GEM NEWS

John I. Koivula and Robert C. Kammerling, *Editors*

DIAMONDS

China. A new diamond-polishing factory has been set up by the Hong Kong–based jewelry firm of Chow Tai Fook in the city of Shunde, Guangdong Province. The new cutting facility will be fully operational as soon as the first 10 diamond cutters and polishers return from training courses in Thailand. Chow Tai Fook expects to increase the work force at this new plant to 300 workers in 1989.

Diamond mining activity in India. Mining and exploration are being carried out again in the ancient Panna diamond fields in northern India, reportedly due to the recent increases in the price of diamond rough. The government's National Mining Development Corp. does most of the mining, although some small plots have been leased out to private prospectors. Some of the diamonds mined by the government are sold at auction.

The Geological Survey of India has recently been exploring areas of the Panna district that contain pipe rocks, several districts of Andhra Pradesh, and the recently discovered kimberlites in the Anantapur district near Venkatampalle and Wajrakarur.

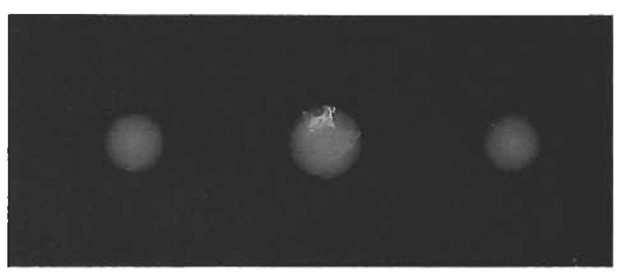
"Filled" diamond update. The Fall 1987 Gem News column reported on the filling of cleavages and fractures in faceted diamonds. The purpose of this treatment is to replace the air that normally fills such breaks with a transparent, essentially colorless substance that has a refractive index much closer to that of diamond, thus resulting in a less visible separation. At the time of this first report it was speculated that perhaps silicone was being used as the filling agent.

Recently, Robert Crowningshield and Tom Moses, of the GIA Gem Trade Laboratory, decided to investigate the possibility that X-radiography would reveal new information about the filled diamonds, since different materials exhibit varying degrees of transparency to X-rays. They subsequently obtained three diamonds known to be treated in this manner and did a standard X-radiograph on them using a lower voltage and current than is normally used on pearls. On the processed film (figure 1), the filled areas of the diamonds proved to be completely opaque to X-rays and appeared as distinct white areas. Next, because of the reports that silicone was involved, they coated an untreated diamond with silicone grease to see if the silicone coating would affect the X-ray transparency. It did not, so silicone was ruled out as the possible filling agent. Further work is now being done at GIA to determine what the composition of the filling material is.

India to synthesize diamonds. During the opening of a Soviet science exhibition in Bombay, Soviet delegates announced plans to teach Indian scientists how to synthesize diamonds for industrial and other uses. [**Editors' Note:** At present we do not know if this technological package includes the methodology required to synthesize gem-quality diamonds.]

Remarkable diamond. A natural diamond with highly unusual inclusions (figure 2) was recently examined by Anthony de Goutière of de Goutière Jewellers, Ltd., in Victoria, British Columbia. Mr. de Goutière at first suspected that these tube-like inclusions in the 0.06-ct round brilliant cut were the result of laser drilling. On further examination, he ruled out laser drilling because the tubes had brown radiation stains, their surface openings lacked the conical appearance normally associated with laser drilling, and drag lines extended from each of the holes (indicating that they were there when the diamond was last polished). His conclusion was further supported by the fact that no remnants of inclusions (i.e., the potential targets) could be seen at the sharp corners of the geometric patterns, and by the questionable economics of laser drilling such a small stone. Careful examination of the evidence strongly

Figure 1. The white areas in this X-radiograph represent the filled cleavages and cracks in these three treated diamonds (the largest weighs 1.49 ct). X-radiograph by Tom Moses.



suggests that these inclusions are of natural origin, possibly fission tracks. Mr. de Goutière has donated the diamond to GIA's Byron C. Butler Inclusion Collection for further study.

Synthetic diamond thin-film update. A number of firms are making continued advances in vapor-deposited synthetic diamond thin films. Japanese companies such as NEC Corp., Seiko Instrument Co., and Sumitomo have been exploring the possible applications for this technology since learning of its discovery in 1975 by Soviet scientists. Crystallume, an American firm in Menlo Park, California, has found a way to make an ultra-thin (less than 1 μ) synthetic diamond window that is ideally suited for X-ray instruments used for materials analysis. This represents the first industrial product out of this technology. Other possible applications include computers and diamond-coated tools.

Presently, two low-pressure methods are used to deposit synthetic diamond films on almost any object. The first requires that a metal filament be heated to incandescence in the presence of a mixture of hydrogen gas and a hydrocarbon vapor, such as methane. At the filament, the hydrogen molecules split into individual atoms and the hydrocarbon molecules break, freeing some carbon. The subject to be coated is also heated to at least 1000°F (546°C). When the hot mix of gases encounters the heated object, a thin coating of carbon, in the form of synthetic diamond, is deposited over the exposed surface area. The other method uses the same mix of gases but irradiates them by a radio frequency field and/or a microwave beam, at which point a thin film is deposited on a heated subject.

The greatest drawback is that the subject must be heated to a high temperature for either process to work. However, the Beamalloy Corp., of Dublin, Ohio, uses a technique known as ion-beam enhanced deposition to deposit a super-hard carbon coating on almost any subject, including those with low melting points such as plastics. Recently, Beamalloy has been working closely with GIA Research to place ion beam–enhanced thin-film coatings on materials such as opal and emerald so that the properties of the coatings can be carefully studied and their potential gemological effects better understood.

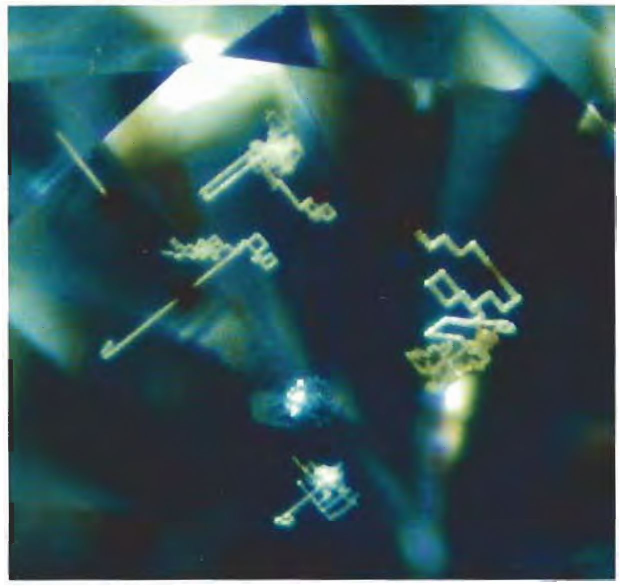


Figure 2. These intricately patterned thin tubes were initially believed to be caused by laser drilling. The radiation stains and the small size (0.06 ct) of the diamond were two of the indications that these tubes are, in fact, natural. Photomicrograph by Anthony de Goutière.

COLORED STONES

Pyrope or spinel . . . a question of identity. Mr. Donald Clary of Rancho Palos Verdes, California, recently brought *Gems & Gemology*'s technical editor, Carol Stockton, a pink stone that had been sold to him as garnet. While it resembled the pear-shaped pink pyrope illustrated in the Summer 1988 issue of *G&G* (figure 1, page 105), its refractive index of 1.718 seemed too low for the depth of color displayed, and suggested instead that the stone was spinel. In addition, it contained some wispy-looking inclusions not at all typical of garnet.

Energy dispersive X-ray fluorescence chemical analysis revealed that the stone was, in fact, a spinel with a trace of chromium to provide the pink color. Gemologically, the only means to distinguish such a spinel from a pink pyrope would be a combination of refractive index, inclusions, and possibly U.V. fluorescence. Pink pyropes have been observed to have refractive indices between 1.730 and 1.742. Below this range, they become very pale and ultimately colorless. Gem-quality pink spinels have a fairly constant refractive index of 1.718. Only in the presence of appreciable chromium, enough to produce the much-desired "flame" red color, does the R.I. rise toward the range of pink pyrope. In this case, of course, color will preclude confusion.

Since pure, colorless pyrope has an R.I. of 1.714, and pure, colorless spinel has an R.I. of 1.712, it is theoretically possible for similar-appearing stones to exist with equally similar indices of refraction. Thus, inclusions provide the best means of separating the two species.

Continued tsavorite mining. Contrary to rumors that have circulated recently, the supply of tsavorite garnet in East Africa appears plentiful. According to geologist Campbell Bridges, tsavorite is becoming so popular that even the more included material is now being cut and marketed.

Mr. Bridges is the discoverer of tsavorite and still one of its major producers. According to him, "It is

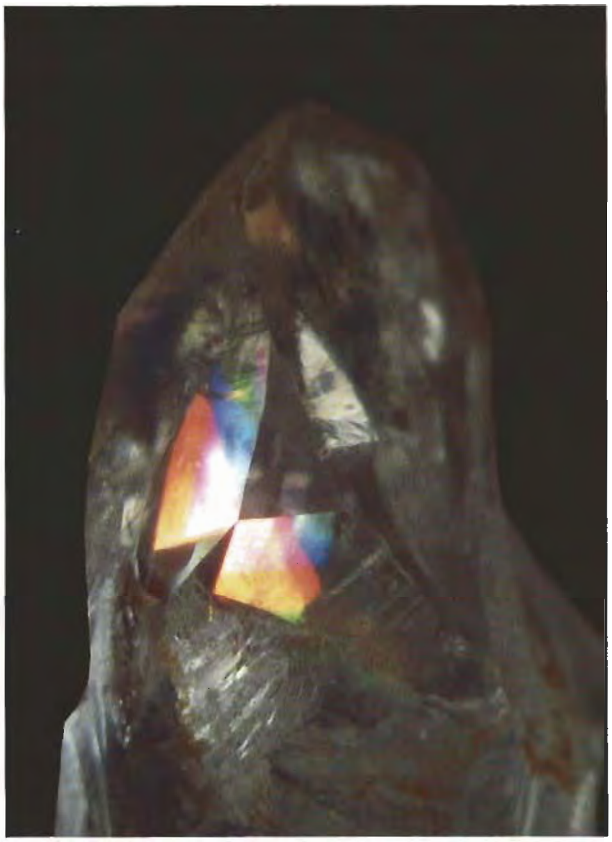


Figure 3. This 6.5-mm-wide near-colorless quartz crystal from near Poona, India, displays brilliant diffraction-caused colors. Photo by John I. Koivula.

expensive to mine . . . [because it] is confined to erratic shoots that, when the overburden becomes too great, have to be followed underground by tunneling. This involves careful blasting and progressively expensive removal of waste as well as the necessity of ventilation to considerable depths. It is possible that in the best of the tsavorite mines in East Africa, the shoots will persist for several hundred and even thousands of feet underground, thereby assuring regular commercial production over the next several years."

Unusual Indian quartz. The Winter 1987 Gem News column reported on Jack Lowell's discovery of an adularescent-like phenomenon observed in some amethysts from Artigas, Uruguay. In these amethysts, this colorful "Lowell Effect" is strictly confined to the minor rhombohedral faces and the areas immediately surrounding them. Now it appears that another source of quartz showing this phenomenon has been discovered.

While on a buying trip to India, Meg Easling and Julie Wellings, the proprietors of Gem Quest Jewelers in Ojai, California, came across some crystal-covered geode sections of colorless quartz from near Poona that displayed what looked like brilliant iridescent colors when viewed in certain directions (figure 3). At first they thought that the colors were a thin-film effect caused by small fractures in the crystals, similar to what is observed in both quench-crackled and natural "iris quartz." Closer examination, however, proved that this was not the case. The colors were confined to the minor rhombohedral faces and zones immediately surrounding them, just as in the amethysts from Uruguay.

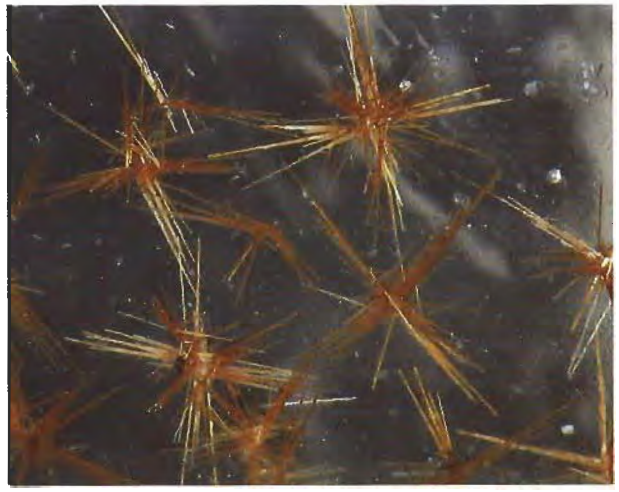


Figure 4. Delicate twinned sprays of rutile such as these are the most common inclusions observed in a new find of smoky quartz from California. The largest rutile clusters are approximately 1 mm across. Magnified 15×; photomicrograph by John I. Koivula.

California quartz. In February 1988, while tracing quartz float up a ravine in the Inyo National Forest in Inyo County, California, Michael and Cora Anderson of Lomita discovered a small pocket containing a few small crystals of smoky quartz near "Crystal Ridge," at the west end of the Santa Rita pluton. Continued exploration showed that the pocket was actually a quartz vein that ranged in thickness from a few inches up to 3 ft. (approximately 1 m) and seemed to contain numerous crystal-bearing pockets.

Following the vein, the Andersons have excavated a small (3 ft. × 10 ft.) adit into the granite mountain. So far, approximately 300 lbs. (135 kg) of single crystals and crystal clusters have been mined. Of these, 20% to 30% are of good specimen quality, while many are facetable. The crystals, which range from transparent to opaque, are most commonly smoky brown; some are near-colorless.

The crystals average about 1 ½ in. (2.2 cm) long, but individual crystals as large as 2 in. × 6 in. have been recovered. Many of the crystals are doubly terminated. A few are wedge-shaped, while others have almost perfectly equidimensional prism faces and nearly ideal terminations. Some show selective or directional etching effects on their surfaces, and many show facial- and etch-produced evidence of Dauphiné twinning, such as the repetition of *s* and *x* faces.

One of the most unusual features of these quartzes is their suite of inclusions. Chlorite, calcite, hematite, and rutile have been identified so far. The rutile is the most obvious inclusion; it appears as exceptional twin sprays reminiscent of "golden stars" (figure 4). The rutile also appears to be directionally deposited and of late-stage syngenetic origin, because it is found only on certain prism and rhombohedral faces, and always just beneath or right at the surface. Although now the Andersons are finding fewer crystals and more of what looks like ordinary chalcedony, they recently found signs of additional quartz deposits nearby.

"Aqua Aura" quartz. Peter and Bobbi Flusser, of Overland Gems in Los Angeles, showed the Gem News editors a new form of treatment being used on rock crystal quartz. The treatment consists of coating both single crystals and crystal clusters with a thin film of gold so sheer that the opacity normally associated with this dense metal is negated and the actual transmitted-light color of gold, a blue to greenish blue, becomes apparent (figure 5). In addition, the crystals acquire a superficial, colorful iridescence that is readily visible in surface reflected light. Because of the obvious bluish color, these treated quartzes are being promoted under the name "Aqua Aura," meaning blue gold, by the supplier, Bob Jackson Minerals of Renton, Washington. Testing by the editors has shown that the coating is very durable and does not seem to affect any of the gemological properties (R.I. and S.G.) of the underlying quartz.

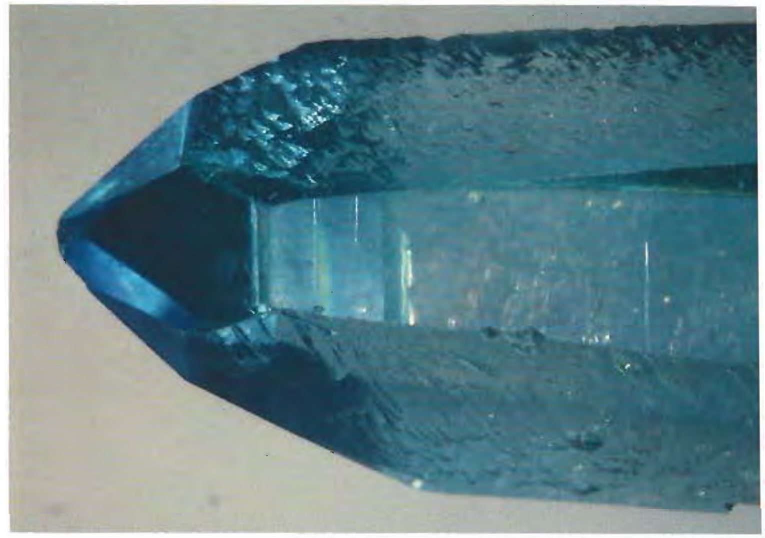
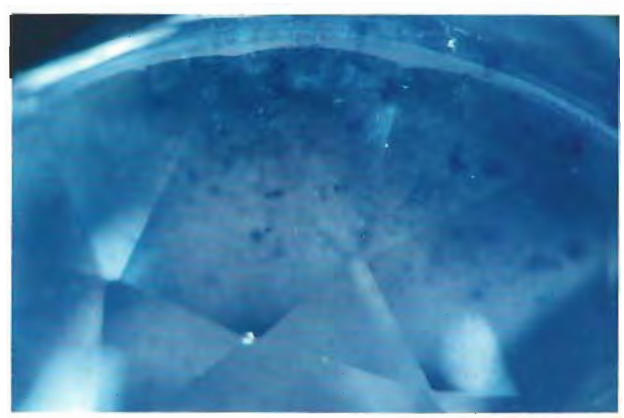


Figure 5. The color in this "Aqua Aura" quartz crystal results from a thin-film coating of gold. Photo by William Videto.

New evidence of treatment in Umba sapphires. Any evidence that provides absolute proof that a sapphire has or has not been heat treated is always of value to gemologists. A recent investigation done by one of the Gem News editors (JIK), which was published in the *Journal of Gemmology* (Vol. 20, No. 7, 1987), showed just such evidence in the form of colored halos surrounding solid mineral inclusions in sapphires from Sri Lanka and Montana. The halos result from the heat-induced theft, by the sapphire host, of color-causing ions from the mineral inclusions.

After reading the above-mentioned article, Dr. Henry A. Hänni, of the University of Basel and the Swiss Foundation for the Research of Gemstones, contacted Gem News and reported his discovery of similar internal diffusion halos surrounding tiny mineral inclusions in blue sapphire from the Umba River region in Tanzania, East Africa (figure 6). Dr. Hänni's observation provides positive evidence that at least some of the sapphires from this locality are being heat treated.

Figure 6. Proof of color enhancement in this sapphire from the Umba River region in Tanzania, East Africa, is shown by the dark blue spots that result from internal diffusion. Magnified 30×; photomicrograph by Henry A. Hänni.



Largest faceted gemstone. In his recent *Gems & Gemology* article (Spring 1988) on faceting large stones, Michael Gray reported that a 22,982-ct topaz, since named the "American Golden," had just become the largest gem ever cut. This gem has now been donated to the Smithsonian Institution in Washington, D.C., by Drs. Marie and Edgar Borgatta together with the American Federation of Mineral Societies.

Dr. Edgar Borgatta preformed the stone from the original 26-lb. (12 kg) piece of rough, and then commissioned Leon M. Agee, of Walla Walla, Washington, to facet it. The cut designed by Mr. Agee has 62 crown facets and 110 pavilion facets; the finished stone measures 17.3 × 14.9 × 9.2 cm. The overall color is basically light yellow, but three light blue chevrons of color zoning provide a slightly chartreuse tinge under some lighting conditions.

Figure 7. The world's largest faceted gem, a 22,982-ct topaz named the "American Golden," was cut by Leon M. Agee. Photo by Ken Nicoles Photographers, Walla Walla, WA.

Mr. Agee designed the machine used to cut the "American Golden" around an older-model Prismatic faceting machine, which he had to modify extensively. The problems of counter-balancing such a large machine with such a large preform were not trivial (figure 7). Approximately 1,000 hours were needed to complete the project.

Ruby receives highest price at auction. A 15.97-ct Burmese ruby (figure 8) was sold at Sotheby's October 18, 1988, jewelry auction in New York for a record price of $3,630,000—the highest price ever paid at auction for a colored stone.

Figure 8. This 15.97-ct Burma ruby sold for $3,630,000 at the October 1988 Sotheby's auction. It is the highest price ever paid at auction for a single colored stone. Photo by Tino Hammid.

SYNTHETICS

Unusual synthetic beryls from the Soviet Union. A selection of unusual hydrothermally grown synthetic beryl crystals, in a variety of colors (figure 9), were provided to Gem News for study by Dr. Nikolai Sobolev of the USSR. The beryls were grown in the Laboratory for Hydrothermal Growth, at the Institute of Geology and Geophysics, Siberian Branch of the USSR Academy of Sciences, in Novosibirsk, under the supervision of Dr. V. A. Klyakhin and Dr. A. S. Lebedev.

Deposited over colorless seeds, these crystals are the product of growth experiments involving the coloration of synthetic beryl using a variety of ionic dopants. The purple results from doping with a combination of chromium and manganese. The bright, intense pink is caused by manganese alone (like morganite and the natural red beryls from Utah). The blue is the product of copper coloration, and the rich, slightly orangy red crystal owes its color to a trace of cobalt.

We do not know how much of this material has been grown and whether or not it will ever be commercially available. Recently, however, Dr. Karl Schmetzer of Heidelberg, West Germany, showed GIA's Dr. Emmanuel Fritsch a 1-cm fragment of a synthetic hydrothermal "aquamarine" grown in the Soviet Union at the same Laboratory for Hydrothermal Growth. Dr. Fritsch described it as a dark "sapphire blue," strongly pleochroic, millimeter-thick overgrowth on colorless beryl. So it appears that, in addition to the crystals shown here, at least one other unusual color of hydrothermal synthetic beryl has been grown in the USSR.

The specific gravities and refractive indices of these crystals are similar to those already reported for hydrothermal synthetic emeralds and some natural beryls. However, their absorption spectra and internal characteristics would be sufficient to identify them as synthetic if faceted stones should ever be cut.

The Pool synthetic emerald. In August 1988, International Colored Gemstone Association (ICA) Alert No. 18 addressed "Pool Emeralds," specifically, "the way in which these laboratory grown emeralds are being promoted [widely in Australia] . . . as the 'treated Pool Emerald.'" A follow-up alert was issued in October 1988 by Australian gemologist Dr. Grahame Brown, who concluded that "the gemmological properties, and the characteristic inclusions, of the Pool Emerald were virtually identical to those of the Biron hydrothermally-grown emerald . . . another product of Equity Finance Ltd." This was followed by a report in *Jewellery News Asia* from a gemological laboratory in Hong Kong which identified the "Pool Emerald" as synthetic. A preliminary study of the gemological properties of the "Pool

Emerald" carried out at GIA's West Coast Gem Trade Laboratory (and confirmed by EDXRF chemical analyses) also showed that these synthetic emeralds have properties virtually identical to those reported for Biron hydrothermal synthetic emeralds by Robert E. Kane and Richard T. Liddicoat, Jr., in the Fall 1985 issue of *Gems & Gemology*.

The promotional material for this product has been revised considerably, apparently in response to criticism. The first literature read: "The Pool Emerald . . . From the Emerald Pool Mine of Western Australia (1929) . . . Source of natural and treated emeralds . . . The Pool Emerald (R) is refined by recrystallising 100% natural emerald from the Emerald Pool Mine . . . . The Pool Emerald (R)—available either clean, or slightly included." The most recent advertisment, however, reads "The Pool Emerald . . . A Laboratory Grown Hydrothermal Emerald . . . . The laboratory grown Pool Emerald is recrystallised emerald from the Emerald Pool Mine, Western Australia."

Figure 9. These synthetic beryls grown in the Soviet Union range from 14.48 ct (purple) to 31.63 ct (pink). Photo by Robert Weldon.

ANNOUNCEMENTS

Great Britain's National Association of Goldsmiths (NAG) has announced its plan to register qualified jewelry appraisers in the United Kingdom. In a program designed to protect the public, the association says it will register only those jewelers who are qualified to produce competent evaluations, and will give them a special red and orange symbol showing the words "NAG registered valuer" to display.

The new journal, Gemological Digest, is no longer being offered free of charge, reportedly because of the higher production costs involved with the new format. For further information, please contact the journal's editor, Richard Hughes, at the Asian Institute of Gemological Sciences, 987 Silom Rd., Rama Jewelry Bldg., 4th Floor, Bangkok, Thailand 10500.

The 1989 International Colored Gemstone Association Congress will be held May 21–26 at the Hilton International, Colombo, Sri Lanka. Planned events include the first ICA Intertrade Auction, voting on several nomenclature issues and trade rules and regulations, and an ICA forum with the association's board of directors. For more information, contact the ICA office at 22643 Strathern St., West Hills, CA 91304; telephone (818) 716-0489.

Also from the ICA comes the Gembureau, a gemstone promotion and information service that will be responsible for international media relations on behalf of the gemstone industry and will serve as a resource for both consumer and trade publications. The funds to establish the Gembureau were contributed by ICA members. For more information, contact Cheryl Kremkow, Gembureau, 609 Fifth Ave., Ste. 905, New York, NY 10017; telephone (212) 688-8452.

INHORGENTA–Autumn München 89 (The Munich Watch and Jewellery Days) will be held September 23–25, 1989, at the Munich Trade Fair Center. This annual event (always the last weekend of September) is organized by the Munich Trade Fair Corp. There is room for 400 exhibits, but the registration deadline is April 15. For more information, contact the sponsors at Messegelande, Postfach 12 10 09, D-8000 München 12, West Germany; telephone (089) 51 07-506.

Hong Kong is the site for several trade shows in 1989. The 2nd World Gems Expo will be held June 3–6, at the Hong Kong Convention and Exhibition Centre. The expo will accommodate over 700 manufacturers, suppliers, cutters, and miners from around the world. The World Fashion Jewelry & Accessories Expo, planned for July 1–4, is a showcase of high fashion/costume jewelry, personal ornaments and accessories, gift items, and much more. The 7th Hong Kong Jewelry and Watch Fair will be held September 19–22; it features jewelry and gems as well as all types of clocks and watches, and even manufacturing equipment. For more information on all of the above, contact Headway Trade Fairs, Ltd., 9/F, Sing-Ho Finance Bldg., 168 Gloucester Rd., Hong Kong.

Mr. Donald Feldpush's name was mistakenly left out of the list of people who received a perfect score on the 1988 *Gems & Gemology* Challenge. We regret the error and congratulate Mr. Feldpush on his accomplishment.