerald crystal recently discovered in North Carolina and examined in the New York Laboratory. The specimen was about equivalent in quality to a very fine Chivor stone.

The mine where the stone was found is open to public digging for a fee. The owner is not only being paid by the public for the privilege of doing its own mining, but the overburden is being stripped away without cost to him – surely, a mine-owner's dream.

Dr. Frederick H. Pough of America, gem consultant for several magazines, talked about colored synthetic quartz being made today in Russia. The colors seen thus far are light blue (colored by cobalt), greenish yellow, and a light greenish blue to bluish green. He also showed a new synthetic turquois made by Gilson.

Mlle. D. Level, a very youthful person for her experience in gem work, who has been in the French laboratory in Paris for over thirty years as assistant to Dr. Gobel and now Dr. Poirot, talked on *New Observations on Ancient Glyptics.* She has made a lifelong study of cameos, intaglios and other gemstone carvings, and delivered an interesting discourse on the subject, illustrated with her own fascinating colored drawings.

Mr. Xaver Saller of West Germany



Left to right:

Dr. Edward Gubelin,

Dr. Pieter Zwaan.

discussed science versus synthetics, a favorite topic he has discussed at several of the more recent Conferences. Mr. Saller is convinced that the synthetics' manufacturers have been given too much room in their advertising of synthetics. The result has been that many of the public have been so misled that they no longer know for sure what is being offered them.

Dr. Hermann Bank is the president of the German Gemmological Association. He discussed many new gem finds, talking principally about Tanzania and other areas in East Africa, such as Mozambique. He showed many gemstones and gave the group an opportunity to examine the latest gem minerals that had come to his firm in Idar-Oberstein. The group welcomed the opportunity to examine the stones, and to hear Dr. Bank's interesting observations about them.

Dr. Bank had a chrome-green tablet with properties between grossularite and andradite. He said it must have been made artificially, because German scientists have shown that it contains ferrosilicon and other artificial materials. By far the bulk of the material is garnet. He also showed an imitation lapis, employing glass and a blue dye on a base of lapis; this is then cut into tablets. He exhibited transparent, dark-brown sanidine feldspar, lovely chrome grossularite, a rich topazlike grossularite (R.I., 1.74), translucent rubies from Bahia with a very rich red color, transparent blue lazulite from Brazil, and yttruim fluoride with indices of 1.615-1.620.

Mr. Ove Dragsted of Copenhagen, the head of the Danish gemological association, discussed a subject entitled *Towards the Philosophy of Nomenclature.* During the course of reading a number of Soviet journals, he found two recommendations, both interesting, and, to Dragsted, practical. The first was that only natural stones should be permitted to have names ending in "ite." The second was that all important gemstones should have

Dr. H.J. Schubnel, Dr. H. Naires, Dr. John Saul.

the same first four letters in all languages. The diamond of the English language becomes *diamant* in French and German and *diamante* in Italian and Spanish. This is easy to follow. In contrast, the difference between emerald in English and *smaragd* in German would not be clear to any casual reader of gemological journals in different languages.

In the evening, at the Royal Library of Albert I, the film *Mogok, the Valley of Rubies,* which was taken several years ago by Dr. Edward Gübelin, was shown with a French soundtrack. This film has been shown in the past with a German soundtrack, but this is the first time in French. It is a fascinating film, made by Gübelin, who is an exceptionally gifted photographer.

Dr. V.B. Meen, Mr. Xaver Saller, Mr. Basil Anderson, Dr. Jan Kanis.

On Tuesday, Dr. John Saul, a geology Ph.D., who is now operating in Tanzania, discussed his theory about the location of gem deposits around the world. Saul's theory is quite interesting, and with it he accounts for the predominance of gem areas in the Southern Hemisphere, extending in certain places into the Northern Hemisphere. When one is in the field looking for a potential gem deposit, some kind of theory is essential to determine at what points one is going to concentrate his early prospecting efforts.

Initially, Dr. Saul pointed out that if one were to remove the unusual situation, such as the formation of diamonds and cool-water deposits and the other freakish one-of-a-kind deposits, there were really only 17 limited areas in the world in which gemstones were produced: Madagascar, the Ural Mountains, Burma, Ceylon, Brazil, Southern California, New York, New England, the Carolinas, Kenya, eastern Australia, Mozambique, Tanzania, South-West Africa, Rhodesia and a few other places.

Looking back to the era before continental drift began, he referred to the two supercontinents that are supposed to have existed. Relating thereto, he traced the areas in the world, particularly the Southern Hemisphere, in which gem deposits existed. He showed a band that was almost continuous from Brazil to Australia in basement rocks, dating back more than two billion years – all of which he stated had received some kind of volcanic event about five hundred and fifty million years ago. His ideas, and theory, led to a very lively discussion, with many of those in attendance disagreeing strongly with his conclusions.

Dr. Gübelin then discussed *Further Observations on Mineral Inclusions in Gemstones;* the subject was diamond. He stated that Dr. Neuhaus of Bonn, Germany, declared that diamonds had been formed in the earth at temperatures on the order of 1300° C. and 50,000 atmospheres pressure. It seems apparent that they formed in eclogite, a rock rich in olivine, garnet and diopside; and that they were then moved upward through cracks in the crust, in the form of the kimberlite that we see near the surface.

Edward Gübelin discussed the structure of the earth as it has been postulated from seismic wave, density and other studies. A belt of molten silicates below the semirigid, thin, silicate crust is thought to be relatively constant in composition. Thus, kimberlites that worked their way to the surface in stages are to be found in many places in volcanic necks all over the world, with only minor differences in composition. Despite the high temperatures, by surface standards, of the molten lava in the necks as it rose to the surface, the diamonds that were crystallized at lower depths dropped in temperature fast enough to have been preserved at the much lower near-surface temperatures of the lava; otherwise, they would have turned to graphite.

He discussed the various inclusions found in diamond and showed slides of many of them that had been identified by electron-microprobe techniques. One of the major ones is olivine, which, because of its pseudotetragonal habit, had been confused with zircon, which apparently does not exist, as had been postulated earlier, as an inclusion in diamond. The peridot, or olivine, series ranges from magnesium silicate, the forsterite end, to fayalite, the iron-silicate end. Most of those found in diamond were shown to be 94% + forsterite; i.e., largely magnesium silicate. They were formed at the same time as diamond. Other inclusions were pyrrhotite (an iron sulphide), magnetite (iron oxide), hematite (another iron oxide), picotite, enstatite, bronzite, apatite and graphite. He had beautiful slides showing the characteristics of the various inclusions that had been identified.

Following Dr. Gübelin, Professor Dr. Pense of the University of Mainz and Idar-Oberstein, discussed *New Research on Turquois.* He delivered the address on behalf of a doctoral student, Mr. Bannerjee, who had worked on the subject with Pense as his mentor to fulfill the requirements of a Ph.D. thesis.

Dr. Pense showed that the absorption curve shown on a spectrophotometer has a typical appearance for various turquois specimens. They had a minimum transmission at about 3500 Å in the ultraviolet, rising quickly toward the visible portion of the spectrum (4000 to 7000 Å), but with a dip between 3500 and 4500 Å, the maximum transmission dropping off abruptly to the end of the visible spectrum, at 7000 Å. The dip was deepest in turquois specimens that had the best color. The imitations showed no such dip in transmission on the rising curve

Mr. Ove Dragsted, Dr. H. Clausen, Mr. Richard T. Liddicoat, Jr.

from 3500 to 4500 Å

Dr. Poirot, of the Paris laboratory, spoke on studies he had made relating to crystal growth. He had some very interesting ideas about the behavior of negative-crystal formation during hydrothermal growth in nature. He pointed out several of the findings that led him to his conclusions. For example, he diagrammed convincingly the reasons he felt accounted for the commalike or spearlike inclusions found in hydrothermal synthetic emeralds.

The title of the talk by Basil Anderson, of the London Laboratory, was *Some Problems & a Few Solutions in the Field of Gem Testing With the Spectroscope.* In his initial remarks, Anderson summed up the problems that plague workers in any gem-testing laboratory when it comes to research. He stated: "Research work in a busy trade laboratory, such as ours, cannot be planned as a commonly considered academic exercise, but consists of untidy, interrupted responses to urgent practical problems of gem identification. One would like very much to tie these together in a neat, shapely bundle, but time forbids. However, for this occasion I felt it might be useful to fellow gemmologists if I were to piece together some recent observations in the field of absorption spectra, with particular reference to those caused by chromium, cobalt and the rare earths.

Because the problems of the London Laboratory coincide so neatly with those of the Gemological Institute of America's Laboratories, we are always particularly interested in Basil Anderson's remarks. In his talk, which we hope to reproduce in *Gems & Gemology* in a forthcoming issue, Anderson discussed some of the problems that are encountered in a gem-testing laboratory. First, he discussed the very many kinds of

Mr. Robert Webster.

spectra encountered in a chromium-rich material, noting the differences between emerald, ruby, jadeite, spinel and pyrope. He pointed out how helpful the spectroscope is in gem identification, particularly among very difficult, ordinary separations. Anderson gave some very interesting comparisons among stones that showed chromium spectra.

There was some free time Tuesday afternoon, so my talk, which had been scheduled for Monday morning, could be given at that time. My talk was concerned chiefly with the new form of treated opal, some recent developments in synthetic rubies and emeralds, and a few other subjects, most of which were reported on or soon will be reported in *Gems & Gemology*.

The initial discussion related to the remarkably beautiful black opals that were so exceedingly low in specific gravity and refractive index as to seem most unusual to us when we encountered them in the Laboratory. The information we had learned was related to the group, and some of their amazingly low properties were given. For example, a stone that by Joe Murphy's excellent weight-estimation techniques for cabochons should have weighed 25.95 carats, if it had an S.G. of 2.10, actually weighed only 15.44 carats. It was explained that the stone increased from 15.44 carats before immersion in water to 20.555 carats after overnight immersion. The apparent S.G. was approximately 1.26 and the R.I., about 1.37. The stone was very sticky to the fingers.

The two methods of treatment told to us as the processes being used were heating in a paper bag until the paper burned, and plastic impregnation, which were discussed as possibilities. Evidence for the two methods were outlined, since the product seemed to show characteristics suggestive of each of the methods.

Also discussed were the latest Gilson synthetic emeralds, which had properties very much in the natural range; i.e., R.I.'s of 1.574-1.580 and an S.G. of 2.685. These synthetics showed absolutely no fluorescence to long-wave ultraviolet, but still had the typical wisplike or veillike inclusions associated with flux-grown synthetic emeralds. Fortunately, an iron line in the spectroscope, at about 4270 Å, gave them away as synthetic emeralds.

The latest Linde synthetic emeralds were also discussed, showing slides of typical identifying characteristics and mentioning the 1.571-1.577 R.I.'s and the 2.68 to 2.69 S.G.

Some of the characteristics of the new Chatham synthetic rubies were discussed, particularly the tendency for a line around the seed, which had a bluish color. A number of slides were shown to illustrate each type.

A turquois that had come in from Gilson was suggested to be synthetic on the basis of its low indices and very odd black inclusions, plus its translucency. At this point, Frederick Pough mentioned he had shown a synthetic turquois from Gilson on Monday.

The next item for discussion was the almost transparent red beryl from Utah that had been discussed at the Americal Gem Society Conclave in

Cincinnati. At that time, it had appeared there was a possibility that this would be a source for transparent red beryl in gem sizes, but this now seems unlikely. Visits to the apparent locality by two different observers (including Pough) suggest that most of the material is nontransparent.

Next, Robert Crowningshield, Director of GIA's New York Laboratory, discussed the new, larger gem-quality synthetic diamonds being produced by the General Electric Co. and that had been loaned to GIA by GE to study in the rough. This subject was of great interest to the European gemologists, and was followed by a number of questions. Crowningshield pointed out that his observations had shown clearly that it would be possible on the basis of the material produced to date to distinguish rather readily between natural and the synthetic. He said that further studies would be made when the first crystals were cut in the next few months.

The next talk was by Mr. Masso of Barcelona, Spain, the head of the gemological association of that country. His talk was entitled *Some Comments on a Synthetic Ruby.* Sr. Masso had encountered on three occasions synthetic rubies that he regarded as different from those he had seen in the past. His study was based on the observation of seven different stones, ranging in weight from 11.01 to 2.78 carats. In his printed report, he had a picture of one of the stones *(Figure 1),* and two photomicrographs of inclusions. He then gave their properties as they had been observed in his laboratory.

He stated that the specific gravity by the hydrostatic balance varied from 3.996 to 4.015 for the seven stones.

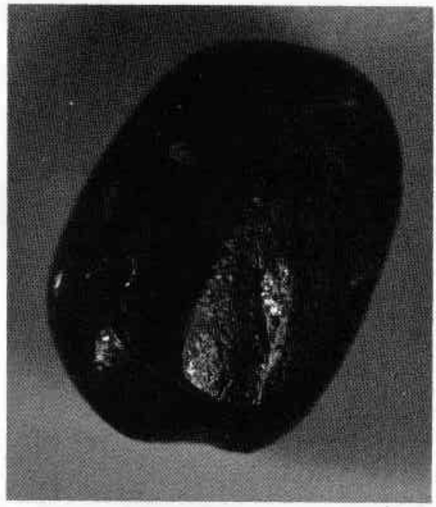


Figure 1

The refractive index of all was 1.760 to 1.768. They all fluoresced strongly under ultraviolet light, being slightly stronger to long wave, and they were transparent to short-wave ultraviolet. He said that although there was no evidence of curved color bands, round and oval gas bubbles were evident in all specimens. He said that these resembled in some respects the Kashan synthetic rubies described in the Spring, 1969, issue of *Gems & Gemology* (although these showed no gas bubbles), but that there were very distinct differences between the synthetics he was describing and those covered in *Gems & Gemology.* He also showed some photographs of inclusions that were distinctly different from any of those of either natural or other synthetic rubies described in the past. The two photomicrographs are shown in *Figures 2* and *3*.

On Wednesday, the discussion started with a talk by Mrs. Cavenago-Bignami, director of the Italian gemological laboratories and author of the book *Gemmologia*. Madam Bignami had concluded from a

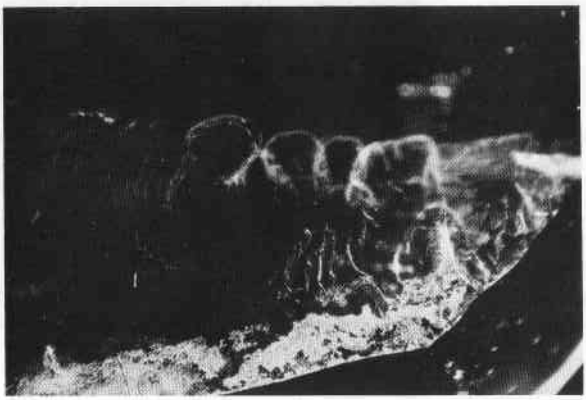
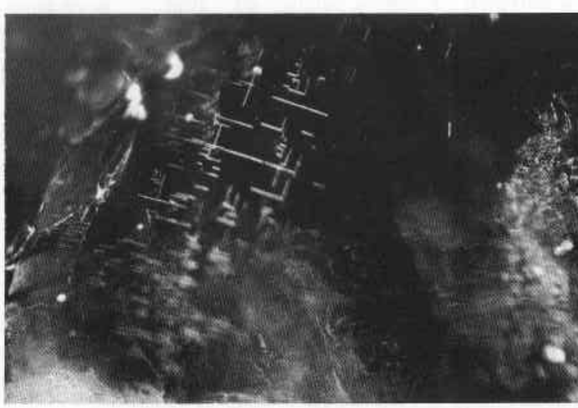


Figure 2

Figure 3



number of observations that the nature of anomolous birefringence in diamonds was related to their color grade. This was a very interesting hypothesis, but not one that was totally accepted by those in attendance, so it was followed by a lively discussion.

Robert Webster, of the London Laboratory, talked next on the subject *Some Investigations on Damaged Gem Material.* He discussed four sources of damage: percussion, thermal effects, radiation effects and chemical attack. Under percussion, he mentioned the effects of ultrasonic cleaning on such stones as strontium titanate and zoisite. Under thermal effects he discussed the fading of color in amethyst and some experiments he had conducted using ultraviolet, infrared and various temperatures, to see how well the color stood up. He found that it did not take very high temperatures for some amethyst to fade. Fading in sunlight was encountered in morganite, kunzite and some zircons (particularly white stones changing to a brown color). He also discussed the effects of sulphide fumes on cultured pearls, fading in turquois, and the effect of vinegar on such materials as coral.

Germany's Dr. Eppler was unable to attend, so Xaver Saller read his talk and showed the slides of inclusions he had prepared. He mentioned some thulite from Australia and South-West Africa. He stated that the recently discovered Zambian emeralds had an S.G. of approximately 2.74 and R.I's of 1.582 to 1.590. They are found in a micaceous schist and are dark green, the center usually blackish. He stated that the Kashan synthetic ruby is made by the Czochralski method. Since the inclusions had convinced us that the Kashan is a flux-melt product, we were interested but somewhat skeptical.

Switzerland's Charles Schiffmann discussed a number of items, including the use of the ProportionScope as an enlarger, the testing of a Linde synthetic emerald that showed refractive indices of 1.566 to 1.571, diamond fluorescence to ultraviolet in yellow, the use of electron spin resonance in testing, and other subjects.

Schiffmann prepared a summary of the information on the new G.E. synthetic diamonds. This had been prepared for the conference, so he asked Robert Crowningshield, who had spoken on the G.E. diamonds the day before, whether there were any changes that should be made in his summary. Crowningshield suggested a few changes. For example, the yellow synthetics were nonconductive instead of semiconductive; and that, although an absorption line at 4155 Å is usually present in natural diamonds, it is usually absent in D & E, GIA's two top color grades.

Schiffmann was followed by Mr. Edwin Sasaki, speaking for Mr. Chikayama, the operator of a gem-testing laboratory for the Gemmological Association of All Japan and their chief instructor. Sasaki stated that the jewelers' association was formed in June, 1967, and that the name was changed to the Gemmological Association of All

Mr. Robert Crowningshield, Sr. Masso, Madam Cavenago-Bignami.

Japan in June, 1969. As of September, 1970, the Association had more than 700 members. He talked about and showed some of the gem-testing equipment that has been made in Japan. They have a refractometer that is very similar in appearance to the Rayner, and a polariscope with a design very similar to that of GIA's instrument. They also have a variety of other equipment, including a monocular microscope set up with a variety of attachments to function as a polariscope, dichroscope and spectroscope.

Dr. Mikkola of Finland spoke on a new kind of gemstone cutting that she had named the "Dandelion Moon." It consists of a hemispherical top bearing a number of flats, usually about nine but sometimes more, and a 16-fold symmetry on the faceted pavilion. It was devised by an FGA in Finland, Mr. Tauno Paronen.

The last talk was delivered by the host, Professor Duyk, of the Belgian group, on the synthesis of fluorite. Duyk pointed out that fluorite belongs to the cubic crystal system, and mentioned some of the related fluorine minerals. He was talking largely about a synthetic red fluorite, made by the Harshaw Division of the Kewanee Oil Co. by the Bridgman-Stockbarger process. He stated that chromium, neodymium, samarium, erbium, holmium and uranium had been used for coloring agents, producing a variety of colors. He showed slides of unusual cavities in the material, which assisted in identification.

The Conference itself ended with a banquet that evening. There was a visit to the diamond bourse in Antwerp the next day.

Two German Gem Meetings

On the following weekend, the Deutsche Gemmologische Gesellschaft met at the Mineralogical & Petrographical Institutes of the University of Heidelberg. The DGG might be called the gemological association of Germany. This organization includes not only jewelers, but hobbyists of all kinds in the gemological field. It is open to everyone in Germany with an interest in gemstones.

The meeting started on Friday, and one of the important items that day was a meeting of people from various parts of the world who had an interest in diamond nomenclature. This group was organized and led by Herbert Tillander, gemologist of Helsinki, the man chiefly responsible for the recently published Scandinavian diamond-grading system, which is based to quite a degree on the GIA system for color and clarity grading and on the AGS cutting-and-grading system. A rather useful discussion took place on some of the stickier problems relating to diamond-grading differences among countries.

There were a number of talks on the following two days by some of the leading professors of mineralogy in Germany, as well as by leading jewelry-industry members of the German gemological association, including Dr. Hermann Bank, the president, Dr. Godehard Lenzen of Hamburg and others. Crowningshield and I were asked to speak, as well. Among the professors was the famous Professor Emeritus Dr. Paul Ramdohr of the University of Heidelberg, who spoke on the moon rocks. Professor Dr. Ramdohr is perhaps the most famous German mineralogist, an 80-plus-year-old gentleman, who is responsible, with Professor Dr. Hugo Strunz, for the European equivalent of our Dana's *Textbook of Mineralogy*, Klockmann's *Lehrbook de Mineralogie.* Others were Dr. E.L. Goresy of Heidelberg's Max Planck Institute; Dr. Berdesinski, also of Heidelberg; Dr. S. Rösch of Wetzlar, who spoke on the coloring of Tanzanite; Dr. G. Richter of Würzburg; and Dr. J. Pense of Idar-Oberstein and Mainz.

Dr. Lenzen and Mr. Eickhorst of Hamburg spoke on their new diamond colorimeter, which is quite similar to the American Gem Society's instrument, in that it uses two filters; theirs uses a blue filter at 4200 Å and another one at about 5100 Å, which is in the blue-green. Many instruments were on display, mostly utilizing the ideas of the former Director of Training for the German Association, Dr. Karl Schlossmacher, who believed that horizontal microscopes were most advantageous, since any stone to be examined could be immersed in a liquid and then viewed through square-walled glass containers. This is good for testing under immersion, but very awkward for the kind of examination that normally confronts the jeweler.

About ten days later, the German Edelsteintag held by the German Friends of Gemstones, the rough equivalent of the American Gem Society, held its annual get-together in Frankfurt. The Executive Director of

Dr. H.J. Schubnel, Professor Dr. Pense, Dr. Poirot.

this organization modeled it, frankly, along the lines of the AGS, but he has a very interesting philosophy with respect to the purpose of his organization, since he feels that its function is to obtain just as much publicity for gemstones as possible. By organizing the event around a monumental display of magnificent gemstones and inviting the public, he is able to obtain what by American standards can only be regarded as an unbelievable amount of publicity. The two national television networks covered the event and from what we could gather, every newspaper of any size carried stories on the display and the event itself.

In contrast to the rather spartan meeting of the German Gemological Association at Heidelberg University, this event, held in a major hotel in downtown Frankfurt, was lavish indeed. There were two "jewel teas" to which local women were invited to view models parading in dresses of local and other designers, and wearing the jewelry of local jewelers. They were charged admission for these events. There was a charity dinner, as well as a "jewel ball" on the last night of the event. The awarding of certificates of diplomas was given a great sendoff, with speeches, chamber music and design awards before the diplomas were distributed.

There were also a number of lectures by professors and gemological teachers, including Prof. Dr. Strunz (who spoke in the United States under GIA Cosponsorship, Prof. Dr. Rosch, Dr. Gübelin, Werner Galia and many others.

Developments and Highlights at GIA's Lab in New York

by

ROBERT CROWNINGSHIELD

Polycrystalline Diamond

In the past few months, we have encountered two rather unusual diamond specimens. *Figures 1 and 2* illustrate a 782.86-carat gray lump that proved to be polycrystalline diamond. We were reminded of the statement some time ago that the term "Diamondite" (which was used as a trade name for synthetic sapphire) was unacceptable because mineralogically there might be a diamond analogous with quartzite. This is the first specimen we have seen that proves this point.

A Rough & Cloudy Diamond Crystal

Figures 3 and *4* illustrate a most unusual use of a rough and cloudy diamond crystal. It came in for identification because the owner needed proof that he really does wear a diamond ring!

Linde Simulated Diamond

Just before our staff lapidary, Jerry Call, left with a partner, Don Spry, to investigate the possibilities in Brazil, they cut for the Linde Co. a really surprisingly beautiful marquise-shaped brilliant of yttrium-aluminum oxide (commonly called YAG, for yttrium-aluminum garnet). *Figure 5* shows the section of boule from which it was cut. Although YAG is cubic in structure, several other boules we have seen have had a hexagonal cross-section. The cut stone, *Figure 6,* went on display in early November to help launch the imitation they call Linde Simulated Diamond. Incidentally, their publicity on this has been unfortunate. We have seen it called both synthetic diamond and manmade diamond.

Transparent Lazulite & Green Andalusite

Another stone that Jerry cut just before he left was a 3-carat transparent lazulite. Although the finished stone is not clean (white breadcrumblike inclusions are shown in *Figure 7),* it was until recently the largest cut

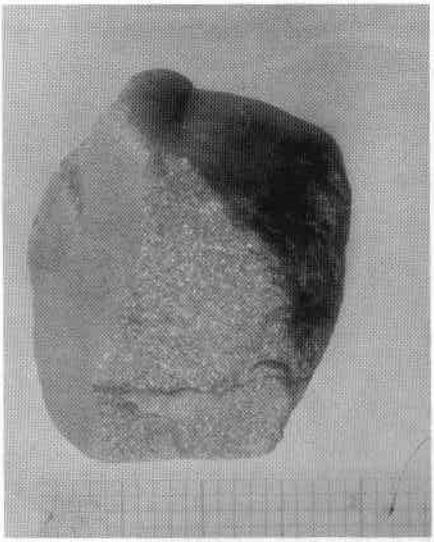


Figure 1

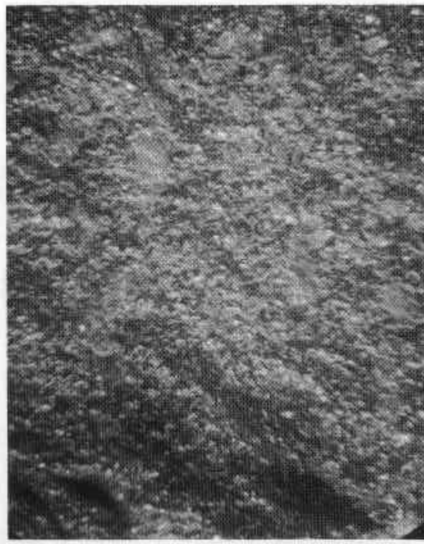
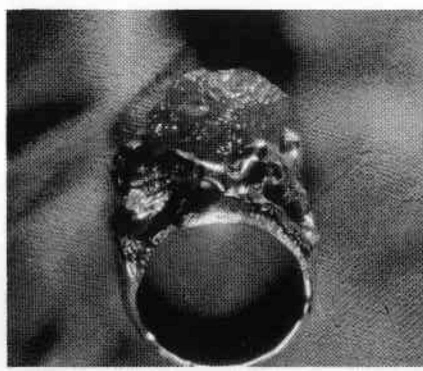


Figure 2

Figure 3

Figure 4



lazulite we had seen. Even in museums, we had only seen stones of less than a carat. Recently, in Idar-Oberstein, Germany, I saw cut stones of 2 carats and quite free of flaws. Also, a magnificent crystal group was seen that weighed in excess of 100 carats. With the unusual dichroism of green and cobaltlike blue, the crystal was striking. Since returning to New York, we have seen several fine cut stones, many weighing more than 5 carats.

We are indebted to a Brazilian gentleman for the lazulite and also for some fine green andalusite with the absorption spectrum that has been attributed to rare-earth elements. We

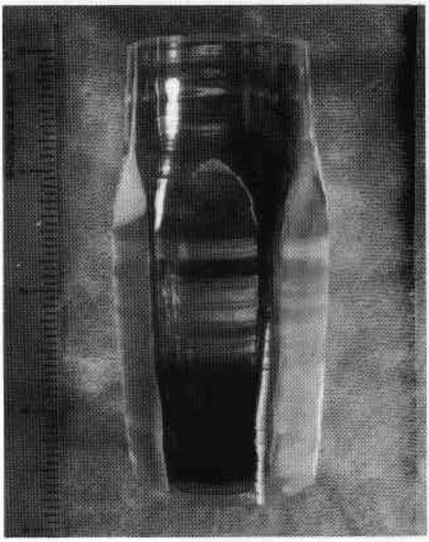


Figure 5

Figure 6

Figure 7

were interested to note from Robert Webster's latest edition of *Gems* that he attributes the spectrum to manganese. We have recently been informed that the supply of lazulite will be limited, as will be its use in jewelry, since it is less than six in hardness.

Laser Beams in Gemology

Diamond cutters have long known that certain dark inclusions in diamond can be reduced in size by using strong acid, providing there is an opening to the surface. Some years ago, we heard rumors of the possibility that laser beams could be used to reach wholly included crystals, etc., allowing the reducing acids to reach them. In September, a diamond dealer, who wishes to remain anonymous, showed us a small cut diamond before it was subjected to the laser operation *(Figure 8)*. It had two prominent inclusions that appeared dark in color, as well as several smaller ones.

A few weeks later he brought the stone back. Neatly piercing the two largest inclusions was a tapering hole, or cone *(Figure 9)*. The inclusions were lighter in color, but from the side *(Figure 10)* the longer cone was reflected in the table and, to our eyes, the clarity grade of the stone was not improved. *(Figure 11* is a similar view before the cone was produced.) We are most grateful to the gentlemen who allowed us to study these stones, because not more than two weeks later we were asked to grade a top-color 7-carat stone and would have been unable to explain the three cones we saw reaching from the surface to rather large white included crystals (or now, negative crystals). Two of the cones and crystals are shown clearly in *Figure 12*. The third is depicted with its reflection in *Figure 13*. Several smaller black crystals were nearby; possibly, they were really a very dark brown. If the laser cone reached the crystal and the acid dissolved or otherwise altered the inclusion, it was a mystery to us as to the nature of the crystal.

We were struck with the precision of aiming, which allowed the tiny hole to just pierce the crystal, but were reminded that laser beams are used for extremely delicate surgery on the retina of the human eye. The main problem of early experimenters was to learn how to aim for an inclusion that

Figure 8

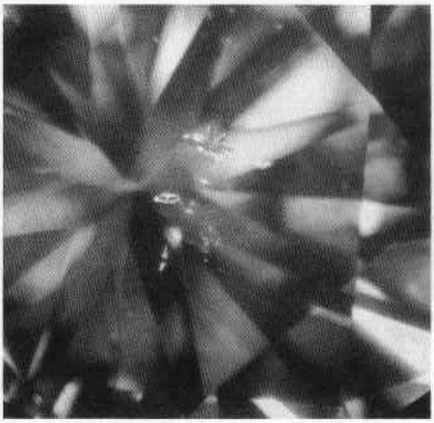


Figure 9

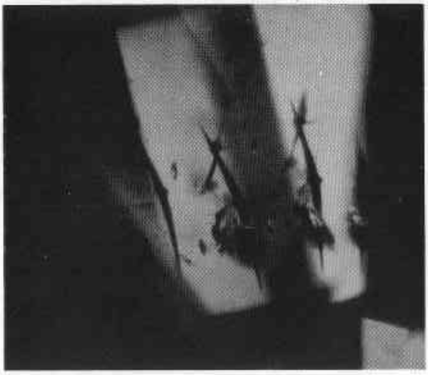
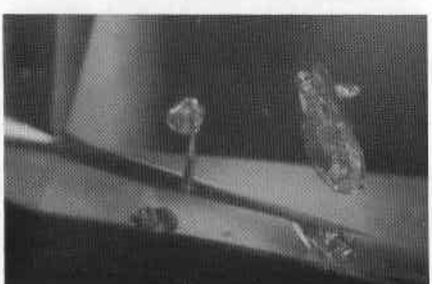


Figure 10

Figure 11

Figure 12

Figure 13



was not really where it appeared to be.

It was our feeling that if the inclusions pierced by the laser were originally black, as the surrounding ones were *(Figure 14),* then the salability (if not the actual clarity grade) of this diamond was considerably improved. We did, however, note a decided cleavage crack radiating from the longest laser hole (arrow in *Figure 12),* which indicates

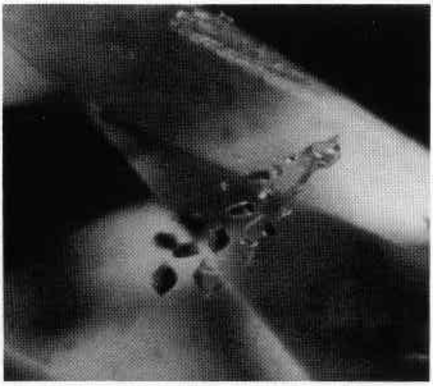


Figure 14

that the procedure is not without some risk.

We are faced with finding a suitable name for what we see in a "lasered" stone, in order to record it in our reports. If and when we can obtain information as to the availability of this activity as a service, we will report it.

"Assembled Emerald"

An emerald in a ring was submitted for testing, since the client was sure it was an assembled stone. At first glance, this seemed entirely likely, since there appeared to be a colorless zone through the girdle *(Figure 15)*. However, under magnification and immersion, inclusions traversed the colorless zone from crown to pavilion, proving the stone to be one piece. The colorless zone was reminiscent of the Linde synthetic emerald.

UV Fluorescence in Diamonds

Ultraviolet fluorescence in truly colorless diamonds (GIA grades D and E) is fairly rare and when it occurs, it is, fortunately, almost always blue in color. Strong-blue fluorescence in colorless stones usually imparts a grayish cast. When it does not impart this cast and occurs in a very transparent stone, the term Jager may be used as a color description. Very rarely, we have encountered a diamond in the D-E-F range that fluoresces yellow – a disappointment when the stone is viewed in daylight.

Recently, we examined a beautiful 21.90-carat pear-shape brilliant for our Laboratory member, Baumgold Bros. The stone was graded E under the controlled illumination of the Diamondlite. Under ultraviolet, the stone glowed an intense and completely unexpected orange, a fluorescent color we have heretofore seen only in fancy-colored diamonds. By coincidence, the next day we graded an 8.10-carat marquise brilliant as F in the Diamondlite, and noticed that it fluoresced an attractive pale green under long-wave ultraviolet.

Testing Demantoids

A test we have never had to resort

Figure 15

to before, and one we would not ordinarily think to use, involved a request to test a large number of loose demantoid garnets. The paper contained several thousand stones, and the client submitted two or three at random for testing. By chance, one was a green zircon. How to test the lot quickly was the problem; the answer was to use short-wave ultraviolet. The few other zircons present glowed a muddy green, whereas the garnets remained inert. Normally, when only one or two stones are being tested, the spectroscope or polariscope and microscope are sufficient.

Amber Identification

We have frequently stated that the most difficult of all identifications is amber. Although separation of plastic imitations is usually accomplished by use of the refractometer, specific gravity and ultraviolet fluorescence, with the hot point as the "clincher," the identification of modern resins requires use of either one or both acetic ether and sulphuric ether.

Recently, a stress-figured red-brown pendant stone was sent in for identification. Everything pointed to plastic, except that we have never seen stress-figuring in plastic and the S.G. was that of amber, not plastic. Its lack of fluorescence seemed to rule out amber until we made a slight scratch near the drill hole. At that point, the normal bluish fluorescence of amber became visible, proving the piece to be a pale amber painted with a dark-red-brown varnish (?) or other medium to improve the color.

Zincian Staurolite

An unusual-appearing specimen from Brazil was submitted for testing; it appeared red-brown in incandescent light and yellow-green in fluorescent light. As a rough fragment, it was unlike anything we had seen, and the biaxial character and refractive index matched nothing we knew. X-ray diffraction by Chuck Fryer in Los Angeles and cross-reference work at the Smithsonian Institution revealed the stone to be a new variety of zincian staurolite. This mineral is very rarely transparent, being known to the collector in the form of fairy crosses from Georgia, Colorado and other areas of the United States. If the new material occurs in large enough pieces, it should make an attractive cut stone, since it tends to be lighter in color than other transparent staurolite we have seen. Its fairly distinct absorption spectrum is seen in *Figure 16.* The R.I. was 1.721-1.731, rather low for staurolite; it was biaxial and trichroic (green, yellow and red); the S.G was 3.79; it was inert to X-ray and UV; and the hardness was approximately 7.

Transparent Colorless Grossularite

If blue is an unheard-of color for garnet, so is transparent and colorless. To our surprise, we were shown 18 small, transparent, nearly colorless stones that proved to be grossularite. Most of the stones were just faintly tinted with green – about K on the GIA Diamond-Color Scale. It was assumed that they represented the extreme end of the new Tanzanian green grossularite, with the fine emerald-green stones the other end in a color series. Some are shown in *Figure 17.*

Acknowledgements

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

To Graduate Gemologist **Stan Sikorski** for a prehnite sphere that, under low magnification, looked exactly like a ball of yarn *(Figure 18).* It is original and "as found," we were informed.

To jeweler **Robert Newman**, Hyde Park, Mass., for a beautiful .03-carat irradiated pink diamond. Also, we wish to thank him for having treated the milky-white diamond mentioned in the last issue of *Gems & Gemology.* We were experimenting with treatment, in this case to green, to see if the cloudiness could be improved. It was our impression that, although the actual cloudiness may not have been affected, now that the stone is green it appears less cloudy.

To student **Murray Darvik** for a selection of transparent tumbled garnets, which will be most useful for student study.

To Graduate **Melvin Strump**, Superior Gem Co., New York City, for an important gift of faceted Brazilian spessartitities, donated by Kurt

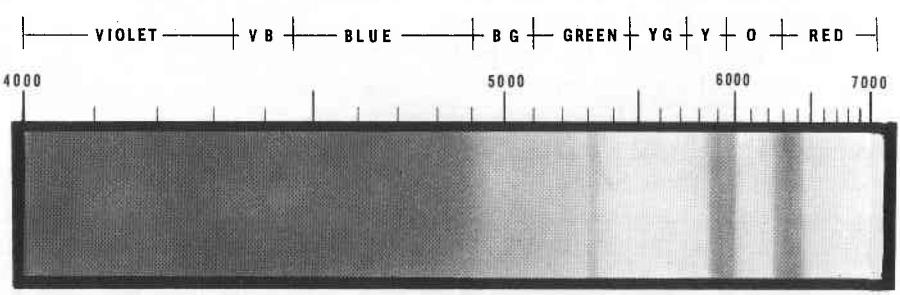


Figure 16

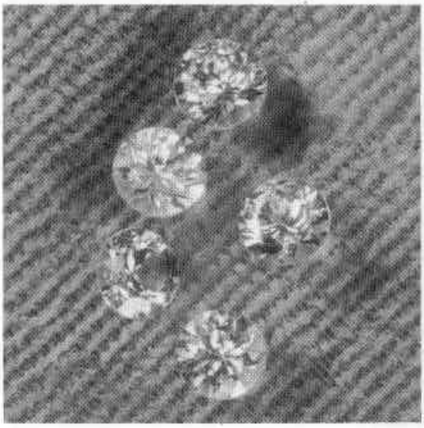


Figure 17

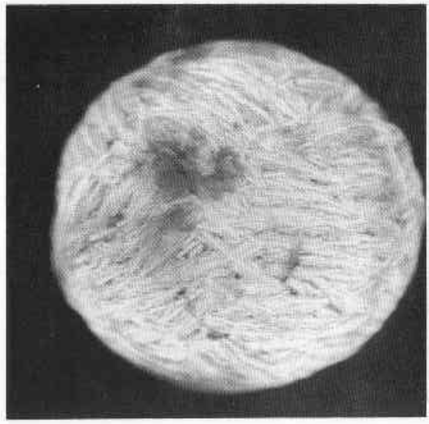


Figure 18

Wichmanis of Brazil. With their high R.I., high specific gravity and clear manganese absorption spectrum, they are more nearly "pure" spessartite than the ones from Tanzania we have recently received.

Richard Liddicoat and I are indebted to Dr. Hermann Bank for hosting and guiding us during our recent visit to Idar-Oberstein. We are also grateful for several unusual faceted stones, such as scapolite, aragonite and Brazilian spessartite.

We were happy to receive a visit from ex-staff member **Jerry Call** on his first return to the United States since leaving for Brazil. We are indebted for a fine-green sphene brilliant, an excellent trilling of chrysoberyl and a most unusual lavendar topaz, which he contributed to our collection.

We wish to thank **Mr. Hans Myrhe** of Oslo, Norway, for responding to a letter of inquiry about a garnet with color change, reported in a Norwegian mineralogical journal in 1967. He not only informed us that the stones were familiar to him, but arranged to send several rough specimens for our collection and several polished slabs on loan for study.

Under an incandescent lamp, the slabs appeared almandite-red in color. Held over a fluorescent lamp, they appeared distinctly blue to violet-blue – a most unusual color for garnet and not heretofore reported. Although it was reported as alexandritelike in the journal, the stones did not appear nearly so much so as the handsome stones from Tanzania reported in the Summer, 1970, issue of *Gems & Gemology*.

We are indebted to Mrs. Poldevaar, Secretary to the Department of Mineralogy of the American Museum of Natural History, for finding and sending us photostatic copies of the original article in Norges Geologske Undersokelse.

Developments and Highlights at GIA's Lab in Los Angeles

by

RICHARD T. LIDDICOAT, JR.

Diamond Polished Nearly Parallel to Grain

Occasionally, we encounter diamonds with a polished surface that appears to be so nearly parallel to a cleavage direction (i.e., nearly parallel to the grain) that a fairly regular pattern of discontinuities in the surface is evident. Such a surface (in this case the table), undoubtedly on a three-point stone, is visible in *Figure 1:* its appearance is not unlike that of magnified calf's-skin leather. Polishing is very difficult in the octahedral direction, so probably the polishing wheel pulled out minute flakes of diamond, leaving the irregular surface shown here. Each of the flakes showed tiny drag marks, indicating that the material had been pulled out by the polishing wheel and the tiny diamond grains grooved the diamond nearby.

Eosphorite

For the first time we encountered an orthorhombic mineral called eosphorite, which is a manganese-aluminum phosphate. It was a small, transparent, brownish-pink faceted stone with refractive indices of 1.640-1.668. The beta index was slightly over 1.660, so the mineral was biaxial negative. The specific gravity was very near 3.06, and the hardness was about 5. The spectrum had a very strong absorption line at 4100 Å and a moderate line at 4900 Å. We were able to confirm the optical identification, made initially by Charles Fryer, with an X-ray powder-diffraction pattern made using the powder from a tiny fragment of the crystal from which the stone had been cut. *Figure 2* shows some long, stringy acicular inclusions that were present in the stone. Eosphorite will never rival corundum or even kunzite in popularity as a gemstone, but it is one more for the collector to try to find.

Gaps in Nacreous Layers of a Cultured Pearl

While examining a cultured pearl under fairly high magnification, we were surprised to notice several areas in which Newton rings were evident. Although we have not examined

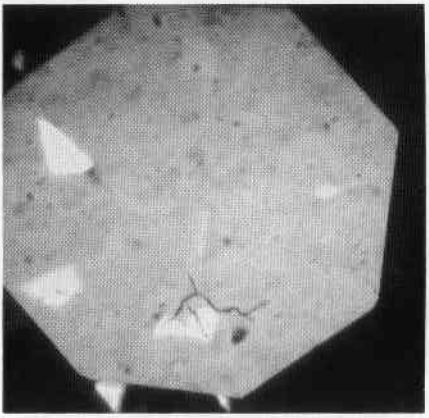


Figure 1

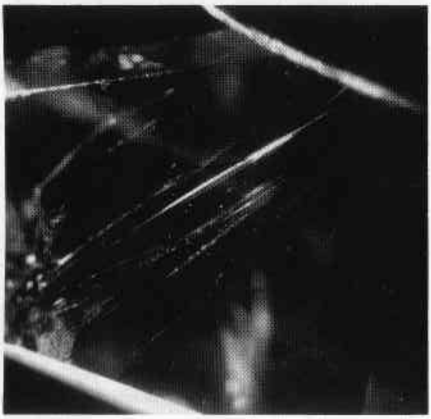


Figure 2

thousands of cultured pearls under this magnification (approximately 40x), nacreous layers with air spaces in various places beneath the surface layers were new to us. After encountering this condition in a single pearl, we examined quite a number of others without again finding it (shown rather vaguely in *Figure 3).* The largest space can be seen at center right, with several others that are slightly more distinct to the upper left of the largest.

Chrome Fluorite

On a recent trip to South America, Edward R. Swoboda, president of Jewels by Swoboda, Beverly Hills, California, found some large pieces of fluorite whose appearance suggested chromium as the coloring agent. *Figure 4* shows the spectrum of the material. The particularly interesting aspect of this fluorite was that a beam of light transmitted through it was a pronounced medium blue, even though the stone itself was chrome green.

12-Rayed Star Sapphire

Twelve-rayed star sapphires are not exceedingly rare, but one submitted for identification was so attractive that we photographed it *(Figure 5).*

Sinhalite

We received for identification a rather attractive sinhalite that was distinguished by some very interesting negative crystals extending to the surface in one corner of the 7.09-carat stone (63x, *Figure 6).* Even this magnification was insufficient to show the terminations clearly, but the orthorhombic nature of the crystals was evident under binocular magnification.

Treated Opal

In recent issues of *Gems & Gemology* we have discussed the new form of treated opal apparently impregnated with a black plastic. The material is very porous, probably from Jalisco, Mexico. One encountered recently was the most porous yet. The

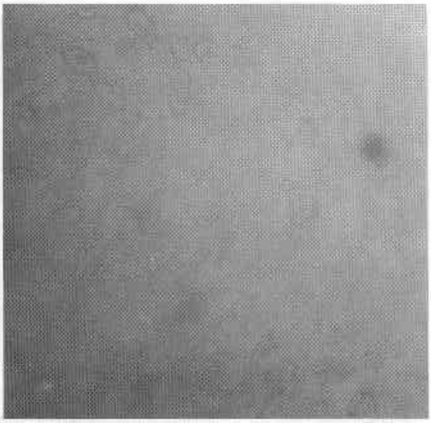


Figure 3

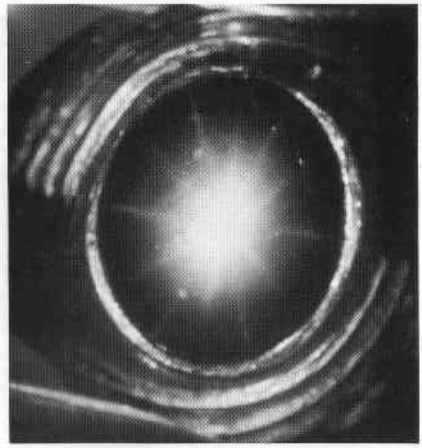


Figure 5

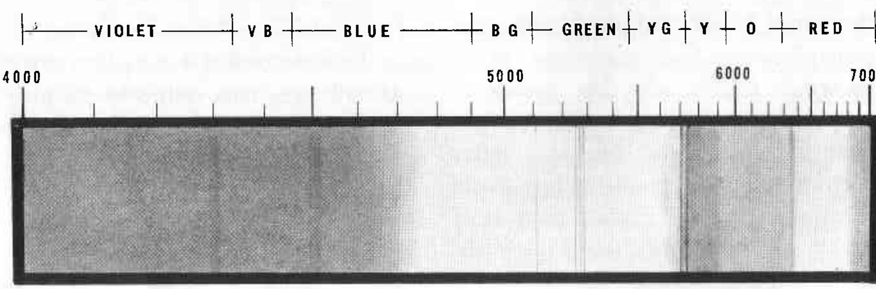


Figure 4

weight when dry was 15.44 carats. Using Joe Murphy's cabochon formula and a specific gravity of 2.10, the estimated weight for this opal was 25.95 carats. It was not possible to take a hydrostatic S.G., because the stone absorbed water so rapidly. When it was soaked overnight and weighed again, it had gained 5.11 carats, to 20.55. Using the cabochon-estimation formula and the dry 15.44 weight, the S.G. worked out to about 1.26. Obviously, this is not a highly accurate method for such a determination, but it served our purpose.

Needles in Natural Spinel

In the last issue of *Gems & Gemology* an illustration was shown of needlelike inclusions in a natural spinel. H.J. Vander Veer of Associated Mines, Inc., Salt Lake City, Utah, sent us some spinels he had found in a large group from Ceylon, in one of which the inclusions were at least as well developed as the one we showed in *Gems & Gemology.* Some of the stones had very short needles and one had a rather interesting included crystal with a halo and a very flat, reflective separation that showed a

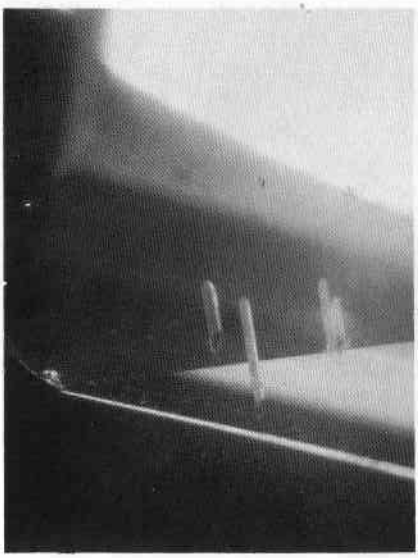


Figure 6

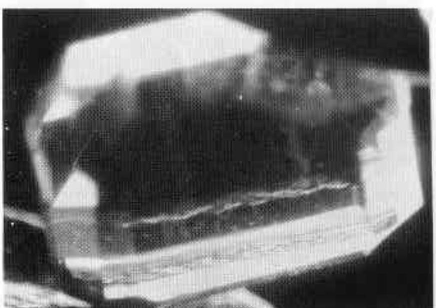


Figure 8

"flying saucer" and a slightly out-of-focus group of typical octahedral crystal inclusions (63x, *Figure 7).*

More on
Linde Hydrothermal Emerald

We have had a chance to examine a large number of Linde hydrothermal synthetic emeralds, and certain characteristics have become apparent in most of the stones that we regard as very helpful in identification.

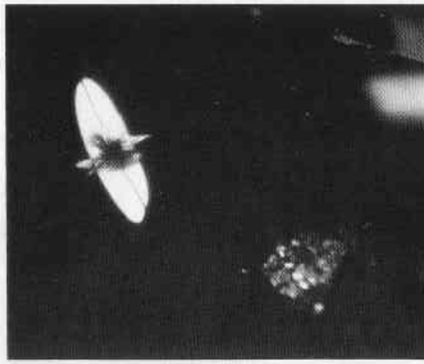


Figure 7

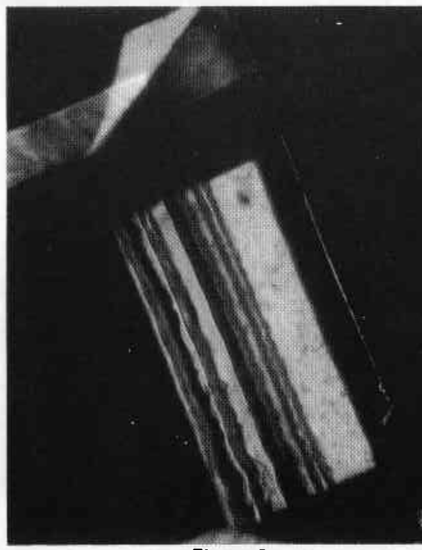


Figure 9

One is what Charles Fryer refers to as an "ocean-wave" effect *(Figure 8),* which occurs as one or more irregular surfaces parallel to the tabular seed. Several of these layers are shown in *Figure 9.* When such surfaces are examined at right angles to the direction of the last illustration, they sometimes appear almost transparent, but at other times produce a cloudy effect *(Figure 10).* The side view *(Figure 8)* is apparently accounted for

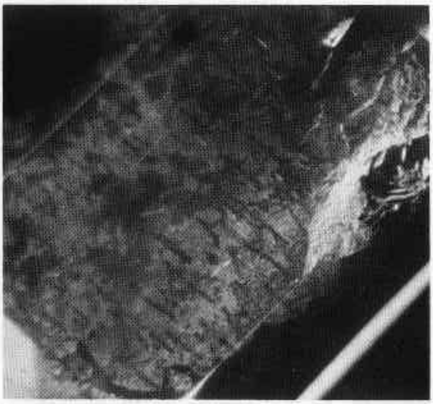


Figure 10

Figure 12

by the development of many faces as growth took place from the seed.

We regard these as just as diagnostic as the commalike or spiculelike inclusions capped by the phenakite crystal shown in earlier references to the Linde product.

Occasionally, a clear, colorless zone is evident, again either in the seed or parallel to it. Such a zone is shown by the arrows in *Figure 11*.

Figure 11

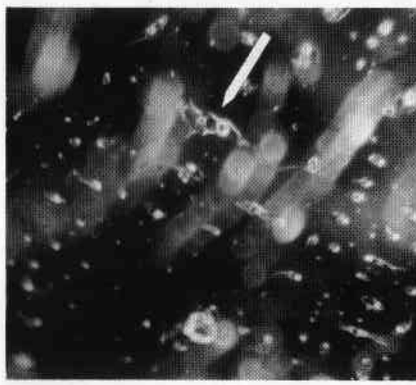


Figure 13

Hexagonal Platelets in Chatham Flux-Melt Rubies

In earlier references to Chatham flux-melt synthetic rubies, Robert Crowningshield called attention to flat platelets with a hexagonal outline. We have had some doubt whether these platelets were negative crystals or metallic inclusions. One reached the surface in a recently tested stone, and we were able to see that it was metallic. It appeared to have a brass-yellow color, but we have not yet made an X-ray powder-diffraction pattern to determine conclusively its identity; Charles Fryer is planning to do this shortly. Several of these inclusions are shown in *Figure 12.*

Three-Phase Inclusions With Two Bubbles

Three-phase inclusions, of course, are common in Colombian emeralds. We were interested, however, in a Colombian stone that showed a number of three-phase inclusions, each one of which had the tiny crystal in liquid in a cavity, bounded by two bubbles on opposite sides of the crystal. There were about a dozen such inclusions. An arrow points to the largest visible in the field in *Figure 13.*

Acknowledgements

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

To **Lloyd G. Davies**, student, Lamplighter Antiques, San Diego, California, for three glass-bead opal imitations.

To **Mark Bernstein**, Graduate Gemologist in Residence, for a very useful selection of rough hydrothermal emerald crystal fragments and pieces and assorted colors of synthetic corrundum boules.

To **John Staver**, student, for a selection of synthetic rubies and sapphires.

To **Sallie Morton**, student, for a number of stones that will be put to good use in our student practice sets, including synthetic corundum (also alexandritelike), synthetic spinel and moonstone.

To Graduate Gemologist **Ben Gordon**, Gordon Jewelry Co., Houston, Texas, for another of many donations to GIA consisting of assorted genuine, synthetic and imitation stones.

To **La Jolla Jewelers**, La Jolla, California, for a very useful assortment of natural, faceted stones.

Book Reviews

PROSPECTING FOR GEMSTONES & MINERALS, by John Sinkankas. Published by Van Nostrand Reinhold Co., New York City, 1970. 397 pages. Clothbound. Well illustrated with 133 black-and-white photographs and line drawings. Price: $10.95.

Almost a decade ago John Sinkankas wrote a useful book entitled *Gemstones & Minerals: How & Where to Find Them.* It very quickly became accepted as a reference work and guide for the amateur prospector, as well as for amateur mineralogists, geologists, gemologists and collectors.

With his usual writing skill, together with his knowledge in the field, Sinkankas has revised and updated the original work and retitled it *Prospecting for Gemstones & Minerals.* Now, as before, the primary purpose of the book is as a guide to recognizing the signs of mineral and gemstone deposits and how to extract them efficiently.

In addition to practical information on planning field trips, tools and equipment, the field appearance of rocks and minerals, digging, extracting, preparing and exhibiting specimens, etc., this latest edition incorporates new photographs and information on the most recent developments in the field and lists new publications. Following the book's nine detailed chapters, five appendices include tables and charts, useful addresses, reference libraries, and suggested references and reading materials.

This authoritative, lucidly written and informative book deserves a prominent place in every gem-and-mineral library.

STEREOGRAM BOOK OF ROCKS, MINERALS & GEMS, by David Techter. Published by Hubbard Press, Northbrook, Illinois, 1970. 64 pages. Softbound. Illustrated with full-color, matched pairs of stereo photographs. Price: $3.95; stereo glasses: $1.95.

Prepared by Hubbard Scientific Co., the *Stereogram Book of Rocks, Minerals & Gems* makes it possible to view high-quality specimens in three dimensions.

Each color plate is presented as a stereo pair that is viewed through accompanying stereo glasses as a three-dimensional specimen illustrating form, shape and structure. Crystal shapes with their characteristic terminating faces or cleavages, for example, are features that cannot be shown adequately in a flat photograph but that are clearly revealed by this method of viewing.

It is apparent that great care was taken to ensure correct color representation by the control of background colors and lighting. The specimens photographed for the book were selected from the outstanding mineral collection of Chicago's Field Museum of Natural History, illustrating good crystallization, sharp and true color and distinctive characteristics. Included are stereo photographs of 18 of the more important gemstones, both rough and cut. Two appendices show stereograms of lunar rock formations and the six crystal systems. Special consultant for the project was Dr. Edward Olsen, Curator of Mineralogy, Field Museum.

The *Stereogram Book* is aimed at both the student with his classroom needs and the independent collector, who may either be beginning his collection or seeking a book to increase his sources for mineral identifications.

THE HISTORY OF DIAMOND PRODUCTION & THE DIAMOND TRADE, by Dr. Godehard Lenzen, FGA; Gemologist, GIA. Published by Praeger Publishers, New York City, 1970. 230 pages. Clothbound. Illustrated with black-and-white photographs and line drawings. Price: $12.50.

In this book, Godehard Lenzen explains and interprets all the phenomena that constitute the history of diamond production and the diamond trade. He traces the diamond's status as a gem through Greek, Latin and Sanskrit texts and discusses in detail its evolution and history as a world commodity, the part played by various countries in its history, and the political and legal developments related to it. Other subjects covered include pricing and evaluation of diamonds, the technical developments that have influenced their industrial and economic roles, and the changing means of production.

Although this book contains some interesting and hitherto unpublished information that obviously required tedious and painstaking research, it will no doubt be considered as dull and ponderous by many readers. Scores of sentences require close rereading and study, only to discover they are either vague and/or fail to make a clear-cut point. Many other sentences are so complex that reducing them to their essentials becomes a laborious and frustrating task.

The fault may lie in the translation (from the German) or, more likely, with the publisher, who failed to make use of expert editors and proofreaders. An editor may not be able (or allowed) to transform pendantry, circumlocutions and pedestrian writing into great literature, but he can turn it into clear, concise English.

Nevertheless, Lenzen, throughly grounded in gemology and mineralogy, has written a book that is unique in its field – a book that will add one more facet to a gemologist's fund of knowledge.

In addition to his gemological titles, Lenzen holds the degree of Doctor of Political Science & History and teaches at the Universities of Hamburg and Graz.

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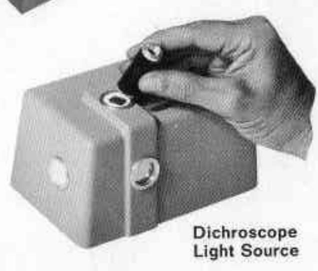

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