
GEMOLOGICAL ABSTRACTS

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COLORED STONES AND ORGANIC MATERIALS

The amber ark. G. O. Poinar, Jr., *Natural History*, Vol. 97, No. 12, December 1988, pp. 42–47.

Dominican amber, known for the well-preserved vertebrate animals it often contains, offers new clues to the theories of evolution and continental drift in Central America and the Greater Antilles (the islands of Cuba, Jamaica, Hispaniola, and Puerto Rico). Poinar describes a specimen he examined that contains a tiny adult frog

This section is designed to provide as complete a record as practical of the recent literature on gems and gemology. Articles are selected for abstracting solely at the discretion of the section editor and her reviewers, and space limitations may require that we include only those articles that we feel will be of greatest interest to our readership.

Inquiries for reprints of articles abstracted must be addressed to the author or publisher of the original material.

The reviewer of each article is identified by his or her initials at the end of each abstract. Guest reviewers are identified by their full names. Opinions expressed in an abstract belong to the abstractor and in no way reflect the position of Gems & Gemology or GIA.

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encased in resin some 30 to 40 million years ago. He continues by explaining that Dominican amber is extremely clear and possesses a high quality of preservation, allowing for accuracy in the identification of flora and fauna.

One of Poinar's goals in studying inclusions in Dominican amber is to "reconstruct the forest ecosystem of the Tertiary period (from about 25 to 40 million years ago) in this part of the Caribbean" based on species he identifies. The evidence produced by his studies supports some geologists' views that during the Tertiary period the islands that now comprise the Greater Antilles were part of a contiguous archipelago between North and South America, and were pushed to their present-day positions through the action of plate tectonics.

Four remarkable color photographs of Dominican amber specimens accompany the text, together with a map of present-day Central America and the theorized positions of the Greater Antilles 35–40 million years ago. JLC

The American Golden. L. M. Agee and E. F. Borgatta, *Lapidary Journal*, Vol. 42, No. 9, December 1988, pp. 80–90.

This article provides a detailed report on the acquisition and fashioning of the 22,892.5-ct (finished weight) yellowish topaz known as the American Golden. From

an approximately 26-lb. waterworn cobble emerged a stone that now measures 173 mm × 149 mm × 92 mm. The stone has 62 crown and 110 pavilion facets, and the table is oriented perpendicular to the cleavage plane. The American Golden was donated to the National Museum of Natural History (Smithsonian Institution) in Washington, DC, on May 4, 1988. Seven illustrations, four in color, accompany the text. WRV

Certitude de la détermination de l'origine des gemmes
(**Certainty of the determination of the origin of gems**). H. A. Hänni, transl. into French by F. Roche, *Revue de Gemmologie a.f.g.*, No. 97, 1988, pp. 4–5.

This carefully worded article deals with the difficult problems of reporting on the geographic origin of gemstones. The many factors that should be considered are listed. The author emphasizes that, even with meticulous observation and comparison to a large number of well-documented stones, any interpretation can only be stated cautiously. Ways of obtaining basic knowledge in this matter are proposed, and the limitations and difficulties one would encounter are listed. The author then provides the reader with the precise wording of the two standard conclusions that his laboratory, the Swiss Foundation for the Study of Precious Stones, issues on their reports. EF

Gemmology Study Club lab reports. G. Brown and J. Snow, *Australian Gemmologist*, Vol. 16, No. 11, 1988, pp. 424–429.

This compilation of brief reports first describes a pair of plastic hololith rings. One that visually resembles lapis lazuli had a 1.69 S.G., a 1.55 spot R.I., and a Mohs hardness of 3, but an S.G. of 1.50. Magnification revealed that it probably had been manufactured by breaking the surface; and a concave circumferential "mold mark" on the inner surface. The other ring, a malachite imitation, also had a 1.55 spot R.I. and Mohs hardness of 3, but with a 1.50 S.G. Magnification revealed that it probably had been manufactured by trephining (drilling) the piece from a block of filled plastic, with the banding produced by including opaque plastic particulate fillers in very carefully controlled layers within a thermosetting plastic matrix.

Also reported on is a "bronze"-colored chatoyant nepheline cabochon from Korea. Gemmological properties include a 2.53 S.G., a 1.55 spot R.I., a vitreous luster, broad chatoyancy of moderate intensity, and no fluorescence or diagnostic absorption spectrum. Examination with a microscope revealed that the chatoyancy was due to reflection of light from fine, parallel, tube-like inclusions.

Other materials examined include a cabochon of dumortierite in quartz; an elephant ivory necklace of African provenance; a ring-set diamond that cleaved badly when it was dropped into a sink; a strand of gray plastic imitation pearls with an artificial nacre that is

considerably more radiopaque than the plastic from which the beads were formed; and a synthetic spinel triplet with a junction plane below the girdle.

RCK

Gemmology Study Club lab reports. G. Brown and J. Snow, *Australian Gemmologist*, Vol. 16, No. 12, 1988, pp. 464–470.

Plastic-impregnated Brazilian opals are the first of several interesting specimens examined, described, and illustrated by the authors. It was noted that transmitted light, alone or in conjunction with lateral illumination, might be used to detect polymer-like fracture fillings in such treated opals.

The next item covered is "Lapis Nevada," an ornamental material with pink thulite, yellow-green epidote, green diopside, and white to lavender scapolite as its major constituents. It has a distinctive appearance, a Mohs hardness of 5 to 7, an S.G. of 2.83, and a variable spot R.I.

An unusual metallic cabochon consisting of bis-muthinite, magnetite, chalcopyrite, quartz, and calcite is described, followed by a report on Emmaville emeralds. X-ray fluorescence scans revealed vanadium as the major chromophore in emeralds from this Australian locality. Also covered are an imitation of a mabe cultured pearl, reportedly constructed from a flattened hemispherical section of the shell of a Philippine land snail; a bicolored cryptocrystalline quartz ring in which the brown component is aventurescent, while the green component contains green mossy dendrites; an amethyst crystal with a movable bubble in a large two-phase inclusion; brownish mottled dyed calcite beads; and a partly devitrified green glass containing gas bubbles and whitish spherical aggregates that morphologically resemble wollastonite. RCK

Gold coral re-evaluated. G. Brown, *Australian Gemmologist*, Vol. 16, No. 12, 1988, pp. 472–474, 476–477.

Gold coral is harvested from the Makapuu Bed off the Hawaiian island of Oahu. This relatively costly material has been imitated by bleaching black coral with a 30% aqueous hydrogen peroxide solution. The treated material may be distinguished by a rough, abrasive surface; the presence of radially arrayed spines; and the superficial distribution of the bleached areas.

The author proceeds to describe the appearance of several necklaces of gold coral that displayed some interesting anomalies: The material had an atypical yellowish brown color, and the surfaces of both the beads and the limb segments had longitudinal grooves as well as an uncharacteristic greenish blue iridescence. Spot R.I. determinations gave readings of 1.60, 0.03 to 0.04 higher than the accepted values for gold coral. Low-power magnification revealed that the material had been impregnated and coated with a plastic; higher magnifi-

cation revealed small bubbles in the thin plastic coating of some beads.

This well-illustrated article should prove most useful in identifying both bleached black coral and plastic-impregnated gold coral.

RCK

A new type of twinning in natural sapphire. K. Schmetzer, *Journal of Gemmology*, Vol. 21, No. 4, 1988, pp. 218–220.

Two twin laws have been observed in natural corundum: contact twins on the basal plane c (0001), or on the positive rhombohedron r (10 $\bar{1}$ 1). Polysynthetic lamellar twins according to the second law are also commonly encountered in faceted gem corundums.

Several inclusions of isolated corundum crystals appearing as part of a lamellar twinning on (10 $\bar{1}$ 1) have been observed in about 50 natural sapphires from Sri Lanka. Since this twinning structure can be described as a combination of a single contact twin and lamellar polysynthetic twinning on the rhombohedral plane, it is classified as combined rhombohedral twinning. Such a feature has been observed so far only in natural corundum. Six photomicrographs illustrate the article.

EF

The New Zealand aurora shell: A unique organic gem material. G. Brown and A. J. McCabe, *Australian Gemmologist*, Vol. 16, No. 11, 1988, pp. 401–407.

The first part of this article deals with McCabe's "discovery" of iridescent New Zealand mussel shell in the remains of a Maori fire at Te Wae Wae beach on South Island. This led to several years of searching beaches around the country for usable iridescent shell. The second half of the report deals with the gemology of what is known variously as Aurora Shell, Fiordland Colour Mussel, and New Zealand Kuku Shell, the highly iridescent, nacreous shell of the New Zealand green-lipped mussel, *Perna canaliculus*.

Gem-quality shell reportedly comes from only three localities on South Island. Polished specimens of iridescent shell nacre examined had the following properties: visual features—pale brownish body color with a patchy color distribution and strong iridescent flashes seen when rotated under overhead illumination; diaphaneity—translucent; Mohs hardness—3–4; fracture—splintery; S.G.—2.75–2.8; spot R.I.—1.52–1.53; U.V. fluorescence—pale bluish white to long wave, very pale bluish white to short wave; no diagnostic visible-light absorption spectrum.

The authors note that finished pieces of jewelry fashioned from this shell are either plastic coated (giving a spot R.I. of 1.54) or composites consisting of shell nacre and a pink polyester resin base. According to the manufacturer, all of the shell that appears in jewelry (composites or otherwise) is dyed, with a variety of dye colors being used.

RCK

Quartz: The starter stone. D. A. Hiss, *Jewelers' Circular-Keystone*, Vol. 160, No. 2, February 1989, pp. 385–392.

As part of JC-K's continuing series of articles on gemstones of the world, the quartz family is highlighted in this issue. As with other articles from this series, it could be described as a microcosm of the topic, yet succinct and informative for the jeweler or quartz enthusiast. Considering the wealth of information that exists on quartz varieties, trade names, and synthetics, as well as on mining localities and history, one is pleased to find it so cleverly synopsized here. Seventeen color photographs help illustrate some of the more notable varieties, typical inclusions, and quartz enhancements that one is likely to encounter in the trade. For those readers interested in the metaphysical aspects of quartz, a section on "Quartz as Healer" is also included.

RW

DIAMONDS

Famous diamonds of the world XXXIII: The Tiffany.

I. Balfour, *Indiaqua*, Vol. 49, No. 1, 1988, pp. 119–122.

The Tiffany jewelry company is known for its taste in fine diamonds. It is not surprising, then, that one of the most famous bears the prestigious name. In its rough state, the Tiffany diamond, an intense yellow octahedron, weighed 287.42 ct; in 1878, it was cut to a 128.51-ct cushion-shape brilliant under the supervision of George F. Kunz.

Balfour explains that the exact year the Tiffany rough was discovered is questionable because of the lack of "precise information" and accurate record keeping at the South African diamond mines prior to 1888. On the basis of a brief account of early diamond-mining history, Balfour concludes that the Tiffany must have originated in the mine claims of the French Company. This is supported by the fact that the rough was shipped to France in 1878, where it was cut. He estimates that it was found in either 1877 or 1878. In the course of this discussion, Balfour provides a fascinating account of the power struggle involving the French Company that eventually led to the formation of De Beers Consolidated Mines in 1888.

Throughout its history, the Tiffany diamond has been on display at the Tiffany store in New York and at numerous exhibitions in the United States and Europe. Possession of the diamond remains with the Tiffany company despite rumored attempts to sell the gem.

JLC

Famous diamonds of the world XXXIV: The De Beers diamond. I. Balfour, *Indiaqua*, Vol. 49, No. 1, 1988, p. 123.

Ian Balfour reports that the De Beers diamond, at 234.50 ct, is the fourth largest cut diamond in the world. Since this article was printed, the De Beers diamond has

become fifth on the list, as the recently completed 407.48-ct triolette-cut diamond sometimes called the Incomparable is now the second largest.

The De Beers diamond was found at the Kimberley mine in March 1888, a 439.86-ct light yellow octahedron. It was subsequently cut to its current 234.50-ct cushion shape. Balfour mentions that the De Beers diamond has been confused with a diamond called Victoria I, but claims that they are actually one and the same.

An unsuccessful attempt to auction the De Beers diamond was made in May 1982 at Sotheby's in Geneva; apparently the \$3.16 million top bid did not meet the reserve set for the stone. It has since been sold to a private buyer. JLC

GEM LOCALITIES

Bamboo coral: A new precious coral from Hawaii. G. Brown, *Australian Gemmologist*, Vol. 16, No. 12, 1988, pp. 449–454.

Beginning with a brief historical review of coral sources and recovery methods, this article reports on the occurrence and gemology of bamboo coral, *Lepidisis olapa*. Bamboo coral occurs in association with both pink and gold coral in the Hawaiian Archipelago. It is harvested at a rate of 150 kg per year by deep-diving submersibles at depths of 300–470 m.

Bamboo coral has a distinctive appearance, consisting of opaque, white, inflexible, slightly curved calcareous internodes 3–7 cm long, and translucent, dark brown, flexible horny nodes 0.2–1 cm long. These two components are gemologically distinctive. The internodes are composed of white calcite that is longitudinally striated. The calcite has a Mohs hardness of 3–4, uneven fracture, subvitreous luster, 2.70 S.G., spot R.I. of 1.63 to 1.65, fluoresces bluish white to long-wave U.V. and pale bluish white to short-wave U.V., and is soluble in HCl. The nodes are composed of brown organic gorgonin that is also longitudinally striated. The gorgonin has a Mohs hardness of 2–3, splintery fracture, resinous luster, 1.38 S.G., spot R.I. of 1.56, is inert to both long-wave and short-wave U.V., and is insoluble in HCl.

The author states that bamboo coral consisting of both nodes and internodes should be relatively easy to identify in jewelry, but that an item formed from only the internode could be difficult or impossible to separate conclusively from white corallium corals. This well-written article also includes a very useful table that compares the properties of Hawaiian corals: bamboo, pink, gold, and black. RCK

Gem tourmaline on Kangaroo Island. J. L. Keeling and I. J. Townsend, *Australian Gemmologist*, Vol. 16, No. 12, 1988, pp. 455–458, 470.

This article reports on the history and geology of Dudley Pegmatite on Kangaroo Island, Australia, and on the

gemological properties of tourmaline recovered from the pegmatite.

Tourmaline was reported from the deposit as early as 1898. Although the quantity recovered over the years is not known, blue, green, and "watermelon" varieties have been mined. After early pockets were worked out, the deposit was used as a source of feldspar, quartz, and kaolin clay for the pottery industry.

This investigation included tourmalines from dumps of old workings, pockets, and the South Australia Museum. The gemological properties of dark blue, pale to dark green, and pink/green "watermelon" tourmaline from this locality are reported. This is an interesting account of one of the few recorded occurrences of gem-quality tourmaline in Australia. RCK

Gems around Australia. H. Bracewell, *Australian Gemmologist*, Vol. 16, No. 12, 1988, pp. 459–463.

This article is an informal report of a trip taken by the author and her husband to a variety of both better- and lesser-known gem deposits in Australia. Beginning in New South Wales, the first visit was to the Torrington tin lode, where topaz, beryl, smoky quartz, and fluorite may be found. Not far from this site is Emmaville, where emerald has been mined commercially.

The next stops on the journey were in Queensland, where many gem materials, in addition to the well-documented opal and sapphire, are recovered. One of these is chrysoprase, which has been mined commercially at Marlborough. In the north of the state, at Mt. Surprise, commercial quantities of aquamarine are found in vugs in association with smoky quartz or feldspar crystals. At Mt. Hay, fossickers dig for thunder eggs; and north of Muttaborra, waterworn quartz, agate, and petrified wood are found in abundance.

Additional gem-producing areas of Queensland and the materials they produce include Chudleigh Park station (peridot, sapphire, zircon, and moonstone), Agate Creek (agate and thunder eggs), Cloncurry (chrysocolla), and Kuridala (amethyst). RCK

Sapphire-bearing ultramafic lamprophyre from Yogo, Montana: A ouachitite. H. O. A. Meyer and R. H. Mitchell, *Canadian Mineralogist*, Vol. 26, Pt. I, 1988, pp. 81–88.

The authors report on their detailed mineralogic and petrographic examination of the sapphire-bearing Yogo lamprophyre dike located in the Judith River basin in central Montana. The authors point out that the Yogo dike is unique in that it is the only known igneous dike from which sapphires are actually mined *in situ*.

The authors found that the dike rock consists of "subhedral grains of phlogopite and clinopyroxene set in a finer groundmass of mica, clinopyroxene, titaniferous magnetite and apatite with a mesostasis of chlorite, calcite, serpentine, and rare K-feldspar." A titanium and aluminum-containing diopsidic augite pyroxene also

occurs as polycrystalline aggregates and is believed to be of low-pressure origin. The phlogopite mica crystals appear to have been distorted during incorporation in the host rock and subsequently further deformed and altered.

On the basis of their research, the authors have classified the Yogo lamprophyre as a ouachitite. It was also determined that the sapphires are xenocrysts and occur as an accessory phase. Eight figures and five tables accompany the article. *JIK*

An unusual ruby from Nepal. H. Bank, E. Gübelin, R. R. Harding, U. Henn, K. Scarratt, and K. Schmetzer, *Journal of Gemmology*, Vol. 21, No. 4, 1988, pp. 222-226.

The identification of a fine-quality 1.288-ct ruby as both natural and Nepalese is described in this note. A detailed discussion of some potentially misleading growth zoning and spindle-like features is especially helpful. The conclusion was based largely on the presence of phlogopite (identified by energy-dispersive chemical analysis) and of liquid, gas, and/or solid inclusions characteristic of previously studied rubies of Nepalese origin. Ten optical photomicrographs and an EDX spectrum of a phlogopite inclusion illustrate the discussion. *CMS*

INSTRUMENTS AND TECHNIQUES

The EW-120SG electronic densimeter. G. Brown and J. Snow, *Australian Gemmologist*, Vol. 16, No. 11, 1988, pp. 422-423.

This report, by the Instrument Evaluation Committee of the Gemmological Association of Australia, evaluates an electronic balance designed specifically to "assay" the precious metal content of jewelry by determining its specific gravity.

The densimeter's three-step process is as follows. First, the precious metal object is weighed on the lid of the instrument; the weight, which is shown on the display, is then manually entered into the memory. Next, the object is weighed in the instrument's hydrostatic weighing tank; this second weight is not displayed but, rather, every 1.5 seconds the densimeter calculates and displays the S.G. The final step is to consult tables provided which correlate S.G. to precious metal content.

The instrument proved to be accurate for "assaying" 24-, 18-, and 9-karat yellow and white golds, but it failed to identify either plated or rolled golds. Another limitation is that only an average of the readings is given. Because this instrument will not distinguish gemstones from metal, it can only be used on nonstone jewelry. It was also determined to be much more accurate for heavier objects than for lighter ones. While not designed for this purpose, the instrument was shown to be useful in rapidly and accurately determining the specific gravity of a number of loose gem materials, as long as they

weighed more than 10 ct (2 grams, the lowest operating limit stated by the manufacturer). *RCK*

Fluorescence from pearls of freshwater bivalves and its contribution to the distinction of mother oysters used in pearl culture. T. Miyoshi, Y. Matsuda, and S. Akamatsu, *Japanese Journal of Applied Physics*, Vol. 27, No. 1, 1988, pp. 151-152.

Fluorescence spectra of white pearls from various mother oysters have been obtained with a pulsed nitrogen laser operating at 337 nm. The fluorescence intensity of the Japanese freshwater pearls from *Hyriopsis shlegeli* (Ikecho) shows a peak at about 410 nm, while pearls of saltwater oysters [*Pinctada fucata* (Akoya oyster), *Pinctada margaritifera* (black lip oyster), *Pinctada maxima* (yellow lip oyster), and *Pteria penguin* (mabe)] have peaks at wavelengths longer than 430 nm. This difference makes it possible to distinguish among bivalve pearls of fresh- or saltwater origin. This result also applies for pink, orange, and gray, but not brown, freshwater pearls. Pearls of *Pinctada penguin* and *Pinctada margaritifera* can be distinguished by a peculiar fluorescence peak at 620 nm under 400 nm excitation wavelength. *EF*

The identification of a natural ruby by electron spin resonance (ESR). D. R. Hutton and G. J. Troup, *Australian Gemmologist*, Vol. 16, No. 11, 1988, pp. 399-400.

This brief report covers the identification of a ruby, purportedly purchased in China, using ESR spectrometry. The procedure used was to run the ESR spectrum of a natural Burma ruby and that of a "synthetic (boule) specimen," and then run the spectrum of the stone being investigated. Based on the similarity of the unknown's spectrum to that of the Burmese stone, the authors conclude that the unknown is of natural origin. They also state in their conclusion "that ESR spectrometry is far more accurate than microscope optical investigation" and question how many natural rubies have been misidentified as synthetic using optical microscopy.

While the authors' identification of this particular specimen may be correct, it is unfortunate that they chose to use only one natural stone and one melt synthetic. At the very least, one or more flux-grown synthetics should have been examined, as it is known that some of these contain iron, an element that appeared in the ESR spectra of the Burmese stone and the unknown but not in the spectrum of the melt synthetic. *RCK*

JEWELRY ARTS

Authenticating Tiffany jewelry. J. Zapata, *Jewelers' Circular-Keystone*, Vol. 159, No. 8, August 1988, pp. 227-230.

Although useful for determining the provenance of a

piece, trademarks can nevertheless be confusing. Here, Tiffany's archivist demystifies the several trademarks that appear on jewelry and jeweled objects made by Tiffany & Co., past and present. The author explains why, in some cases, a small plaque with the Tiffany stamp on it is attached to the piece rather than the piece itself being stamped. In addition, she also clarifies what additional marks, such as a beaver or a globe, signify.

Well written and illustrated, the article also provides bibliographic sources for further reference. It would be wonderful to have this type of focused coverage for other jewelers and their trademarks as well. *EBM*

The elegant Edwardians. J. Jonas, *Jewelers' Circular-Keystone*, Vol. 159, No. 8, August 1988, pp. 220-225.

Jewelry from the brief (1890-1914) but opulent Edwardian age is described in this short but informative article. The period was named for British King Edward VII (who reigned from 1903 to 1910). His extravagant and sophisticated lifestyle was copied by other royalty and the leisure classes of the time. The refined elegance of Edwardian life was best exemplified by its jewelry: Lacy delicate mountings of platinum were set with a profusion of diamonds and pearls, often accented with colored gems or pastel-colored enamels.

In this article, which appears in the quarterly "Heritage" section of *JC-K*, Ms. Jonas skillfully weaves design, materials, workmanship, and history into a glittering tapestry that introduces us to this exceptional period. This era established platinum for use in jewelry, the briolette and marquise cuts for gems, the "dog-collar" necklace, and the "sautoir." Seven photographs augment the well-presented text. *EBM*

Enameling: Ancient art, enduring beauty. T. Paradise, *Jewelers' Circular-Keystone*, Vol. 160, No. 2, February 1989, pp. 326-332.

This is a concise historical review of the art of enameling. In the first half of the article, the author briefly chronicles the development of enameling from its discovery around 1500 B.C. through the end of the 19th century, touching lightly on the cultures that added most to the technical evolution of the art. The second half of the article covers general techniques and materials used by enamelists. Particularly useful is a glossary that provides definitions, pronunciations, and some schematic diagrams for 30 enameling terms. Jewelers who deal with antique and period jewelry and jewelry history students will find this helpful as a quick reference tool.

This article is one of five in this edition of "Heritage," a welcome new section that will appear every three months. Other titles in this issue include "All that glitters . . ." by E. Weber—a description of several unusual materials found in antique jewelry; "Georgian style: exquisite & opulent" by J. Rosenberg—an over-

view of jewelry styles worn primarily during the 18th century; "Antique jewelry, 2500 BC to 2000 AD" by F. Sandmel and J. Sataloff—a broad sketch of the various influences that shaped the development of jewelry through history; and "Confessions of a collector" by L. Williams—basic guidelines for starting a collection of antique and period jewelry. *EBM*

SYNTHETICS AND SIMULANTS

Alexandrite: Natural or synthetic? H. Bank, E. Gübelin, U. Henn, and J. Malley, *Journal of Gemmology*, Vol. 21, No. 4, 1988, pp. 215-217.

The authors describe the identification of a natural alexandrite on the basis of potassium-rich aluminosilicate inclusions, probably potassium feldspar. They conclude that solid metal inclusions that had deceptively suggested synthetic origin of the gem were remnants of cutting and polishing discs. Photomicrographs and an energy-dispersive chemical spectrum of the identifying inclusion accompany this note. *CMS*

ESR and optical spectra of Mn^{2+} sapphire. R. Liebach, J. Dobbie, D. R. Hutton, and G. J. Troup, *Journal of Gemmology*, Vol. 21, No. 4, 1988, pp. 227-231.

This relatively technical article includes a description of the manufacture of Mn^{2+} -containing (pink) synthetic sapphire and its characterization by optical and electron spin resonance (ESR) spectroscopy. The optical spectrum illustrated is clearly distinct from that of (Cr^{3+} -bearing) synthetic ruby. Comparison of the ESR spectra of the Mn^{2+} synthetic sapphire to those of Fe^{3+} - and Cr^{3+} -bearing blue and yellow sapphires likewise reveals markedly different features, although the authors suggest that weak Mn^{2+} lines may be discernable in the spectrum of the natural yellow sample illustrated. They conclude with a comment that Mn^{2+} -containing synthetic sapphire is unlikely to be produced commercially. *CMS*

The gemmological characteristics of Inamori synthetic cat's-eye alexandrite chrysoberyl. J. I. Koivula, E. Fritsch, and C. Fryer, *Journal of Gemmology*, Vol. 21, No. 4, 1988, pp. 232-236.

The properties of 12 Inamori synthetic cat's-eye alexandrites are reported, including basic gemological properties; spectra in the ultraviolet, visible, and infrared; and X-ray diffraction. The gemological properties are essentially the same as those reported by R. E. Kane in the Fall 1987 issue of *Gems & Gemology*. Spectrophotometry in the near-ultraviolet revealed the lack of the Fe^{3+} feature commonly found in natural alexandrites. In addition, infrared spectra indicated a lack of water in the synthetics. X-ray diffraction produced a typical chrysoberyl pattern. The authors conclude that only microscopy and/or U.V. spectra can conclusively identify this new synthetic material. Five color photo-

graphs and a U.V.-visible spectral graph illustrate the features discussed. CMS

The Pool Emerald_(t). G. Brown and J. Snow, *Australian Gemmologist*, Vol. 16, No. 12, 1988, pp. 443-449.

The Emerald Pool Mining Company (Pty.) Ltd. of Australia markets the "Pool Emerald" worldwide. According to some of the promotional literature, this material is either "natural gem quality stones, or the treated Pool Emerald_(t) which are designated by a suffix to disclose their treated nature." The material is marketed in three grades based on the relative absence of inclusions. The source of the rough emerald from which the "Pool Emerald" is reportedly produced is said to be the Emerald Pool Mine, formerly known as the Emerald Gem Mine, located 16 km southwest of the Poona Emerald Field in Western Australia.

In this well-illustrated report, the authors describe the gemological properties of the "Pool Emerald": diaphaneity—transparent in top two qualities, transparent to translucent in the commercial quality; luster—vitreous; color—moderate to strong green, with a slight bluish secondary hue; S.G.— 2.75 ± 0.05 ; R.I.— $\omega = 1.574$, $\epsilon = 1.569$; birefringence—0.005; pleochroism— ω = bluish green, ϵ = yellowish green; Chelsea filter reaction—red; long-wave and short-wave fluorescence—inert, but some specimens glowed a faint red in intense transmitted white light; absorption spectrum—features attributable to both chromium and vanadium.

Magnification revealed a number of characteristics, some of which, along with the refractive indices, the authors conclude are diagnostic. These include planes of reflective gold particles, some small grayish white "breadcrumb" inclusions, tapering growth tubes terminated by low-relief phenakite crystals, intersecting or angular growth features, and (rarely) segments of a seed plate.

The authors conclude that the "Pool Emerald" is a hydrothermally grown synthetic with properties virtually identical to those of the Biron product. They suggest that impurity-free crushed material from the Emerald Pool Mine is used as the feed source—with vanadium doping—to produce synthetic emeralds in gold-lined pressure vessels. RCK

A Verneuil sapphire with induced fractures. G. Brown and S. M. B. Kelly, *Australian Gemmologist*, Vol. 16, No. 11, 1988, pp. 419-421.

Beginning with a review of separate reports by John Koivula and Bob Kane on Verneuil synthetics with induced fingerprint inclusions, the authors go on to describe their investigation of a faceted synthetic sapphire with induced, natural-appearing filled fractures. The listed gemological properties of the specimen are consistent with those in the literature for flame-fusion products. Magnification revealed curved color banding; induced internal fractures "healed" by a whitish "soap

scum" solid material; and iridescent, surface-breaking, air-filled fractures.

On the basis of the diffused nature of the color banding, the resemblance of the fracture-filling material to that of the acetanilide "healing" described by Koivula, and the absence of solid fillings in surface-breaking fractures, the authors identify the specimen as a Verneuil synthetic sapphire with induced, partly healed fractures. Furthermore, they believe the fracturing/filling resulted from a heat-treatment process aimed at color improvement and/or the diffusion of the color banding. RCK

TREATMENTS

Some aspects of the heat treatment of ruby. S. J. A. Currie, *Australian Gemmologist*, Vol. 16, No. 11, 1988, pp. 417-419.

In a small town outside Chanthaburi, Thailand, the author observed the preparatory steps taken for heat treatment of ruby. Of particular significance in this account is his description of the colorless, nonviscous liquid that was added to the crucible and his hypothesis as to its composition.

One of the gemstone treaters demonstrated the properties of this liquid by placing a cupro-nickel coin in it. After about 30 seconds, a brown gas could be seen and the liquid began turning green-blue. The reaction accelerated for about two minutes, during which time significant quantities of nitrogen peroxide were produced. When the coin was removed and washed, it was seen to be very bright.

The person giving the demonstration stated that there were only three ingredients to the solution, which had a slightly sour smell, produced no noticeable irritation around or under a fingernail when a finger was dipped into it, and left only a slight brown stain on the skin. Currie hypothesizes that the major constituent of the solution was nitric acid, the second ingredient was water, and the third was a chloride to activate the nitric acid, possibly sodium chloride, common salt. He further suggests that the nitric acid provides oxidizing conditions for converting ferrous iron to ferric iron, while the chloride assists in volatilizing this base metal at high temperatures. As of this writing, he has been unable to test his theory on untreated ruby rough. RCK

Treatments used on spodumene: Kunzite and hiddenite.

K. Nassau, *Colored Stone*, Vol. 1, No. 7, 1988, pp. 16-17.

This short article about spodumene treatment deals with the influence of irradiation and heat on this gem, and reviews some of its basic properties and characteristics. Irradiation of kunzite produces a deep green spodumene, because of the change of Mn^{3+} to Mn^{4+} ; this color fades rapidly. In stones from Madagascar, the change can be accompanied by the formation of a brown color center, which also fades rapidly. Some intense

orange to yellow spodumene has been produced by irradiation in a nuclear reactor, but has been found to be radioactive. Heating of spodumene does not create any color but generally helps to bleach the various color centers. Color can be restored in light- or heat-bleached kunzite by first irradiating the stone and then gently fading the brown or green color. EF

Violet emeralds? H-W. Schrader, *Journal of Gemmology*, Vol. 21, No. 4, 1988, pp. 237-251.

Various researchers have observed that neutron (and, in one instance, X-ray) irradiation of both natural and synthetic emeralds brings about a color change of a somewhat unstable nature. Dr. Schrader describes the resulting colors as "smoky" to "violet," with optical absorption features superimposed on the original chromium bands. Those specimens that turn violet generally fade in daylight to the lighter smoky color in about five months. He suggests that a color-center mechanism similar to those known for smoky quartz or amethyst may be the cause of the effect in emerald. The 40 quantitative chemical analyses provided for one representative sample of each type emerald studied demonstrate the replacement of silicon by aluminum and iron, which Dr. Schrader suggests would "form color centers when subjected to intense radiation." Graphs of the chemical data are provided for all the specimens analyzed (16 natural, eight flux, and six hydrothermal emeralds) by electron microprobe. CMS

MISCELLANEOUS

The birthstone story. D. Federman, *Modern Jeweler*, Vol. 88, No. 1, January 1988, pp. 55-60.

In this article, David Federman traces the roots of the birthstone tradition. As early as 3000 B.C., in ancient India and Babylonia, Vedic astrologers were consulted for advice on which gemstones would best influence one's ruling planets (the exact position of the planets at one's birth). The concept of birthstones spread to Western civilization by means of the confusingly documented breastplate of Aaron, which was decorated with 12 gemstones that were eventually correlated to the 12 signs of the zodiac. The modern birthstone list used by jewelers today was developed in 1912. The author notes that this list was "the source of much controversy" at that time, when even gem expert George F. Kunz outlined the dangers of tampering with such an ancient tradition.

Two inserts accompany the article. One discusses the history of the breastplate of Aaron and the correlation of its gemstones to the zodiac. The other describes how one jeweler has incorporated ancient Vedic astrology into his designs by charting the client's horoscope and prescribing gemstones to wear based on that chart.

A chart included with the article outlines the changes in birthstones from ancient Hebrew times through the 20th century. This could be a useful sales tool for the retail jeweler.

It would be an added benefit if articles of this nature included a reference list or a list of further reading for those whose interest has been aroused.

JLC

Brilliance, windows and extinction in gemstones. R. W. Hughes, *Gemological Digest*, Vol. 2, No. 1 and 2, 1988, pp. 10-15.

Hughes discusses the optical characteristics controlled by the pavilion angles of faceted gemstones. Emphasizing the importance of cutting in the evaluation of colored gemstones, Hughes pays particular attention to "extinction" or "black-out." Windowing and brilliance are also discussed.

Hughes points out that inclusions and fluorescence tend to scatter light within gemstones, thereby reducing the amount of extinction. He fails to mention, however, that these features interfere with the transmission of light and reduce a stone's brilliance as well.

The article presents some useful information which, along with diagrams, will help readers understand the pavilion optics of cut stones. It is unfortunate, though, that the author never mentions the effects that a gem's crown features (crown angle and table percentage) can have on its optics; a stone's brilliance, extinction, and even windowing can be significantly affected by these other factors. BCC

Museum Idar-Oberstein. S. Frazier and A. Frazier, *Lapidary Journal*, Vol. 42, No. 9, December 1988, pp. 41-57.

Although this article focuses mainly on the modern *Edelsteinmuseum* (gemstone museum) in Idar-Oberstein, it also includes interesting information on the surrounding area, historical deposits, and local dealers. The extensively referenced text is accompanied by six illustrations (two in color), including a 15th-century woodcut of a water-driven cutting mill.

WRV

GEMS & GEMOLOGY is an international publication of original contributions (not previously published in English) concerning the study of gemstones and research in gemology and related fields. Topics covered include (but are not limited to) colored stones, diamonds, gem instruments, gem localities, gem substitutes (synthetics), gemstones for the collector, jewelry arts, and retail management. Manuscripts may be submitted as:

Original Contributions—full-length articles describing previously unpublished studies and laboratory or field research. Such articles should be no longer than 6,000 words (24 double-spaced, typewritten pages) plus tables and illustrations.

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Daragh P.J., Sanders J.V. (1976) Opals. *Scientific American*, Vol. 234, pp. 84–95.

Liddicoat R.T. Jr., Copeland L.L. (1967) *The Jewelers' Manual*, 2nd ed. Gemological Institute of America, Santa Monica, CA.

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