CELEBRATING 75 YEARS OF *GEMS & GEMOLOGY*

Stuart Overlin and Dona M. Dirlam

Gems & Gemology, the professional quarterly of GIA, debuted in 1934. Appearing in the 306th issue, this article looks back at the first 75 years. By reviewing the journal's milestones, it also traces the history of modern gemology, as the articles, notes, and news updates in *G&G* represent a virtual encyclopedia of the developments that have influenced the science into the 21st century.

When the January 1934 premier issue of *Gems & Gemology* rolled off the presses, the world was in the throes of the Great Depression—daunting odds for any publication, let alone one devoted to an obscure field in its infancy. But one man's vision made all the difference.

Gems & Gemology (figure 1) was the brainchild of Robert M. Shipley, founder of the Gemological Institute of America. Shipley (figure 2) had once been a successful retail jeweler in Wichita, Kansas. After his business fell apart in 1927, he left America for Europe and, while living in Paris, completed gemology courses offered by Great Britain's National Association of Goldsmiths (NAG). He returned to the United States in 1929, settled in Los Angeles, and set out to professionalize America's gem and jewelry industry.

The enthusiastic response to his evening gem lectures at the University of Southern California led Shipley to incorporate GIA in Los Angeles in February 1931. The Institute aimed to safeguard the future of the gem and jewelry industry through education, instruments, and laboratory services. In 1934, Shipley created a sister organization, the American Gem Society (AGS), as a professional association of jewelers. GIA and AGS were headquartered under the same roof until their amicable parting 13 years later. (A more complete account of Robert Shipley and his founding of the two organizations appears in *G&G*'s Spring and Summer 1978 issues, as well as in William George Shuster's 2003 book, *Legacy of Leadership: A History of the Gemological Institute of America*.)

Shipley also saw another need: a periodical that would keep gemologists informed of developments and discoveries in the nascent field and keep them connected to GIA and AGS. He was no doubt influenced by *The Gemmologist*, the monthly journal begun by NAG in 1931 that was billed as a publication for "the jeweler, connoisseur, expert and manufacturer." Shipley started with a short-lived newsletter titled *Gemology: Bulletin of the Gemological Institute of America* in 1931. *Gems and Gemologists*, which followed in August 1933, was a prospectus for a future publication. If 2,000 initial subscriptions were sold, the cover announced, GIA would have the resources to create the periodical. In an editorial that acknowledged the influence of President Franklin Roosevelt's recently enacted New Deal, Shipley laid out the foundations of a grassroots

Authors' note: The original, smaller-format issues, from January 1934 through Winter 1980–1981, may be downloaded free of charge on the *G&G* website, www.gia.edu/gemsandgemology. To locate specific articles from past issues, please refer to the subject and author indexes also featured on the site.

See end of article for About the Authors and Acknowledgments.
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Figure 1. With the growth of gemology as a field of study over the past 75 years, Gems & Gemology *has provided the latest research on gem characteristics, sources, and technologies. Shown here is a selection of issues from the January 1934 premier through Spring 2009. Image by Karen Myers.*

"gemological movement" that would educate American jewelers and protect the gem-buying public. With features such as a history of the Pigott diamond, GIA news bulletins, a report on the World Jewelry Trade Congress, and a gem quiz, the lone issue of *Gems and Gemologists* succeeded in launching *Gems & Gemology*.

BIRTH OF THE JOURNAL

Gems & Gemology debuted with the January 1934 issue. The journal's aim was set forth on the cover, in what would now be called a mission statement:

> A bi-monthly periodical, without paid advertising, supported by subscriptions from Gemologists and other gem enthusiasts, aims to increase the gem merchant's knowledge and ability in order that he may protect more thoroughly his customers' best interests.

Intent on making the journal an independent, unbiased source of gemological research and information, Shipley established a policy of no advertising beyond GIA products and services.

From its first issue, *G&G* offered a broad mix of editorial content. Pages were devoted to profiles of famous diamonds such as the Jonker, Orloff, and Regent; tips on using the loupe and other basic gemological instruments; book reviews; and running segments such as a beginner's glossary and Henry Briggs's gemological encyclopedia, which ran from the premier issue to 1943. Throughout these early years, the journal sought to give jewelers and gemologists a common language with which they could communicate. Another staple was GIA and AGS news, as the journal sought to promote the gemological movement.

Gems & Gemology, along with every other aspect of the two organizations in the 1930s, was a family affair operated out of Shipley's Los Angeles

Figure 2. Former retail jeweler Robert M. Shipley (1887–1978) founded the Gemological Institute of America in 1931 and established its quarterly journal three years later. Shipley nurtured Gems & Gemology *until his retirement in 1952.*

Figure 3. Notable contributors during the journal's early decades included: (top row, left to right) Robert Shipley Jr., Sydney Ball, and Edward Wigglesworth; (middle row, left to right) Basil Anderson, Edward Gübelin, and George Switzer; and (bottom row, left to right) Robert Webster, G. Robert Crowningshield, Lester Benson Jr., and Eunice Miles.

apartment. His wife, Beatrice Bell Shipley, was the business administrator and an occasional contributor (under the pen name "B. W. Bell"). But the bulk of the writing initially fell on Shipley himself and Robert Jr. (figure 3), the elder of two sons from his first marriage and the Institute's resident scientist/inventor. The three Shipleys, involved as they were in every aspect of expanding GIA and AGS, still managed to produce the journal with the support of a small, thinly stretched staff. Then, as now, contributing authors were not paid for their articles. Yet Robert Shipley Sr., through his energy and force of personality, was able to draw on the talents of experts such as mining engineer Sydney Ball and Edward Wigglesworth, director of what is now the Museum of Science in Boston.

The fledgling journal's tight budget was reflected in its modest appearance. It began as a 5½ × 8½ in. publication, 32 pages per issue (though the page count was halved within two years). Each cover was simply the table of contents, and the pages contained little photography, all of it black-and-white. Subscriptions cost $3.50, an annual rate that would not increase for more than *40 years*, until the end of 1976. After two years as a bimonthly journal, *G&G* became a quarterly with the Spring 1936 issue.

An early milestone for the journal was GIA's 1941 hiring of Richard T. Liddicoat Jr. (figure 4; see also the Spring 2002 tribute), who had recently obtained his master's degree in mineralogy at the University of Michigan. Liddicoat's first byline in *G&G* was a Fall 1941 piece, written with Shipley Sr., titled "A solution to diamond grading problems" (see box A). Liddicoat would eventually lead the Institute and the journal to new heights.

WAR YEARS

Within a decade of *Gems & Gemology*'s birth, though, its very existence was threatened by the impact of World War II. GIA suffered a staggering drop in enrollments as millions of young men joined the war effort. Among them were two of the journal's most important contributors. Robert Shipley Jr. was called up in 1941 by the Army Air Corps, which used his engineering talents to develop photo reconnaissance equipment. Liddicoat left for the Navy in 1942, serving as a meteorologist on aircraft carriers in the South Pacific.

Yet the journal continued to deliver original research, due in large part to a $50,000 endowment raised by AGS jewelers that made the Institute a non-profit organization and kept it "from becoming a war casualty," as the February 1943 issue of *National Jeweler* put it. In addition to a diamond glossary that ran from 1941 through 1947, *G&G* issues from this period featured brief but influential articles. Leading the way were Wigglesworth in Boston and European authors Basil W. Anderson and Edward J. Gübelin. Until his death in 1945, Wigglesworth wrote on topics ranging from refractometer and polariscope use to specific gravity testing and synthetic emerald detection. Anderson, head of the Precious Stone Laboratory of the London Chamber of Commerce (which later merged with the Gemmological Association of Great Britain, now Gem-A), published a four-part series on the gemological applications of the handheld spectroscope.

Gübelin, a young Swiss gemologist, had recently begun his pioneering research on inclusions in gemstones. (For more on the career of Dr. Edward J. Gübelin, see the Winter 2005 cover story.) Among his dozen wartime articles for *G&G* were studies of the microscopic differences between Burmese and Thai rubies and Colombian and Russian emeralds (both in 1940), methods for determining a sapphire's geographic origin (1942–1943), and the identifying characteristics of various synthetics. To show the internal features of a gem, Gübelin made extensive use of photomicrography, a first for *G&G*.

Other highlights from the period were A. E. Alexander's pair of 1941 articles on distinguishing natural and cultured pearls and Shipley's first look at commercially available synthetic emeralds the following year. Gemological Digests, a series of industry news briefs from around the world, debuted in 1944 and became a regular column for the next two decades.

THE POSTWAR ERA

Having survived the war years, *Gems & Gemology* resumed its original 30-plus page count by 1947. Liddicoat had returned from military service the year before and, with the departure of Shipley Jr., was now Shipley Sr.'s heir apparent at GIA and as editor of the journal. Gübelin and Anderson remained leading authors, joined by George Switzer of the Smithsonian Institution and Robert Webster, Anderson's colleague from the Precious Stone Laboratory. The journal was further bolstered by the 1947 establishment of an editorial board, comprised of Anderson, Ball, Gübelin, Switzer, and William Foshag, also from the Smithsonian. With the appointment of the editorial board, the masthead no longer described *G&G* as a GIA "organ" but rather as the "official journal" of the Institute, implying a more academic perspective.

Notable articles from the early postwar years included Shipley's 1947 study of diamond fluorescence and William Barnes's four-part series that same year on X-ray diffraction to identify natural and cultured pearls. Shipley's final article for the journal was a 1949 piece that examined the business operations of De Beers.

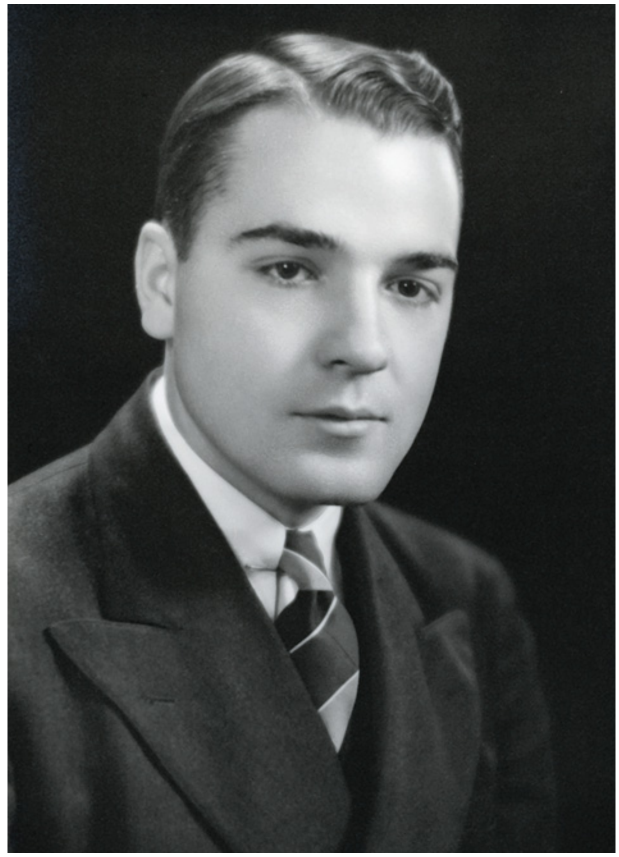

Figure 4. Richard T. Liddicoat Jr. (1918–2002) succeeded Shipley as GIA president and G&G *editor in 1952. Over the next 50 years, Liddicoat exerted an enduring influence on the journal. In addition to numerous feature articles and editorials, he penned GIA's West Coast lab highlights column from 1961 to 1980.*

Box A: Landmark Articles

Gems & Gemology has published some of the finest gemological research of the past 75 years. Members of the journal's editorial staff and several longtime contributors joined the authors in selecting 20 of the most noteworthy articles (or series) in *G&G*'s history, with apologies to the many others that deserve mention. This list includes particularly influential first reports, articles that cast new light on important topics, and studies that have been widely referenced and are considered authoritative years after publication.

Fall 1941: "A Solution to Diamond Grading Problems." Robert Shipley and Richard Liddicoat took on the monumental challenge of creating a system for consistent diamond color grading, at a time when none existed. It combined the Diamolite, a reliable natural daylight–equivalent lamp that provided a controlled viewing environment, with the Colorimeter, a device that compared a diamond's color against a fixed standard. This early color grading system was adopted by AGS and represented an important advancement in diamond grading methodology.

Edward J. Gübelin

Calcite in Burmese ruby.

1944–1945: The "Gemstones and the Spectroscope" series. In the 1940s, more than 70 years after the first observations of gemstones using the spectroscope, the instrument was still relegated to the background of gemological research. Based on his decade of experience with the spectroscope, Basil Anderson explored the capabilities of this simple tool and offered practical tips on using it that still apply today.

1945–1946: The "Inclusions as a Means of Identification" series. Edward Gübelin, the Swiss gemologist who pioneered the study of gemstone inclusions, set forth the fundamentals in this three-part series. The articles focused on the inclusion characteristics of the most common garnets, with numerous photomicrographs.

Winter 1957–1958: "Spectroscopic Recognition of Yellow Bombarded Diamonds." The advent of irradiated diamonds, in a range of colors, posed a difficult question for the industry in the mid-1950s: Was a diamond's color natural or the product of irradiation? After a study of more than 10,000 yellow diamonds with the spectroscope, G. Robert Crowningshield established the absorption line at 5920 Å (592 nm) as an identifying feature of irradiated yellow diamonds.

Winter 1962–1963 and Summer 1964: The "Coated Diamonds" series. As a wave of convincing diamond coatings entered the market in the 1950s, Eunice Miles undertook a two-year study. Miles's research culminated in these two *G&G* articles, where she presented her microscopic clues to detecting diamond coatings.

Summer 1971: "General Electric's Cuttable Synthetic Diamonds." When GE succeeded in producing cuttable-size synthetic diamonds, Crowningshield arranged to examine the first four faceted and several uncut specimens. This detailed study marked the first published report of their color, clarity, fluorescence, spectroscopic, and X-ray characteristics. Crowningshield concluded that the synthetics could be detected by their unusual inclusions, strong fluorescence, and prolonged phosphorescence. This was the first of several articles that *G&G* would publish as gem-quality synthetic diamonds transitioned from a research oddity to a commercial product.

1984–1985, 1988: The "Gem Pegmatites of Minas Gerais" series. For many years, the complex granitic pegmatites of Minas Gerais, Brazil, supplied most of the world's market for fine gem beryl, chrysoberyl, topaz, tourmaline, and kunzite. In this four-part series, Keith Proctor reviewed the occurrence of pegmatitic gems in the region, as well as related exploration and mining activities.

Winter 1985: "A Proposed New Classification of Gem-Quality Garnets." With the discovery of new types of garnets in the 1970s, the existing classification system for these gems had become inadequate. Carol Stockton and D. Vincent Manson devised a new system based on the chemical and spectroscopic analyses of more than 500 samples and proposed eight varieties of gem garnets, all of which could be identified with traditional gemological instruments.

Winter 1986: "The Gemological Properties of the Sumitomo Gem-Quality Synthetic Yellow Diamonds." In 1985, Sumitomo Electric Industries achieved the first commercial production of gem-quality synthetic diamonds, in the form of yellow crystals up to 2 ct. James Shigley et al. provided standard gemological methods for detecting these products. Similar articles followed over the next several years, as other manufacturers entered the marketplace with a broader product mix.

Fall 1987, Spring 1988, and Summer 1988: The "Update on Color in Gems" series. Emmanuel Fritsch and George Rossman's three-part series began with a summary of the factors that govern the perception of color, from the source of light to the human eye, and examined the role of dispersed metal ions in the coloration of gems such as ruby and emerald. The series went on to explore charge-transfer phenomena and color centers as the cause of color in blue sapphire, Maxixe beryl, and other gems. It concluded with colors that involve band theory and physical optics, such as the play-of-color in opal and the blue sheen of moonstone feldspars.

Summer 1989: "The Characteristics and Identification of Filled Diamonds." In the late 1980s, the filling of surface-reaching cracks in diamonds with high-RI glass to enhance clarity became the most controversial diamond treatment up to that point. As the industry struggled to deal with the issue, John Koivula and coauthors described clear-cut methods to detect the filling. Their study also marked the beginning of *G&G*'s unprecedented reporting of treatments involving colorless diamonds, the mainstay of the industry.

Fall 1990: "Gem-Quality Cuprian-Elbaite Tourmalines from São José da Batalha, Paraíba, Brazil." The introduction of exceptionally bright blue and green tourmalines from the Brazilian state of Paraíba in 1989 captivated the colored stone world. In one of the first reports on "Paraíba" tourmaline, Emmanuel Fritsch and coauthors described the gems and performed quantitative chemical analyses, which revealed that the striking colors were related to unusually high concentrations of copper. They also examined the role of heat treatment.


Harold & Erica Van Pelt

Cu-bearing tourmalines from Paraíba, Brazil.

Spring 1991: "Age, Origin, and Emplacement of Diamonds: Scientific Advances in the Last Decade." Melissa Kirkley, John Gurney, and Alfred Levinson's definitive review was a key resource for understanding the formation of diamonds millions of years ago, as well as the mechanisms that brought them to the surface. The article resonated beyond the gemological community, becoming widely cited in the geological literature.

Summer 1991: "Fracture Filling of Emeralds: Opticon and Traditional 'Oils.'" The filling of surface-reaching fractures in emerald has long been a widespread practice, but as epoxy resins began to replace traditional fillers, the trade demanded to know more about these new substances. Robert Kammerling and coauthors examined the most widely used epoxy resin, Opticon, and found that it could be detected by established methods.

Winter 1994: "Color Grading of Colored Diamonds in the GIA Gem Trade Laboratory." During the 1980s, colored diamonds became more prevalent and far more popular than ever before. Amid this newfound appreciation for "fancies," John King and a team of colleagues presented the GIA Laboratory's updated system for color grading these diamonds, as well as the theory behind it.

Winter 1995 and Spring 1996: The "History of Diamond Sources in Africa" series. Since 1867, Africa has been the world's most important diamond source. A. J. A. (Bram) Janse chronicled the history of African diamond exploration and mining with this two-part series. South Africa was reviewed in part one, followed by East and West Africa in part two.

Fall 1996: "De Beers Natural versus Synthetic Diamond Verification Instruments." Christopher M. Welbourn and colleagues from the De Beers DTC Research Centre introduced a pair of instruments specially designed to distinguish synthetic diamonds: the DiamondSure and the DiamondView. The DiamondSure detects the presence of the 415 nm optical absorption line found in nearly all natural diamonds but not in synthetics. The DiamondView produces a fluorescence image from which the distinctive growth structures of natural and synthetic stones can be determined.

Fall 1998, Fall 2001, and Fall 2004: The "Diamond Cut" series. Of all the diamond quality factors, cut is the most difficult to evaluate objectively. Following a 15-year study that used computer modeling and observation testing, GIA researchers found that the *combination* of proportions is more important than any individual proportion value, and that attractive diamonds can be cut in a wider range of proportions than traditionally thought possible. The study resulted in the 2005 launch of GIA's diamond cut grading system for round brilliants.

Summer 2000: "Characteristics of Nuclei in Chinese Freshwater Cultured Pearls." In the late 1990s, the exceptional size and quality of some freshwater cultured pearls from China sparked debate over the growth process used, particularly claims that they were being beaded with reject cultured pearls. Based on the study of some 41,000 samples, Kenneth Scarratt, Thomas Moses, and Shigeru Akamatsu determined that these freshwater cultured pearls were being grown with mantle tissue only, using larger mussels and new tissue-insertion techniques, and that they could be identified with established X-radiographic methods.

Summer 2003: "Beryllium Diffusion of Ruby and Sapphire." The first major colored stone challenge of the 21st century was the heat treatment of corundum involving diffusion with beryllium. Stones artificially colored by the process were being sold undisclosed, which sent shockwaves through the colored stone market. John Emmett and coauthors tackled the issue with this 52-page article, the longest in the journal's history. Their study found that standard gemological testing could identify many of these goods, whereas quantitative chemical analysis by secondary ion mass spectrometry (SIMS) and LA-ICP-MS were required for the rest.

Figure 5. Early associate editors (top row, left to right) Virginia Hinton, Kay Swindler, and Jeanne Martin laid the foundations for (bottom row, left to right) Lawrence Copeland, Robert Gaal, and John Koivula during the late 1960s and 1970s. Koivula remains a major contributor to the journal.

When Shipley retired in 1952, Liddicoat assumed the reins of GIA and its quarterly. Like his predecessor, Liddicoat was an actively involved editor, and he continued to write extensively for *G&G*. But the day-to-day management of the journal was being handled by associate editors Virginia Hinton (1944–1946), Kay Swindler (1946–1953), and Jeanne Martin (1953–1966; see figure 5).

By the early 1950s, one of the greatest challenges facing the gem industry was the color alteration of diamonds through laboratory irradiation. Earlier *G&G* articles, in 1938 and 1949, reported on diamonds that had been colored green by exposure to radium. In a 1954 study, De Beers researchers J. F. H. Custers and H. B. Dyer identified irradiated blue diamonds by their absence of electrical conductivity. Yet there was still no means of detecting yellow irradiated diamonds, which were on the market and often sold without disclosure. That was when G. Robert Crowningshield, head of GIA's recently established New York laboratory, made one of gemology's most famous discoveries. Using a simple handheld spectroscope, Crowningshield spotted an absorption line at 5920 Å (592 nm) that was present in yellow diamonds artificially colored by irradiation. His Winter 1957–1958 "Spectroscopic recognition of yellow bombarded diamonds" was a breakthrough in identifying these treated stones.

Soon, more of Crowningshield's discoveries and observations would be featured in a regular lab column. The Winter 1958–1959 issue introduced the Highlights at the Gem Trade Lab section, featuring brief notes on interesting and unusual gems encountered at the GIA laboratories. Crowningshield was the New York correspondent, with GIA researcher Lester B. Benson Jr. reporting from Los Angeles. These entries were written for easy reading, with some as short as a single paragraph. The column continued for the next two decades and (in 1981) became the popular Lab Notes section, with Crowningshield as a contributing editor. (The lead article in the Fall 2003 issue took an in-depth look at Crowningshield's six-decade career.)

The postwar years also saw a new emphasis on photography, including *G&G*'s first foray into color. Between 1946 and 1951, the journal printed 38 full-page color plates that represented every major gem species, as well as lesser-known ornamental materials. Save for the color plates, though, the journal was still black-and-white. The covers became less austere with the Winter 1946 issue, which featured a bouquet of diamonds and emeralds from the Russian Crown Jewels. Black-and-white jewelry photos adorned the covers through 1966 (again, see figure 1).

THE SIXTIES AND SEVENTIES

The 1960s began on a somber note with the untimely death in 1961 of Lester Benson, whose Los Angeles lab column was carried on by Liddicoat. The *G&G* editor also produced two of the decade's most notable articles: 1962's "Developing the powers of observation in gem testing," and "Cultured-pearl farming and marketing" in 1967. Eunice Miles, the first female gemologist at the GIA laboratory, addressed one of the New York diamond industry's most pressing concerns with two articles on detecting coated diamonds (at the end of 1962 and in 1964). But with growing demand for GIA's new diamond grading services, gemological research assumed a lower priority at the Institute, and few other scientific studies would be conducted until the establishment of GIA Research in 1976.

As a result, the driving force behind *G&G* in the late 1960s and early 1970s was the lab highlights section. Roughly half of each issue was devoted to these accounts and photos of oddities, damaged stones, imitations, and outright frauds seen at the New York and Los Angeles labs. The section was also a record of gemological milestones, such as the introduction of the diamond imitation yttrium-aluminum garnet (YAG) at the end of 1964 and irradiated topaz in 1967. Another first was the 1967 identification of a previously unknown violet-blue zoisite, a material that would eventually become famous as *tanzanite* (figure 6). In 1970 and 1971, the lab highlights section noted the advent of laser drilling, a process used to bleach dark inclusions in a diamond to improve its apparent clarity. The section later described the first commercially available synthetic opal and synthetic alexandrite (1972) and the first specimen of gem-quality jeremejevite examined by lab staff members (1973).

In-depth reports on other critical developments appeared as *G&G* feature articles. In 1971, Crowningshield chronicled a major milestone in gem history with his description of the first cuttable-size synthetic diamonds, produced by General Electric. A 1974 article by Campbell Bridges offered a firsthand look at the green grossular garnet from Kenya that became known as *tsavorite*. Hiroshi Komatsu and Shigeru Akamatsu examined the differentiation of natural from treated black pearls in 1978, while two years later Robert Kane contributed a seminal study on graining in diamonds.

Through 1980, the journal was managed by a succession of distinguished associate editors (again, see figure 5), most notably Lawrence Copeland (1967–1971), Robert Gaal (1973–1977), and John I. Koivula (1978–1980). During this period, synthetic gem materials were being developed for laser applications in communications and other fields. These new materials invariably made their way into the gem market. In the 1970s, gemology attracted the interest of Kurt Nassau (figure 7), then a research scientist at Bell Laboratories. Nassau wrote several articles on synthetics (including a Winter 1979–1980 review of the decade's advances) and simulants (such as the new diamond imitation cubic zirconia in 1976), as well as treatment processes and the causes of color in gems (e.g., deep blue Maxixe-type beryl in 1973).

Figure 6. In 1967, G&G *reported on a brilliant new violet-blue zoisite that came to be known as* tanzanite. *This photo, from the Summer 1992 cover shoot, shows a 98.4 g crystal and 24.30 ct faceted tanzanite. Courtesy of Michael Scott; photo by Harold & Erica Van Pelt.*

G&G's first all-color edition was the Spring 1977 special issue on the Hixon Collection of colored stones, which had been donated to the Natural History Museum of Los Angeles County between 1971 and 1977. A year later, the Summer 1978 Robert M. Shipley memorial issue was devoted to remembrances of the journal's founder and the early days of GIA and AGS.

Figure 7. Among the most prolific contributors from recent decades are: (top row, left to right) Kurt Nassau, Robert Kane, and Emmanuel Fritsch; and (bottom row, left to right) John King, Alfred Levinson, James Shigley, and Karl Schmetzer. Shigley is also contributing editor of G&G *and editor of the* Gems & Gemology in Review *series; King is editor of the* Colored Diamonds *book in that series. Levinson was editor of the Gemological Abstracts section from 1997 to 2005.*

Figure 8. Editor-in-chief Alice Keller's transformation of G&G *began with the Spring 1981 issue. She was later joined by editor Brendan Laurs and managing editor Tom Overton, who bring geological, gemological, and legal expertise to the journal. Photo by Kevin Schumacher.*

A NEW ERA

In 1980, with GIA's 50th anniversary a year away, Liddicoat and the board of governors decided it was time to revitalize the Institute's flagship publication. Koivula, eager to return to his highly regarded gem inclusion research and photomicrography, stepped aside and Alice Keller (figure 8) was chosen to take over as managing editor. Unlike her predecessors, Keller was not a gemologist, but she had an extensive background in peer-reviewed medical and business journals. She immediately put a lasting imprint on *G&G*, beginning with the Spring 1981 issue, which was headlined by Gübelin's article on peridot from the Red Sea island of Zabargad and Nassau's update on cubic zirconia.

Keller's debut issue was a dramatic departure for the journal. It had a larger format (8½ × 11 in.) and twice the page count. But the most striking feature of the redesigned *G&G* was its emphasis on high-quality color photography, which finally did justice to the subtle nuances of gems and their eye-visible and microscopic features. With the next issue, Summer 1981, the renowned team of Harold and Erica Van Pelt (figure 9) began taking artistic cover shots and lead photos for feature articles. Over the years, Tino Hammid, Robert Weldon, Shane McClure, and Maha Tannous also contributed significantly, while Koivula's photomicrographs captured the internal world of gems (he shared some of his techniques in

Spring 2003's "Photomicrography for gemologists"). Complementing the photos were numerous color illustrations, including detailed maps and graphs.

But the changes were more than just cosmetic. Keller reestablished the journal's editorial review board, the backbone of any peer-reviewed journal, to evaluate manuscripts prior to publication. The new board included Nassau and Crowningshield, as well as Cornelius Hurlbut of Harvard University, George Rossman from the California Institute of Technology, Pete Dunn of the Smithsonian Institution, Anthony Kampf from the Natural History Museum of Los Angeles County, and venerable gem and mineral author John Sinkankas, among others from GIA and the gem trade. Meanwhile, Gem News (later Gem News International) was added as a forum for new sources, synthetics, and other breaking developments from around the world. The longstanding lab highlights section became Gem Trade Lab Notes (simply Lab Notes since Summer 2003) and grew more comprehensive under GIA Laboratory leaders Crowningshield, C. W. (Chuck) Fryer, Robert Kammerling, Thomas Moses, and Shane McClure (figure 10). The Gemological Abstracts section, which presented summaries of notable articles published elsewhere, expanded under the editorship of GIA library director Dona Dirlam and her successor, University of Calgary geochemist and diamond expert Alfred Levinson.

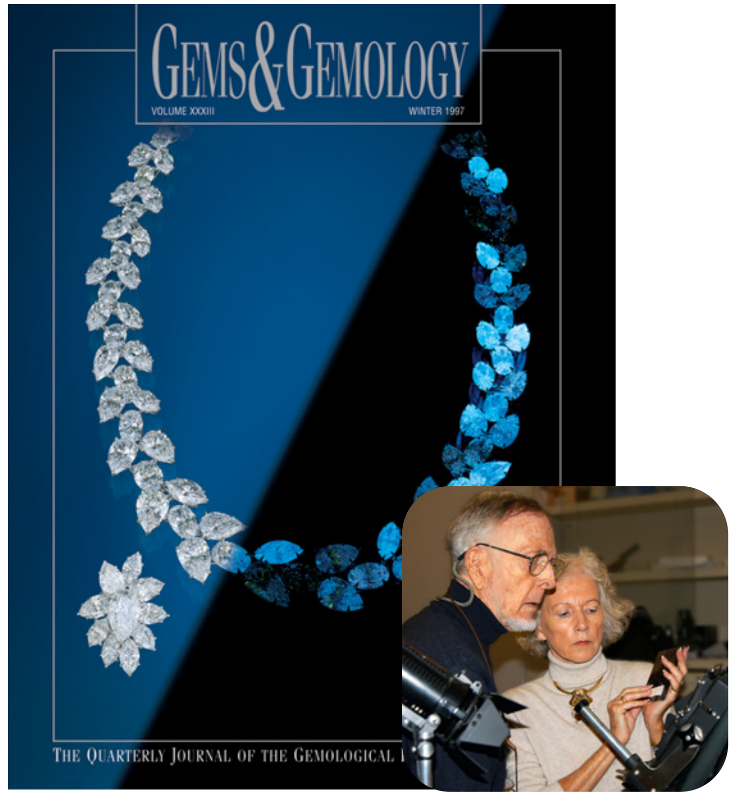

Figure 9. G&G's emphasis on attractive, informative color photography is evident in the Winter 1997 cover, which demonstrated the wide range of fluorescence shown by the fine diamonds in this Harry Winston suite. The composite image was taken by photographers Harold & Erica Van Pelt (inset, by Karen Myers), who have captured artistic cover shots for almost every issue since Summer 1981.

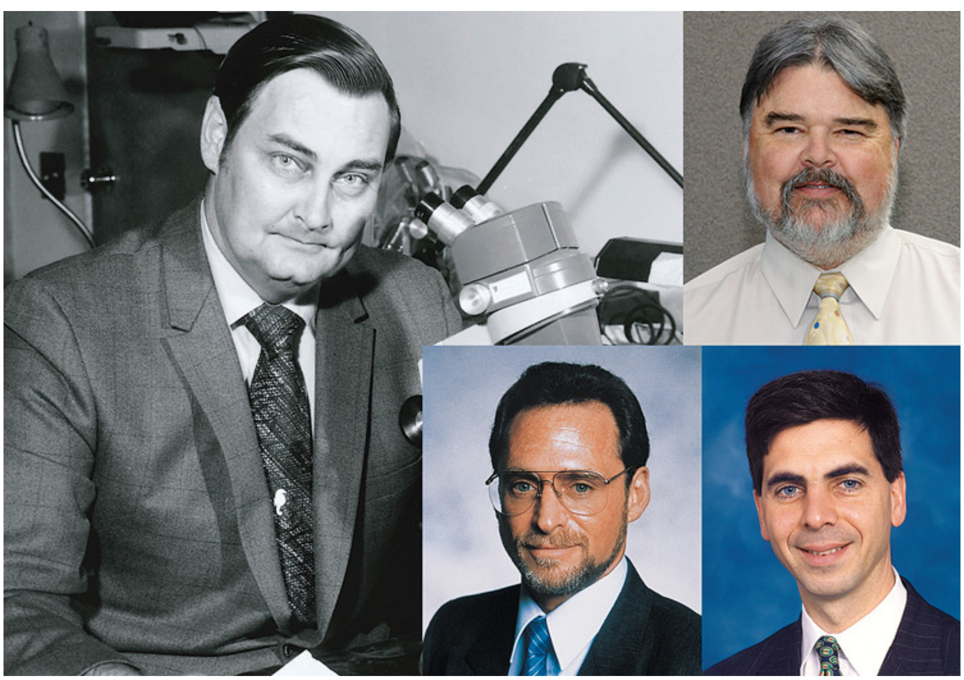

Figure 10. Since 1981, the Lab Notes section has grown under editors (clockwise from far left) C. W. (Chuck) Fryer, Shane McClure, Thomas Moses, and Robert Kammerling.

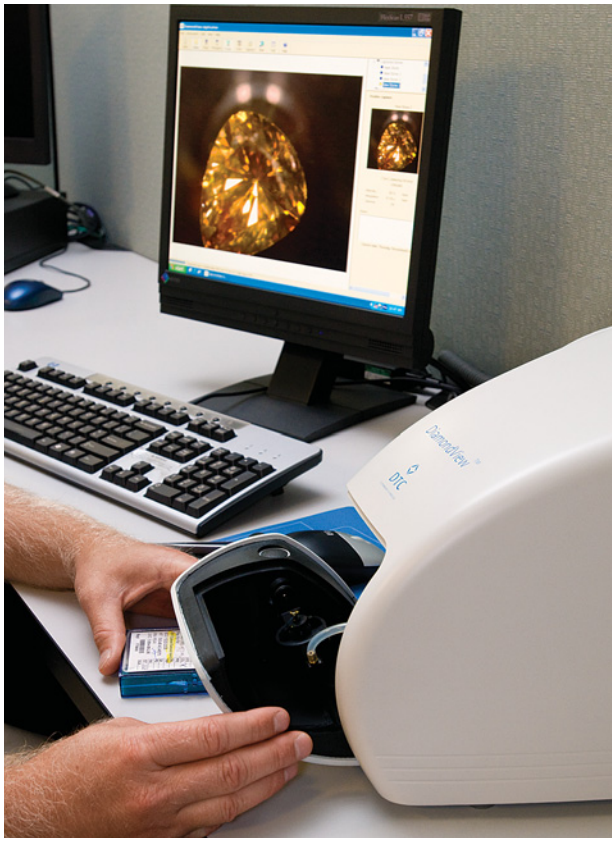

Figure 11. Shown here is a recent model of the DTC DiamondView, which was introduced to gemologists in a 1996 G&G *article by Chris Welbourn et al. It is one of many advanced technologies that have figured prominently in the journal since the 1980s. Photo by Kevin Schumacher.*

In 1982, *G&G* debuted a pair of perennial Spring issue features. The Most Valuable Article Award, voted on by readers and later renamed in honor of Gübelin, offers recognition and a monetary prize as an incentive for authors. The *G&G* Challenge, a multiple-choice quiz based on the previous year's articles, promotes continuing education in this rapidly developing field.

The Spring 1986 "China" issue, an unprecedented look at the country's gem resources, was the first of several special editions of the redesigned journal. Retrospectives of the 1980s and 1990s (Spring 1990 and Winter 2000) reviewed major developments for each decade in five key areas: gem sources (including a world map and table of important localities), synthetics, treatments, new technologies, and jewelry styles. In addition, the Fall 1999 and Fall 2006 issues were devoted to presentations by industry leaders and prominent researchers at GIA's third and fourth International Gemological Symposiums.

The Impact of Technology. The changes in *G&G* coincided with a virtual revolution in gemology. Technological advances in the 1980s began to foster more precise, sophisticated forms of gem synthesis, resulting in an influx of high-quality synthetic rubies, sapphires, and emeralds. Although GE had produced the first jewelry-quality synthetic diamonds for experimental purposes years earlier, Sumitomo was the first to make such material commercially available—initially for industrial use. During this decade, *G&G* covered the Ramaura and Lechleitner synthetic rubies, among others, as well as the Sumitomo and De Beers gem-quality synthetic diamonds. At the same time, experimentation in other fields, such as high-pressure physics and materials science, brought a new generation of enhanced gems to the fore. The traditional gauges and scopes—and even electron microprobe analysis and UV-visible absorption spectroscopy, techniques first applied in the 1970s—were not always sufficient to characterize these materials. Out of this necessity came new tools for gemological discovery.

Many of these new identification technologies involved spectroscopic methods, which measure the absorption or emission of electromagnetic radiation to determine a gem material's composition and characteristics. Several advanced forms of spectroscopy were introduced to gemologists through the pages of *Gems & Gemology* during the 1980s, most notably infrared, energy-dispersive X-ray fluorescence, and Raman. The decade also saw further development of the electron microprobe as a useful tool in measuring the chemical composition of gem materials. The increasingly technical nature of the submitted manuscripts led Keller to add the position of technical editor to the journal's staff in 1985. Carol M. Stockton, a well-published GIA researcher, held the post for more than 20 years and continues to support *G&G* as consulting editor.

In the 1990s and 2000s, advances in diamond synthesis and challenging new treatments would forever change the way gemologists looked at diamonds, rubies, and sapphires. Following on the broader application of Raman analysis for gem identification, laser ablation–inductively coupled plasma–mass spectrometry (LA-ICP-MS)—also adapted from other research disciplines—emerged as an important technique for quantitative chemical analysis of gem materials. However, not all of gemology's new methods were borrowed from other fields: A 1996 article presented two instruments developed by De Beers researchers specifically for detecting synthetic diamonds. One of them, the DiamondView, produces a luminescence image revealing the growth structure of the diamond being tested, thereby indicating its natural or synthetic origin (figure 11).

Gem Sources. During the 1980s, reviews and updates on classic colored stone localities—Colombia, Burma (Myanmar), Sri Lanka, Pakistan, Kashmir, Afghanistan, and Thailand—prevailed in the pages of *G&G*. To this day, Keith Proctor's four-part "Gem pegmatites of Minas Gerais" series, which appeared between 1984 and 1988, serves as a comprehensive overview of the major occurrences in this gem-rich Brazilian state. But this decade and the next also saw increased exploration and the emergence of new localities. Soon after the discovery of unusually vivid green and blue copper-bearing tourmalines at a mine in northeastern Brazil, Emmanuel Fritsch headed a 1990 report on these new "Paraíba" tourmalines. The following year, Robert Kane led a report on rubies and fancy sapphires from Vietnam, and in 1992, Dirlam et al. surveyed the colored stone wealth of Tanzania.

Adolph Peretti and coauthors provided the authoritative article on the new rubies from Mong Hsu, Myanmar, in 1995. Richard Hughes et al.'s 2000 report on their visit to Myanmar's jadeite mines marked the first time foreign gemologists had been allowed into this historic locality in more than 30 years. Kenneth Scarratt led a 2000 study of the nuclei in Chinese freshwater cultured pearls, laying to rest unfounded claims about how these exceptionally large, attractive goods were being cultivated, with an update the following year by Akamatsu et al. on the processes used (figure 12). A 2003 article by Brendan Laurs and colleagues marked the first scientific description of the new gem mineral pezzottaite.

Important new diamond sources came onto the scene during the 1980s and 1990s, and groundbreaking articles soon followed. Among these were the seminal 1991 article by Melissa Kirkley et al. on the age and origin of diamonds, and the two 1995–1996 articles by A. J. A. (Bram) Janse on diamond sources in Africa. The discovery and mining of Australia's Argyle diamond deposit, the world's largest by volume, was the focus of a 2001 article by James Shigley and coauthors, and a year later Bruce Kjarsgaard and Alfred Levinson reported on the emerging Canadian diamond deposits and their potential impact on the industry.

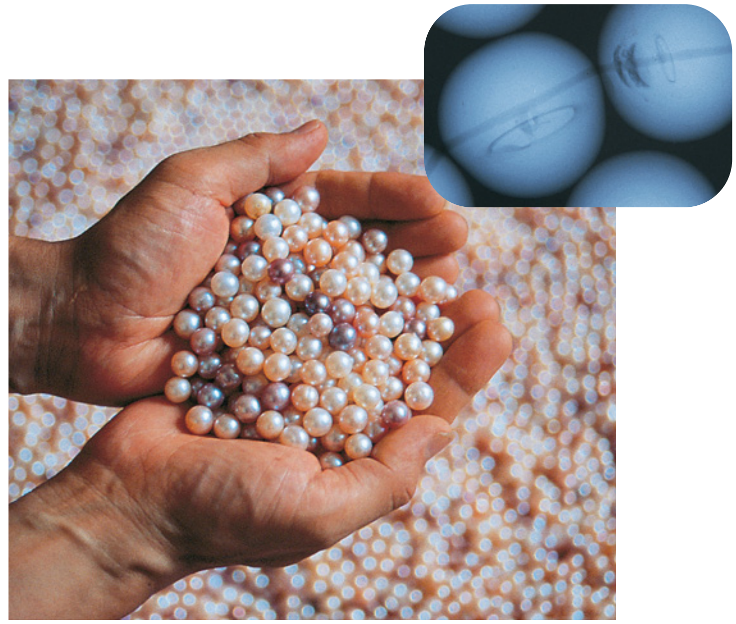

Figure 12. In the past decade, the journal has examined Chinese freshwater cultured pearls and the cultivation process that has resulted in dramatically larger, higher-quality goods, such as those shown in this photo by Shigeru Akamatsu. The inset shows an X-radiograph of these cultured pearls, where the oval shapes mark the original tissue implant; courtesy of Kenneth Scarratt and Thomas Moses.

Colored Stone Identification. Along with examining the geographic sources of colored stones, *G&G* delved further than ever into gem characterization and identification. Responding to the discovery of several new garnet types, Stockton and D. Vincent Manson proposed a more precise garnet classification system in 1985. The following year, Crowningshield, Fryer, and Hurlbut presented their method for separating natural and synthetic amethyst using a simple polariscope, addressing a problem that had plagued the colored stone industry for years. Technology developed for the defense and other industries led to the proliferation of new synthetic rubies and sapphires, which posed a challenge for gemologists around the world. To keep pace, Kane and other researchers examined the new Chatham, Lechleitner, and Ramaura synthetic corundum products, while Karl Schmetzer focused on state-of-the-art synthetic beryls being grown in Russia, China, and elsewhere.

The rise of new and ever more sophisticated treatments likewise demanded attention in the pages of *G&G*. One of the biggest challenges to the colored stone industry during the 1980s was the emergence of diffusion treatment, in which light-colored sapphires were heated with titanium oxide to impart a thin surface-related blue coloration. In

Figure 13. In 2002, the industry learned that beryllium diffusion was being used to significantly alter the color of corundum, changing pink stones (such as those on the left of this photo by Sriurai Scarratt) to pink-orange after treatment (right). This was dramatically illustrated by Shane McClure's inset photo of a 0.51 ct pink sapphire that had been cut in half, with the portion on the right undergoing Be diffusion.

1990, Kane et al. addressed the identification of these treated sapphires, the first of three *G&G* articles on a process that would change the face of the ruby and sapphire industry in the 21st century. When the corundum trade was rocked by the emergence of "deep" diffusion with beryllium in 2002 (figure 13), John Emmett et al.'s comprehensive 2003 article laid out the mechanics of the treatment and clues to its identification. One year later, SSEF's Michael Krzemnicki and Henry Hänni helped describe a new detection method for Be diffusion, laser-induced breakdown spectroscopy (LIBS).

During the 1990s especially, the emerald trade was hit by numerous scandals over undisclosed clarity enhancement. Although common for decades, the oiling of emeralds was not well understood by consumers, and the use of new and different fracture-filling substances challenged trade and public acceptance of the treatment. Concerns about the stability of these new filling materials led to a 1991 article by Kammerling et al. that examined their effectiveness. In 1999, a series of articles presented detection criteria for different emerald fillers and GIA's policy for grading them. GIA's emerald research project culminated in a 2007 article analyzing the durability of various emerald fillers (figure 14).

Diamond Treatments. For most of the journal's existence, colored stone treatments and synthetics were the hot-button topics. While articles were published on diamond grading, simulants such as CZ, and occasionally coating and irradiation treatments, the diamond industry remained relatively untouched by problems that had long plagued colored stones. That ended in 1987, with the discovery that surface-reaching cracks in diamonds were being filled with a lead-based glass to improve their apparent clarity. Unlike irradiation, an issue limited to colored diamonds, glass filling directly affected colorless diamonds. Koivula et al. responded with a 1989 article on the identifying characteristics of these goods, while Kammerling and colleagues delivered a 1994 follow-up (figure 15).

In 1999, the industry was again shaken by the emergence of a new treatment for colorless diamonds—one that permanently removed brown coloration from type IIa stones yet left little gemological evidence. Lazare Kaplan International subsidiary Pegasus Overseas Ltd., the distributor of the treated diamonds, announced that GE had developed the process and that hundreds of these goods had passed through gem laboratories undetected. *G&G* responded with a series of investigations, beginning with Thomas Moses et al.'s Fall 1999 "Observations on GE-processed diamonds: A photographic record," which revealed characteristic internal features of these diamonds and confirmed the use of a high-pressure, high-temperature (HPHT) treatment

Figure 14. Mary Johnson's 2007 article on emerald fillers investigated their durability over time and under common conditions of wear and cleaning. The fissures in this 0.74 ct emerald filled with Araldite 6010 (left) partially emptied out after 30 minutes of ultrasonic cleaning (right).

Figure 15. The late 1980s saw the introduction of a new treatment that used lead-based glass to fill surface-reaching cracks in diamonds to improve their apparent clarity. The left and center photos show a 0.20 ct diamond before and after filling. G&G *articles noted identifying features of these treated diamonds, such as the "flash effect" seen on the right (magnified 29×). Photomicrographs by Shane F. McClure.*

method. Subsequent issues provided additional important clues, first by Karl Schmetzer and then by De Beers researchers David Fisher and Raymond Spits. In 2000, Christopher Smith and coauthors offered an in-depth gemological and spectroscopic analysis of diamonds before and after HPHT processing (figure 16).

Diamond Synthetics and Imitations. Although GE had created gem-quality synthetic diamonds on a small scale in the early 1970s, technical barriers and high production costs kept them in the experimental stage for more than a decade. Starting with Sumitomo in 1985, as noted earlier, a number of manufacturers began to achieve commercial production of gem-quality synthetic diamonds for industrial purposes, a development with serious implications for the jewelry industry. Several articles on the characterization and identification of synthetic diamonds appeared in the journal into the 21st century (figure 17), most of them spearheaded by GIA research director James Shigley.

While these early synthetic diamonds were created by the same basic method—heating carbon with a metal flux at high temperatures and high pressure inside a large press—the technique of chemical vapor deposition (CVD) emerged in the 2000s. The CVD synthetics had very different gemological and spectroscopic characteristics, requiring a new round of intensive research. Landmark articles on CVD synthetic diamonds, led by GIA's Wuyi Wang and De Beers researchers Philip Martineau et al., would follow in the pages of *G&G*.

Even diamond simulants saw advances in technology, with the introduction of synthetic moissanite as a jewelry material in the 1990s. A 1997 article by Nassau and coauthors showed how to identify this new imitation, which could not be detected by the thermal conductivity probes then in wide use.

Diamond Cut and Diamond Grading. GIA had begun grading diamonds in the 1950s, but by the 1980s it was clear that refinements to the system were necessary. One of the earliest concerns was the need for a cut grade. Thus began a 15-year research project, which culminated in a series of *G&G* articles that laid out the basis for the Institute's cut-grading system for round brilliant diamonds, launched in 2005. Color grading saw advances as well, for both fancy-color and colorless stones. In 1994, John King and a

Figure 16. High-pressure, high-temperature (HPHT) treatment removed the brown coloration from this 0.97 ct type IIa diamond (courtesy of the Gübelin Gem Lab).

Figure 17. As gem-quality synthetic diamonds began to enter the market, G&G *provided the tools to identify them. These yellow, blue, and pink synthetic diamonds from Chatham Created Gems were featured in 2004. Photo by Harold & Erica Van Pelt.*

team of coauthors presented the GIA Laboratory's updated system for color grading fancy-color diamonds; this was followed over the next several years by companion articles on grading blues, pinks, and yellows. In 2008, King spearheaded a comprehensive article outlining the development of GIA's color grading system for D-to-Z diamonds.

Scientific and Industry Reviews. Not all *G&G* articles are based on original research—many of the journal's most important contributions have been reviews of developments in the field. Emmanuel Fritsch and George Rossman's three-part "Color in gems" series in 1987 and 1988 remains a seminal reference on the topic two decades later. In 1988, nuclear engineer Charles E. Ashbaugh III provided a comprehensive review of the physics and methods of gemstone irradiation. William Boyajian, then GIA's president, wrote the 1988 classic "An economic review of the past decade in diamonds," which set the stage for similar in-depth analyses of the state of the diamond trade. Menahem Sevdermish et al. profiled the rise of India's diamond cutting industry in 1998, and Russell Shor contributed 2005's update on the state of the global diamond industry. In 2007, Janse took on the monumental task of compiling global rough diamond production statistics since 1870. That same year, Shor analyzed the economics of the cultured pearl industry.

Jewelry History and Fashion. Along with its more scientific studies, *Gems & Gemology* also published scholarly articles on jewelry history and fashion. Looking back to the turn of the 20th century, jewelry historian Elise Misiorowski examined Art Nouveau and Edwardian jewelry (figure 18) in 1986 and 1993. J. Mark Ebert's 1983 article captured the creative spirit of the Art Deco period of the 1920s and 1930s, as did Sally Thomas's 1987 article covering jewelry from the 1940s to the 1960s. In 1985, Dirlam and coauthors reviewed pearl fashion from antiquity through modern times. The importance of gemstone durability in jewelry design and manufacturing was featured in Deborah Martin's 1987 article and accompanying chart.

TWENTY-FIRST CENTURY DEVELOPMENTS

Having stepped down as GIA president in 1983, Liddicoat remained chairman and *G&G* editor-in-chief until his death in 2002. After his passing, Alice Keller was named editor-in-chief. Geologist Brendan Laurs, the journal's senior editor since 1997 and a widely published expert on global gem sources, became editor. Attorney and copyright specialist Tom Overton has been managing editor since 2002 (again, see figure 8).

Meanwhile, a number of *G&G* products have supplemented the quarterly issues. Illustrated wall charts, a more regular feature under longtime art director Karen Myers, provide easy reference and have become popular educational and sales tools. These include a world map of gem localities and charts of commercially available gem treatments, synthetic diamonds, and beryllium-diffused corundum. Another valuable resource has been the cumulative indexes, which help users access the subjects and authors that have appeared in the journal since 1981. Printed every five years from 1990 to 2005, the index has been updated online each year since 2005. That same year, the journal launched the *Gems & Gemology in Review* book series, each volume a collection of *G&G* articles and news briefs on a particular topic. Edited by James Shigley, the series to date includes *Synthetic Diamonds* (2005), *Colored Diamonds* (2006), and *Treated Diamonds* (2008).

In the late 1990s, *G&G* began delivering content electronically on the GIA website, and updates from the journal became a regular feature in the *GIA Insider*, the Institute's free electronic newsletter. Today, articles and issues—from the most recent back to 1981—can be downloaded at gia.metapress.com (with all earlier issues and a data depository available for free along with the indexes at www.gia.edu/gandg). What started as a small publication for American jewelers has become a professional journal reaching a worldwide audience of jewelers, gemologists, educators, and researchers. *G&G* is delivered to more than 100 countries, with a Japanese version provided by GIA Japan.

Since 1981, *G&G* has received 31 honors for editorial excellence and print quality, including 12 Gold Circle Awards for best peer-reviewed journal from the American Society of Association Executives and five Gold Ink Awards, the nation's most respected print competition. In 2004, *Gems & Gemology* was accepted into the database of the Institute for Scientific Information (now the Thomson Reuters database), the world's most prestigious resource for indexing and referencing academic journals. To date, *G&G* is the only gemological journal to achieve this recognition.

Figure 18. Elise Misiorowski's 1993 "Jewels of the Edwardians" is one of several jewelry history articles published in G&G. *The cover of that issue, I. Snowman's circa-1910 portrait of Queen Alexandra, consort of King Edward VII, captured the essence of the era in the fabulous jewels she wore. Painting courtesy of A. Kenneth Snowman.*

SUMMARY

Just as print production has shifted from film photography and linotype machines to digital photography and desktop publishing, the field of gemology has witnessed changes that were unimaginable 75 years ago. Once, gemologists used only a few basic tests and techniques (refractive index, specific gravity, fluorescence, prism spectroscope, and microscopic examination). Today, they rely on a multitude of sophisticated instruments and specially trained technicians. *Gems & Gemology* has introduced its readers to these new methods, educated them on how to use and interpret the results, and helped them determine when the identification of a gem material requires more advanced testing. Throughout, the journal has remained committed to its original purpose, set forth in the first issue's editorial: providing "accurate and up-to-date information concerning gem-stones."

In the process, *G&G* has become a powerful forum for up-to-date technical information, derived from global research efforts, that has been rigorously reviewed and insightfully illustrated. As long as there are new gem localities and gem features to explore, new treatment processes and synthetic materials to address, and technological innovations to embrace, the role of *Gems & Gemology* will remain crucial.

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