A GEMOLOGICAL PIONEER: DR. EDWARD J. GÜBELIN

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During a career that spanned more than 65 years, the eminent Swiss gemologist Dr. Edward J. Gübelin (1913–2005) built a monumental legacy. He is perhaps best known for his pioneering work on gemstone inclusions. He established the first systematic classification of inclusions in natural gem minerals, and his research demonstrated the importance of these internal features in determining a gem's identity as well as its country of origin. He wrote extensively on nearly all aspects of gemology, eloquently recording his observations in 13 major books and more than 250 articles. A widely traveled explorer, Dr. Gübelin also reported on some of the world's most important gem localities. In addition, he was an innovator in gem-testing instruments, an influential educator, a major gem collector, and one of gemology's most ardent and respected global ambassadors.

To those who are able to explore their secrets, precious stones relate a story as interesting as that of the huge pyramids erected by the Pharaohs at Memphis, and it would seem that their sublime internal spheres might best be called, "The Fingerprints of God."

Edward J. Gübelin
Inclusions as a Means of Gemstone Identification, 1953

The late Dr. Edward J. Gübelin (1913–2005; figure 1) will forever be linked to the study of inclusions in gemstones, an area of research he pioneered in the early 1940s. His lifelong studies yielded breakthroughs in determining a gem's identity and geographic origin based on these internal features, thus helping to establish the foundation of modern gemology. In many ways, he transformed the way we look at and study these very special minerals. Yet his acclaimed research on inclusions tells only part of the story. Dr. Gübelin was also an insightful and prolific writer whose works on nearly all aspects of gems and their study have been widely read and translated into several languages. He was an inventor of gem-testing instruments, an important gem collector, and an educator who influenced several generations of gemologists. In addition, he was an explorer who chronicled many of the world's major gem sources, both classic and new.

As a tribute to one of the most remarkable figures in the history of gemology, this article examines the many dimensions of Edward J. Gübelin's career, from his early academic training to the enduring legacy he has left behind.

THE EARLY YEARS

The story of Edward J. Gübelin begins with the founding of a family business. In 1854, Jakob Josef Mauritz Breitschmid opened a watchmaker's shop in the picturesque lakeside city of Lucerne, Switzerland. Breitschmid's apprentice, Eduard Jakob Gübelin, married his master's daughter in 1886 and purchased the company in 1899. Their son, Eduard Moritz Gübelin (1888–1945), took the reins in 1919 (*150 Years of Gübelin*, 2004).

See end of article for About the Authors and Acknowledgments.
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Figure 1. The pioneering Swiss gemologist Edward J. Gübelin (1913–2005) looks at a set of gems from his personal collection, which contains more than 5,000 specimens. Best known for his landmark research on gemstone inclusions, Dr. Gübelin was a renowned author, photographer, educator, and explorer whose contributions to the field may never be surpassed.

Eduard Joseph Gübelin, the eldest son of Eduard M. and Maria (Schriber) Gübelin, was born March 16, 1913. Young Eduard (figure 2) attended grammar and high school in Lucerne, with a special focus on natural science and languages. He eventually became fluent in four languages—German, French, English, and Italian—in addition to his native Swiss German, and he could read and write Latin and Greek. Because Dr. Gübelin preferred the English spelling of his given name when publishing for an English-speaking audience, the balance of this article will refer to him as "Edward."

Edward J. Gübelin's lifelong passion for gems was sparked while walking home from grammar school one day, when he saw a brooch set with rubies and diamonds in a shop window. To nurture his son's budding interest, watchmaker Eduard M. Gübelin took the remarkable step of adding a jewelry division to the company:

> It must have been about 1922 or '23 when my father wanted me and my younger brother to decide which profession we wanted to take. And I told my father I'd like to become a jeweler. He said, "Okay, I like the idea. And under the circumstances, I shall add a jewelry section to the firm." However, he was a watchmaker and he didn't know much about gemstones and jewelry. So he took a gemological course with Prof. Michel, who—from Vienna—was the European pioneer in gemology. (Gübelin, 2001)

In 1923, the senior Gübelin also established a small gemological lab to support the fledgling jewelry side of the business. This facility would become the foundation for the Gübelin Gem Lab (*150 Years of Gübelin*, 2004).

THE ACADEMIC AND HIS THIRST FOR KNOWLEDGE

Academic Career. In 1932, at the age of 19, Edward J. Gübelin joined the family business. While working part-time, he majored in mineralogy at the University of Zurich, with additional studies in art history, literature, and ancient languages (Jaeger, 2005).

A crucial period in Dr. Gübelin's gemological education was the winter 1936–37 term, which he spent at the Institute of Precious Stones in Vienna. There he studied under Prof. Hermann Michel, his father's tutor a decade earlier. The professor was an early pioneer in practical gemology whose books included the English-language *Pocketbook for Jewelers, Lapidaries, Gem & Pearl Dealers* (1929). Prof. Michel taught his young protégé to "observe and distinguish inclusions within gemstones and to appreciate their diagnostic value" (Gübelin, 1953). Dr. Gübelin's detailed notes from this class reveal a systematic rigor and enthusiastic curiosity that would characterize his work over the next seven decades.

Another influential figure during these formative years was the renowned German gemologist and mineralogist Prof. Karl Schlossmacher, who had revised Dr. Max Bauer's classic book *Edelsteinkunde*

Figure 2. Edward J. Gübelin, second from the left, excelled from an early age in natural science and languages. Also shown, left to right, are his younger siblings Werner, Walter, Hans Ulrich, Robert, Maria, and Albert Gübelin. Courtesy of Gübelin AG.

[*Precious Stones*] in 1932. During his university time in Zurich, Dr. Gübelin attended a summer course taught by Prof. Schlossmacher, who remained a friend and guiding influence for many years (Gübelin, 2001).

Dr. Gübelin's doctoral dissertation, written in 1938, examined the minerals in dolomite from Campolungo, in the Tessin region of the Italian Swiss Alps (Gübelin, 1939). He was formally awarded his doctorate from the University of Zurich in 1941. His university studies completed, Dr. Gübelin traveled by steamship to the United States in January 1939 to work in the Gübelin firm's New York office and improve his salesmanship and English skills. At this same time, he contacted Robert M. Shipley, founder of the Gemological Institute of America, and enrolled in the Institute's correspondence classes. Dr. Gübelin arrived at GIA in Los Angeles in July 1939 to complete the coursework and prepare for his examinations. He later recalled, "The deeper I delved [into the courses], the more enthusiastic I grew" (Shuster, 2003, p. 66). In August 1939, he received GIA's title of Certified Gemologist (the forerunner of today's Graduate Gemologist, or G.G., diploma; Certified Gemologist later became the title given by the American Gem Society).

After graduating from GIA, Dr. Gübelin returned to Lucerne, where he married Idda Niedermann and rejoined the family business. During World War II, he served in the Swiss Army as an intelligence officer while continuing to pursue gemological studies and independent research when his military duties allowed (figure 3). In 1945, he earned his Diamond Certificate from the Swiss Gemmological Society. He continued his studies with the Gemmological Association of Great Britain and became a Fellow of the Gemmological Association of Great Britain (FGA) with distinction in 1946. This was followed by a gemological certificate from the German Gemmological Society and the Institute of Gemstone Research, both in Idar-Oberstein, in 1954. The next year, Dr. Gübelin was awarded the Gemstone Expert Diploma of the Swiss Gemmological Society.

When Dr. Gübelin was asked recently what

1854 1913 1923 1936–1937 1938 1939 1940

1854 Jakob Breitschmid opens watchmaking shop in Lucerne, forerunner of the Gübelin group of companies

March 16, 1913 Edward J. Gübelin born in Lucerne

1923 Jewelry division added to the watch company, as well as the precursor to the Gübelin Gem Lab

1936–1937 Edward J. Gübelin is introduced to the study of inclusions under Prof. Hermann Michel in Vienna

1938 Completes doctorate in mineralogy at the University of Zurich (diploma awarded in 1941)

1939 Earns Certified Gemologist diploma at GIA

1940 Returns to the family business in Lucerne and marries Idda Niedermann

Publishes his first *Gems & Gemology* article, "Differences between Burma and Siam rubies"

The Gübelin company begins issuing diamond and colored stone certificates signed by Edward J. Gübelin

Joins the Swiss Army, serves until 1945

Figure 3. Dr. Gübelin began publishing on gemstone inclusions in 1940. Here he is using the darkfield Gemmoscope, which he developed in 1942 using the latest in Zeiss optics. Inset: One of Dr. Gübelin's early photomicrographs, of curved striae and elongated gas bubbles in a flame-fusion (Verneuil) synthetic ruby.

advice he would give a young gemology student today, he responded, "The best advice I can give him is to be curious. Ask questions [of] yourself, [of] other people, but remain curious to find out everything you can about gemstones" (Gübelin, 2001).

Lifelong Thirst for Knowledge. Throughout his life, Dr. Gübelin's yearning for gemological knowledge never diminished. Into the 21st century, he rigorously read gemological journals in at least four languages and frequently wrote letters to the authors of these articles to compliment, critique, comment on, or politely question their findings and conclusions.

Perhaps one reason Dr. Gübelin stayed so productive for so long was that his vocation was also his hobby, and as such he did not make any distinction between work and pleasure. In 1991, at the age of 78, he commented on his retirement from business 15 years earlier. "Gemology has become a necessity to me, something that I have to do," he said (Berenblatt, 1991, p. 30). "I'm still studying gemological literature. I'm still receiving gems from all over the world. I enjoy analyzing the nature of the gems."

UNLOCKING THE MYSTERIES OF GEMSTONE INCLUSIONS

> *Inclusions in gemstones speak eloquently of the geological origins and subsequent history of their costly host. All we need to do is open our eyes and explore.*
>
> *Photoatlas of Inclusions in Gemstones*, 1986 (p. 518)

No one in the history of gemology has had as profound an impact on the research and appreciation of inclusions as Edward J. Gübelin. When he first

1942 1945 1946 1950 1952 1953 1962 1963

1942 Develops the Gemmoscope, a darkfield-illuminator-equipped microscope, and creates a diamond cut gauge

1945 Takes over the Gübelin company with brother Walter after the death of their father

1946 Receives FGA with distinction from the Gemmological Association of Great Britain

Founding member of the Swiss Gemmological Society

1950 Develops the first desk-model gemological spectroscope

1952 Helps found the International Gemmological Conference (IGC)

1953 Publishes the classic *Inclusions as a Means of Gemstone Identification*

1954 Receives gemological certificate from the German Gemmological Society

1962 First trip to Burma (now Myanmar)

1963 Produces the film "Mogok, Valley of Rubies" with daughter Marie-Helen. He is the last Western gemologist to visit Mogok for nearly 30 years.

gazed into a microscope in the 1920s, inclusions were considered little more than undesirable flaws and imperfections. As a direct result of his pioneering research and photomicrography, inclusions are now recognized as valuable indicators of a gem's identity, geographic origin, and natural or treated condition, as well as—in many cases—conclusive proof of whether a gem is natural or synthetic. They are also appreciated as objects of natural beauty in their own right, in gems cut or carved to showcase their internal features.

Classifying Gemstone Inclusions. In his 1953 book *Inclusions as a Means of Gemstone Identification*, Dr. Gübelin proposed a classification of mineral inclusions based on when they formed in relation to the host gem crystal.

- **Protogenetic (preexisting) inclusions:** Protogenetic inclusions formed before the growth of the host. These inclusions are always minerals; preexisting gases and liquids are not considered protogenetic. Examples include actinolite and biotite in emerald, and pyrrhotite in diamond. Calcite and dolomite in ruby can be either protogenetic or syngenetic (figure 4, top).

- **Syngenetic (contemporaneous) inclusions:** Mineral inclusions, as well as fluids (liquids and gases), that formed and were "imprisoned" as the host crystal was growing are syngenetic. Classic examples of syngenetic inclusions are the well-known three-phase inclusions in Colombian emeralds, and pyrite in quartz or emerald (figure 4, middle).

- **Epigenetic (post-growth) inclusions:** Epigenetic inclusions formed after the host completed growing, anywhere from immediately to millions of years later. Perhaps the best-known examples are rutile needles in rubies and sapphires, as well as the "fingerprints" that occur in many gemstones, including rubies and sapphires. Rutile needles occur in corundum through exsolution of trace amounts of titanium forced out of the gem's crystal structure during cooling, while fingerprint-like inclusions result from the healing of internal surface-reaching fractures by growth fluids, sometimes long after the host crystal's formation (figure 4, bottom).

In addition to when they were created, Dr. Gübelin classified inclusions by their physical form. This allowed for better description of the inclusion, which has become increasingly important with the multitude of treatments that often alter the internal characteristics of a gemstone. Here he also broadened the definition of *inclusion* beyond internal solids, liquids, and gases within a host gem to encompass characteristics such as cracks and fissures and growth phenomena (e.g., twinning, color zoning, and textural growth structures).

Today, Dr. Gübelin's various inclusion classifications are widely accepted, and their usefulness only grows as new localities are discovered and new synthetics and treated materials continue to emerge. The just-released *Photoatlas of Inclusions in Gemstones, Volume 2* (Gübelin and Koivula, 2005) presents a new classification of gemstone inclusions based on specific diagnostic

1967 1968 1969 1974 1975 1976 1980 1982

1967 Publishes *Burma, Land der Pagoden*

1968 Publishes *Die Edelsteine der Insel Ceylon*

1969 Publishes *Edelsteine*, translated in 1975 as *The Color Treasury of Gemstones*

1974 Publishes *Internal World of Gemstones*

1975 Writes groundbreaking articles on green grossular garnet (tsavorite) deposit in Kenya

Photo by Robert Weldon

1976 Officially retires from the Gübelin company

1980 Receives the Jewelers of America's International Award for Jewelry Leadership

Photo by Robert Weldon

Writes seminal article on cause of color in alexandrite and alexandrite-like gems in *Neues Jahrbuch für Mineralogie Abhandlungen*

1982 Named first honorary member of the American Gem Trade Association (AGTA)

Founding organizer of the International Colored Stone Association (ICA)

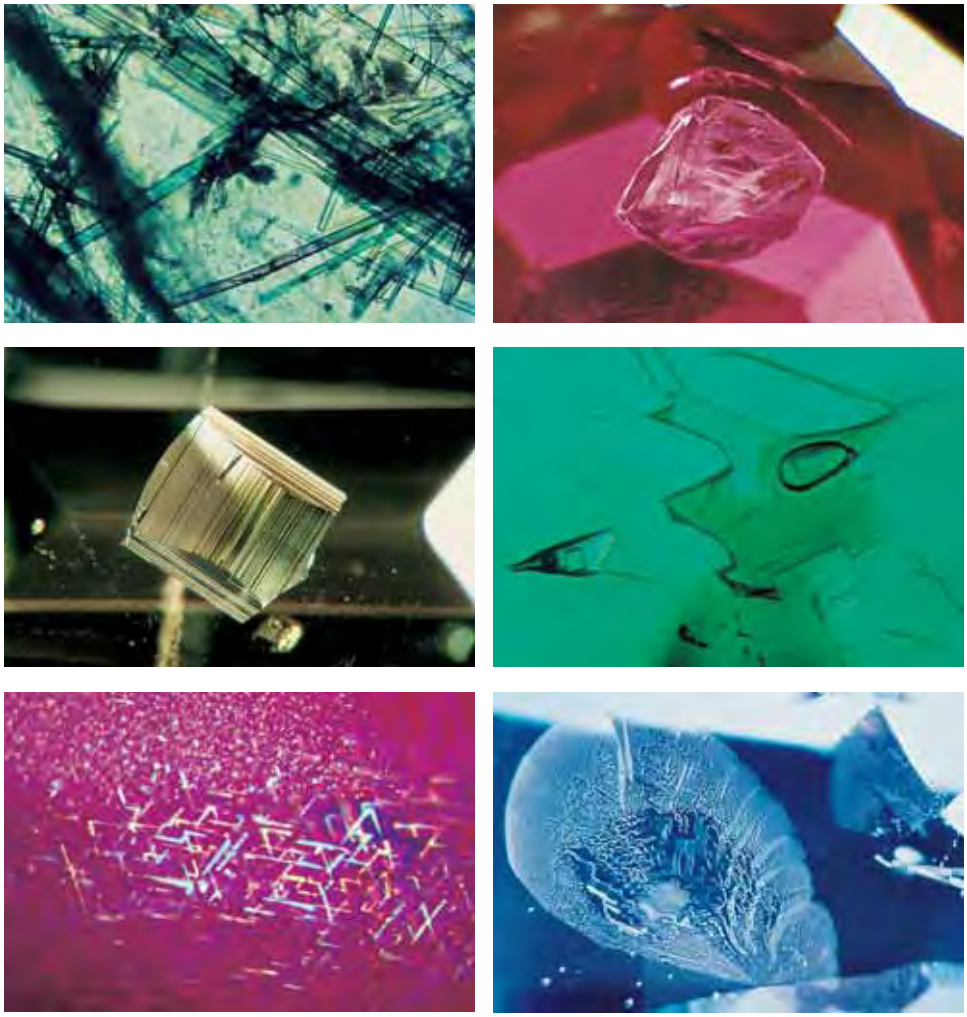


Figure 4. Dr. Gübelin classified mineral inclusions according to when they formed in relation to the host gem crystal. Top: These inclusions of actinolite in Austrian emerald (left, magnified 32×) and calcite in Burmese ruby (right, 32×) are protogenetic (formed before the growth of the host). Middle: This pyrite crystal in Brazilian quartz (left, 25×) and the three-phase inclusions in Colombian emerald (right, 50×) are syngenetic (formed and then "imprisoned" as the host crystal was growing). Bottom: These rutile needles in Burmese ruby (left, 50×) and "fingerprints" in Burmese sapphire (right, 20×) are epigenetic (formed after the host completed growing). Photomicrographs by Edward J. Gübelin, from the Photoatlas of Gemstone Inclusions *(1986); used with permission from Opinio Verlag, Basel, Switzerland.*

mineral species, colors, morphology, and fluid inclusions. It also makes correlations between the inclusions and their hosts on the basis of their geologic formation.

Inclusions as Diagnostic Tools. How did Dr. Gübelin use these microscopic features as diagnostic tools? His understanding of mineralogy and of how and where certain minerals formed in the

1986 1988 1991 1993 1994 1997 1999 2003 2005 2005–2006

1986 Publishes the classic *Photoatlas of Inclusions in Gemstones* (with John Koivula)

1988 Publishes the "World Map of Gem Deposits" (with the Swiss Gemmological Society)

1991 Receives the ICA Lifetime Achievement Award

1993 Presented with the coveted Medal of the City of Paris

One of the first Westerners to return to the gem areas of Mogok

1994 Receives the American Gem Society's Robert M. Shipley Award

1997 *Gems & Gemology's* Most Valuable Article Award is renamed in his honor

1999 Publishes *Edelsteine: Symbole der Schönheit und der Macht* (with Franz-Xaver Erni), translated in 2000 as *Gemstones: Symbols of Beauty and Power*

2003 Inducted into GIA's League of Honor

March 15, 2005 Dies in Lucerne at the age of 91

2005–2006 Posthumous publication of *Photoatlas of Inclusions in Gemstones, Volumes 2 and 3* (with John I. Koivula)

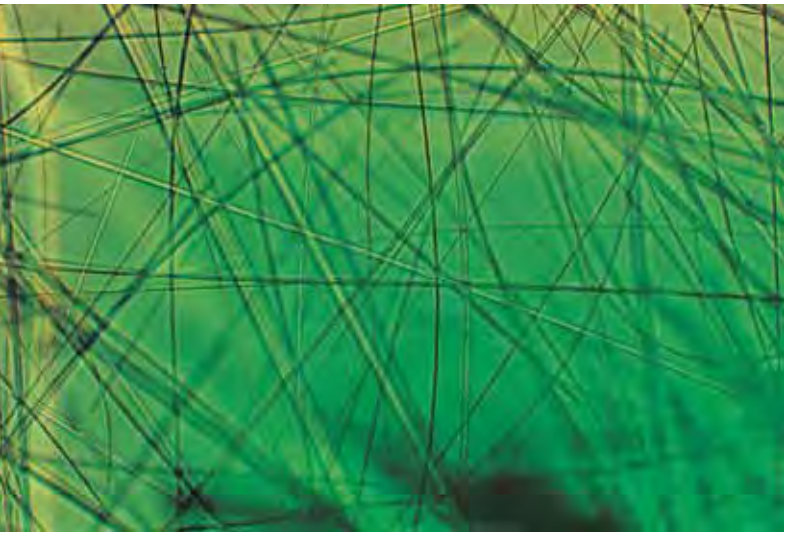


Figure 5. These amphibole fibers, which Dr. Gübelin believed were tremolite, are characteristic of emeralds from Sandawana, Zimbabwe. Photomicrograph by Edward J. Gübelin, magnified 20×, from the Photoatlas of Gemstone Inclusions *(1986); used with permission from Opinio Verlag, Basel, Switzerland.*

earth enabled him to surmise a great deal of information simply by looking at an inclusion with magnification. With polarized-light microscopy, for example, Dr. Gübelin could observe long, slender, fibrous clusters of highly birefringent transparent crystals in an emerald and conclude that they were amphibole inclusions, such as tremolite or actinolite. He knew that such inclusions, with their slightly rounded edges and lack of sharp crystal faces, indicated a protogenetic formation. Protogenetic amphibole inclusions in emerald are known to occur only in certain metasomatic geologic environments, such as those at the mines in Sandawana, Zimbabwe (see, e.g., Gübelin, 1958). Thus armed with a profound knowledge of the relationships between gem minerals, their host rocks, and their internal features, Dr. Gübelin could look through his microscope and ascertain within seconds that these protogenetic inclusions were amphiboles and, on the basis of their morphology, that the emerald in question grew in a geologic environment similar to that at Sandawana (figure 5). The shape, size, quantity, distribution, and fissure patterns of these amphibole inclusions differentiate Sandawana emeralds from those found at other sources, such as Habachtal in Austria or the Ural Mountains in Russia, which also contain amphibole crystals. It was remarkable that Dr. Gübelin could identify these amphibole inclusions without chemical analysis, and determine the emerald's probable geographic origin using only a microscope.

Characteristics of Gem Species. In some cases, Dr. Gübelin stressed, an inclusion type alone will conclusively identify a particular gemstone species or variety. For instance, thread-like "trichites" indicate tourmaline, and "lily pads" are typical of peridot from most localities. Octahedral negative crystals filled with white dolomite identify spinel. "Heat-wave" or "roiled-effect" growth structures are characteristic of hessonite. When such internal features are present, no further tests are necessary to identify the gemstone host (Gübelin, 1999).

His research also revealed that the internal features of many gemstones are globally analogous, or even the same. A few examples of gems where the inclusions are the same from one locality to the next are beryl (other than emerald), kyanite, spodumene, and zircon.

Over the course of his long career, Dr. Gübelin identified hundreds of mineral species as inclusions in the tens of thousands of gems he examined. There is scarcely a gem material he did not report on, from the most common stones on the market to the rarest collector gems, such as ekanite, taaffeite, axinite, and cassiterite. If a gemstone had inclusions, he was intent on learning as much as he could about it. Dr. Gübelin was the first to observe many inclusion relationships, such as chromium-pyroxene in diamonds and apatite and calcite in hessonite. Also consider quartz, which Dr. Gübelin once said he regarded as the most interesting gem mineral. In an October 1995 International Gemmological Conference (IGC) lecture in Thailand, he reported that he had discovered 136 different inclusions in quartz, 40 of them in material from the Swiss Alps.

Genetic Conditions. In 2000, Dr. Gübelin (with Franz-Xaver Erni) wrote, "Just as fossils in rocks give paleontologists information about past geological periods in the earth's history, the inclusions in precious jewels bear witness to formation and growth conditions as well as to the gemstones' place of origin" (p. 218). Conclusions about the geologic conditions under which the original crystal grew can be drawn by studying the internal paragenesis (mineral association) of a gemstone. Dr. Gübelin published his initial observations on this in a 1943 *Gems & Gemology* article titled "Survey of the genesis of gem stones" (figure 6). Calcite and dolomite inclusions in a ruby are proof of the

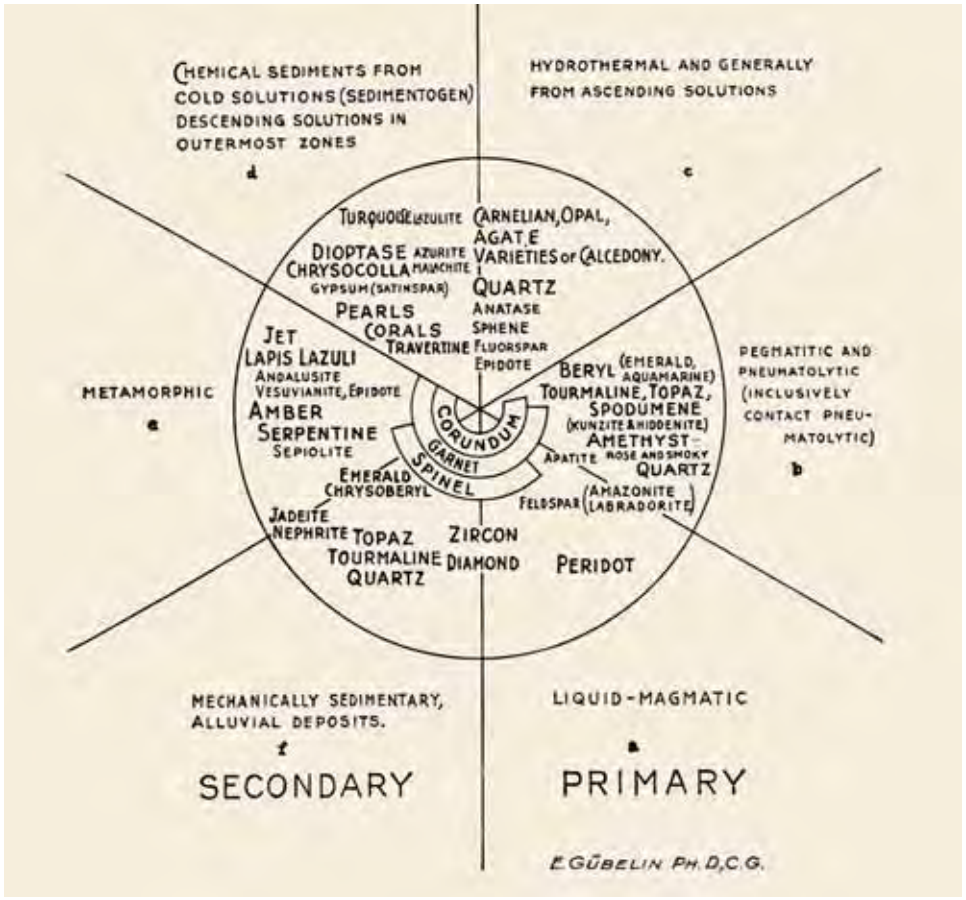


Figure 6. This illustration from Dr. Gübelin's Winter 1943 Gems & Gemology *article, "Survey of the genesis of gem stones," shows a system for classifying primary and secondary gem deposits.*

metamorphic cycle that created the marble in which the original crystal grew, whereas pyrrhotite in ruby betrays its igneous (basaltic) origin. Some (igneous) peridot contains small black chromite crystals, which are remnants from the earth's mantle, just as they are in some (ultramafic) diamonds.

Dr. Gübelin (1999) pointed out that not only do certain inclusions indicate origin in a specific magmatic environment, but they also provide evidence of where within the earth their gemstone hosts formed. For example, chromium-rich diopside, enstatite, and pyrope indicate origin in metamorphic ultramafic rocks of the upper mantle, whereas actinolite, diopside, epidote, and ilmenite predominate in metamorphic rocks of the lithosphere, which extends to the earth's surface.

Diamonds contain a multitude of mineral inclusions (olivine, garnet, pyroxene, spinel, etc.), as well as diamond itself. Because diamonds formed deep in the mantle and were carried to the surface by a magma, inclusions in diamond do not serve as indicators of geographic origin and typically are similar from one locality to the next. They do, however, offer scientists great insights into "deciphering the genesis of diamond and the composition of the earth's mantle at depths of approximately 200 km. These depths are far beyond man's capability to reach, and thus the information contained in these inclusions is of much scientific interest" (H. O. A. Meyer in Gübelin and Koivula, 1986, p. 271).

Natural versus Treated. In some gemstones, inclusions supply evidence of treatment or the absence thereof. With rubies and sapphires, for example, the unaltered or altered state of the inclusions may indicate whether or not the stone has been heat treated at moderate to high temperatures. In emeralds, the microscope reveals visual evidence of the oils and other foreign fillers that are commonly used to reduce the visibility of fractures. As gemstone treatments became prevalent in the trade, Dr. Gübelin began reporting on them (see, e.g., his 1964 *Gems & Gemology* article, "Black treated opals"), and the 1986 *Photoatlas* contains an entire chapter devoted to inclusions in treated corundum.

Natural or Synthetic Origin. Inclusions are essential to identifying the vast majority of synthetics available today. Dr. Gübelin's first report on a synthetic

gem material was "The synthetic emerald" (Gübelin and Shipley, 1941), which described the new products from German manufacturer IG Farben. This article detailed the gemological properties of the Farben synthetics and compared them to natural emeralds from Colombia, Brazil, Russia, and Africa, with several exceptional photomicrographs of the synthetic emeralds' characteristic inclusions. This was the first of many articles on the subject, and nearly every book Dr. Gübelin published featured a discussion accompanied by photomicrographs of inclusions showing the reader how to identify what he dubbed "usurpers from the factory" (Gübelin, 1974a, p. 197). The 1986 *Photoatlas* devoted an entire section, comprising 10 chapters, to synthetics and imitations.

Locality Characteristics (Country of Origin). Historically, certain gemstones with a legendary provenance—such as Burmese rubies, Kashmir sapphires, and Colombian emeralds—have commanded higher prices than comparable stones from other sources (figure 7). Dr. Gübelin learned this fact as early as the mid-1930s, even before his formal gemological training, when the Gübelin firm was dealing with a Colombian emerald:

> They sent the emerald to Prof. Michel, and [he] decided it was a genuine emerald from Colombia. I wondered, 'Why is it so important to know about Colombia?' My father gave me [the] rudimentary information he had, but it impressed me very much. And especially afterwards when I learned about Burmese rubies and the emphasis on Burmese rubies and Kashmir sapphires, I wanted to know why. . . . I started studying inclusions, and that's how I noticed that [there were] visible differences, so I started classifying inclusions. (Gübelin, 2001)

Dr. Gübelin systematically studied geographic origin during his 1936–37 term under Prof. Michel, who had a collection of gemstones that were classified according to localities and their typical inclusions. He learned that certain inclusions form only in specific geologic environments. Dr. Gübelin (1999) acknowledged the "almost incalculable" number of factors that contribute to the variation of inclusions from one gem deposit to another, but are frequently consistent at one particular geographic locality:

> [E]ven gems formed in identical parent rocks e.g. dolomitic marbles at Jagdalek (Afghanistan), Mogok and Mong Hsu (Myanmar), Chumar and Ruyil (Nepal), Hunza Valley (Pakistan), Morogoro (Tanzania) and Luc Yen (Vietnam) manifest specific local differences, by which the gems from these deposits may be ascribed to their particular place of origin. While pargasite may be an inmate of rubies from Mogok and the Hunza Valley, it has not been observed in rubies from other similar sources. Hunza rubies also usually boast margarite mica and pyrite inclusions, whereas calcite, scapolite, sphene, spinel, and sometimes pyrite as well, characterise rubies from Mogok. Rubies from Mong Hsu are devoid of this inclusion assembly—they excel rather in fluorite, which has not been encountered in rubies from any other locality. Rutile—usually with acicular habit and oriented along three . . . directions (forming so-called "silk")—is a regular inhabitant of rubies from most of those places. . . .
>
> However, it is not merely the presence of a specific, single guest mineral which may indicate a particular mother rock, but more often the

Figure 7. The two sapphires in this photo illustrate the commercial importance of determining a gem's geographic origin, which was one of Dr. Gübelin's specialties. Although the natural-color 8.92 ct loose sapphire on the right looks remarkably similar to a "classic" Kashmir sapphire—which many dealers argued that it was—the fact that it was actually from Madagascar resulted in its selling for less than one-fifth the price of a comparable gem from Kashmir. The price per carat of the 20.97 ct natural-color Burmese sapphire in the ring would fall between the prices for comparable Kashmir and Madagascar stones. The matched pair of heated Burmese rubies weighs a total of 4.02 ct. Photo © Erica & Harold Van Pelt and Robert E. Kane; courtesy of Fine Gems International.

> internal association of various repeatedly occurring guest minerals is symptomatic of a specific source. . . . The guest mineral assembly such as apatite, rutile, zircon, etc., in sapphires from metamorphic rocks (e.g., from Sri Lanka) is completely different from that in sapphires from basaltic beds (volcanic origin: Australia, Cambodia, Laos, Thailand, Vietnam) encompassing columbite, plagioclase, uraniumpyrochlor [*sic*] (uranpyrochlore). On the other hand, allanite, pargasite, plagioclase, tourmaline and zircon specify sapphires of pegmatitic origin in Kashmir. (pp. 20–22)

Dr. Gübelin was particularly adept at recognizing combinations of features that were characteristic of a particular locality. A classic example he described was ruby from Mogok: "The combination of calcite- or dolomite- crystals (with their typical lamellar cleavage and poly-synthetic twins) with small 'gratings' of rutile needles in swirly surroundings, is the privilege of the sought-after Burma rubies" (Gübelin and Koivula, 1986, p. 48).

He observed that fibrous inclusions in some gemstones "emphatically hint to definite places of origin," such as almandine with fibrous sillimanite from Okkampitiya, Sri Lanka; andalusite with sillimanite fibers from Santa Teresa, Minas Gerais, Brazil; and quartz with fibrous, hair-fine sepiolite from Finland (Gübelin, 1999, p. 22).

Conversely, Dr. Gübelin reported, "the lack of a particular mineral inclusion may also exclude a particular origin and therefore indicate another source" (Gübelin, 1999, p. 22). A well-known example he cited, demantoid from Namibia, was found to be devoid of the "horsetail" chrysotile inclusions that are characteristic of its counterpart from Russia's Ural Mountains and Val Malenco, Italy.

Starting with the issuance of his first gemological report in the early 1940s, and propelled by his continuing research and the trade's widespread acceptance of geographic locality origin in the 1960s, Dr. Gübelin in effect began what is now a gemological "cottage industry." Using techniques pioneered by Dr. Gübelin, today many gemological laboratories around the world issue reports on a gem's probable country of origin by analyzing a combination of properties such as inclusions, trace-element chemistry, spectral characteristics, and internal growth structures. Because origin determination is not an exact science, in situations where ambiguity exists or properties overlap, most of these labs will not provide a report opinion on the geographic origin of that specific gemstone.

The Science and Art of Capturing Inclusions on Film. Dr. Gübelin's introduction to photographing inclusions through the microscope came during his 1936–37 gemological studies with Prof. Michel in Vienna. Learning to take photomicrographs, he recounted, "was a great experience . . . to put down on paper documents what I had seen with my eyes" (Gübelin, 2001). In the early 1940s, he began providing Gübelin jewelry store customers with a photomicrograph of a gem's inclusions along with a certificate (Peet, 1957). Over the decades, he took tens of thousands of photomicrographs, many of which he published or presented to captivated audiences during his lectures. Dr. Gübelin's enthusiasm for photographing inclusions never waned: He took his last photomicrographs on March 5, 2005, just 10 days before his passing.

In his 1974 *Internal World of Gemstones* (p. 28), Dr. Gübelin wrote, "For research and documentation the employment of microphotography is more or less mandatory. Only photomicrographs—if possible, in colour—allow comparison of objects, provide material for proof of gemstone identity, and at the same time preserve in permanent visual form the inner glories of the world of inclusions for everyone." Indeed, Dr. Gübelin's artistic photomicrography, particularly with the widespread use of color in his books and articles beginning in the 1960s, gave gemologists an entirely new appreciation of the natural beauty of inclusions. "I was always fascinated by looking at gemstones under the instruments," he once noted (Berenblatt, 1991, p. 30). "What has always motivated me to continue my work has been the beauty of gemstones and the beauty of inclusions."

Dr. Gübelin's photomicrographs were exceptional not only for their technical content, but also for their visual quality. He had an artistic eye and an intense curiosity, which he combined with an ability to build and adapt his equipment.

Dr. Gübelin began taking photomicrographs in the 1930s with a monocular microscope before turning to the binocular Gemmoscope he developed in 1942. He also modified Prof. Schlossmacher's horizontal immersion microscope to take many of the photomicrographs that appeared in his 1953 book *Inclusions as a Means of Gemstone Identification* (see "Development of Practical Gem-Testing Instruments" section below). In recent years, his microscopes of choice were the Zeiss SV8 (with a custom adapter for a Nikon SLR camera; figure 8) and a Zeiss petrographic research microscope. With the Zeiss research microscope and its built-in camera, he

Figure 8. Throughout his career, Dr. Gübelin continuously refined his photomicrographic techniques. Here he is shown taking a photomicrograph with his Zeiss SV8 microscope with custom darkfield illumination.

could attain 600× magnification and capture highly detailed inclusion scenes. His last microscope was a Zeiss SV11 with an advanced camera attachment and special exposure timing device, which he used for the new *Photoatlas* volumes (2005 and 2006).

Dr. Gübelin constantly experimented with the best micro-optics available and continued to refine his techniques. He worked with different light sources from the early lamps through fiber optics in his later years. In *Internal World of Gemstones*, Dr. Gübelin describes how he combined darkfield and transmitted light (lightfield) illumination, as well as other techniques, to bring out the contrast between the host mineral and the inclusion (1974a, pp. 27–28). More recently, he used oblique fiber-optic illumination and shadowing techniques to better illuminate the desired inclusion. As he upgraded his microscopes and camera equipment, he also adopted new and better film. His recent favorite was Kodak Tungsten 64.

For his photomicrographs, Dr. Gübelin took detailed notes in shorthand that included the date, film type, magnification, exposure time, and description of the subject inclusion. As part of a larger acquisition, GIA obtained many of these log books along with the entire collection of more than 22,000 slides (see the "Gem Collection" section below). These slides actually represent less than half the number he developed, since he routinely disposed of duplicates or those that did not meet his high standards.

It is unlikely that there is a gemologist anywhere in the world who has not consulted one of Dr. Gübelin's invaluable photomicrographs. It is common practice for many gemologists to compare what they observe in their microscopes to photomicrographs in Dr. Gübelin's many published works. This started with his landmark articles in the 1940s, and continued with his many books such as *Inclusions as a Means of Gemstone Identification* (1953), *Internal World of Gemstones* (1974a), and the original *Photoatlas of Gemstone Inclusions* (1986). His recently published *Volume 2* (2005) and the forthcoming *Volume 3* (in preparation for 2006) of the *Photoatlas* will continue to provide gemologists with the most current inclusions in gemstones for many years to come. Without a doubt, his brilliant execution of photomicrography helped bring the science of gemology to where it is today.

PROLIFIC AUTHOR

Since his early years, when he was one of only a few gemological researchers, Dr. Gübelin sought to inform jewelers and gemologists of new developments in synthetics, treatments, and localities, as well as inclusions. Although he achieved this through his frequent lectures and classes around the world (figure 9), Dr. Gübelin's greatest impact was in his numerous landmark articles and books. He was a

*Figure 9. Dr. Gübelin began lecturing and teaching gemological classes in the early 1940s. In this photo, he is giving a lecture in Sweden (*Swenska Dagblad et*, August 20, 1946). Courtesy of the Edward J. Gübelin family.*

Figure 10. This 1987 photo shows Edward and Idda Gübelin and their five daughters. Standing (left to right): Birgitta Burkart, Franziska Greising, Mrs. Gübelin, Dr. Gübelin, Marie-Helen Boehm. Seated: Isabelle Morelli and Daniela Strub. Courtesy of the Edward J. Gübelin family.

gifted writer, with the ability not only to present his ideas in an informative manner, but also to poetically stimulate the reader's interest in the science and beauty of gemstones. This excerpt from *Internal World of Gemstones* (1974a, p. 137) offers a glimpse:

> The saturated green crystal-clear calm mountain lake is the image of the most beautiful emeralds. Such a peaceful mountain lake magnetizes our gaze into its depths. As we sink into it we attain a world where, in the shimmer of a distant greenish light, fronds of weed cast shadows, rigid growths stretch their limbs like chandeliers, vistas open up in bizarre forests of plants motionless in the eternal tranquility of the deep. . . . This, too, is the scene in the depths of the loveliest emeralds, in whose clear interior we find again vegetation of the deeps and the green foliage; floating between them, we dream our way into it, marvelling, as we admire them under the microscope.

Dr. Gübelin was a dominant force in 20th century gemological literature, with many books and more than 250 articles. His output is all the more astonishing when one considers that he accomplished this as co-director of the Gübelin group of companies, head of its gemological laboratory, a devoted family man with a wife and five daughters (figure 10), and an international traveler. To assist in his prolific output of gemological research, Dr. Gübelin always maintained two sets of fully equipped gemological laboratories—one at the company, and another at his home—so that he could work in the evenings and on the weekends (figure 11). Even after his retirement in 1976, Dr. Gübelin dedicated more hours to his gemological pursuits than many do during their most productive working years.

Books. During his career, Dr. Gübelin wrote 13 major books (see Box A for an annotated bibliography). Many of these were subsequently revised or published in various languages, for a total of at least 34 volumes. In addition, he wrote more than a dozen promotional gem and jewelry booklets for the Gübelin company. Each new book marked a unique contribution to the gemological literature.

"My favorite book is the *Internal World of Gemstones*, because it is the most beautiful. I prefer it, to a certain extent, to the *Photoatlas* because it is

Figure 11. Dr. Gübelin's tremendous research output was aided by his having access to two fully equipped gemological laboratories—one at the company and another at his home. This photo shows his private laboratory as it appeared between 1942 and 1947. Courtesy of the Edward J. Gübelin family.

BOX A: BOOKS BY EDWARD J. GÜBELIN

Between 1940 and 1957, Dr. Gübelin wrote more than a dozen promotional booklets for the Gübelin jewelry stores, covering a wide range of gem-related topics. These handsome booklets were written for the gem and jewelry buying public, both to educate and to generate excitement about precious gems. Most were in German, and the topics included diamonds, color grading of diamonds, precious stones, rubies and sapphires, emeralds, pearls, gems and jewelry, inclusions, and birthstones.

Edelsteine [*Gemstones*] (1952): This small but comprehensive book was intended for the layperson, with 18 beautiful watercolors of rough and faceted gemstones. First published in German in 1952, it was translated into French (*Pierres Précieuses*), with 1953 and 1955 editions. An English version (*Precious Stones*) was published in 1963, followed by a second edition and a third in 1973.

Inclusions as a Means of Gemstone Identification (1953): This is the first book in gemology to provide a comprehensive classification of gemstone inclusions and explain their usefulness in identification. Detailed text and 256 black-and-white photomicrographs describe the internal features in diamond as well as ruby, sapphire, emerald, and other major colored stones. This book is a compilation of Dr. Gübelin's popular series of *Gems & Gemology* articles on inclusions in gemstones, which were published between 1940 and 1946.

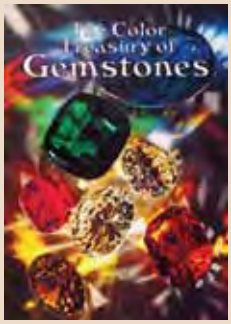
Schmuck- und Edelsteinkundliches Taschenbuch [*Jewelry and Gemology Pocketbook*] (with Karl F. Chudoba, 1953): In the introduction, the authors suggest that this is the first German-language pocket reference on precious stones. It contains brief characterizations of the major gems, plus information on inclusions, synthetics and imitations, and instruments.

Echt oder Synthetisch? [*Natural or Synthetic?*] (with Karl F. Chudoba, 1956): This succinct volume on the differences between natural and synthetic gems provides a brief history of the development of synthetics and describes how they can be identified by growth marks, inclusions, and other features. It contains exceptional black-and-white photomicrographs of inclusions in synthetic and natural gemstones.

Edelsteinkundliches Handbuch [*Gemology Handbook*] (with Karl F. Chudoba, 1966): This retitled and significantly revised second edition of the 1953 *Schmuck- und Edelsteinkundliches Taschenbuch* had considerable text and photographs added. A third edition, with an expanded dictionary and important new material on synthetics, followed in 1974.

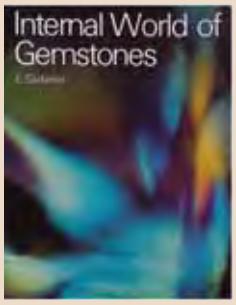
Burma, Land der Pagoden [*Burma, Land of Pagodas*] (1967): Researched in various parts of Burma in 1963, this volume is illustrated with extraordinary photos by Dr. Gübelin's eldest daughter, Marie-Helen Gübelin Boehm. This German-language text is a general-interest book on Burma with a section on Mogok and ruby mining. It was an important commentary on this country, published just as a military regime took power and foreign entry became severely limited for the next several decades. A French version was later issued.

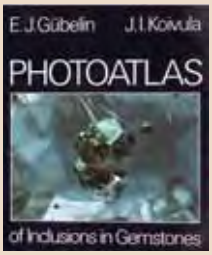
Die Edelsteine der Insel Ceylon [*The Gemstones from the Island of Ceylon*] (1968): Based on Dr. Gübelin's numerous travels to Sri Lanka (formerly Ceylon), it provides information on the geology, mining, and production of the island's gem wealth. It also contains many of Dr. Gübelin's exceptional locality photos and inclusion photomicrographs. Aside from descriptions of individual gemstones, sources, and inclusions throughout various chapters, the gemological properties and data are summarized in a tabular format in the last part of the book.



Edelsteine [*Gemstones*] (1969): This all-new work with the same German title as his 1952 book was also written in a nontechnical style that emphasizes the beauty of gems. In addition to profiles of the major gemstones, it touches on subjects such as rarity, cause of color, lapidary arts, phenomenal gems, and ornamental stones. It is accompanied by superb color photographs, many of which were taken by Dr. Gübelin. The German version sold 50,000 copies; it was also published in Italian as *Pietre Preziose*, in French as *Pierres Précieuses*, and rereleased in German as *Schmuck- und Edelsteine aus aller Welt* in 1977. The English edition was published in 1975 as *The Color Treasury of Gemstones.*

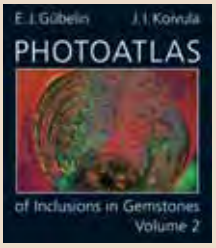
Innenwelt der Edelsteine: Urkunde aus Raum und Zeit [*Internal World of Gemstones: Documents from Space and Time*] (1973, followed by the English translation in 1974): This successor to Dr. Gübelin's 1953 book on inclusions contains 350 color photomicrographs and additional text on the genesis of these internal features. Sinkankas (1993) wrote of this work, "The photographs of superb quality and sharpness of detail are expected to provide ready reference as the student examines inclusions in the microscope." This book was ideally suited for the gem expert as well. Second and third English editions appeared in 1979 and 1983.





Photoatlas of Inclusions in Gemstones (with John I. Koivula, 1986): The *Photoatlas* is considered one of the most important gemological texts of the 20th century, and is the "crown" of Dr. Gübelin's 50 years of intensive research on gemstone inclusions. It contains some 1,400 color photomicrographs of inclusions in diamond, ruby, sapphire, emerald, quartz, and many other gems, as well as in the synthetic and treated gems introduced up to that time. First published in both German and English in 1986, a second revised English edition came out in 1992, followed by a third revised edition in 1997, and a fourth edition in 2004. A Chinese version was released in 1991.

Gemstones: Symbols of Beauty and Power (with Franz-Xaver Erni, 2000): This book, which followed a 1999 German edition, and preceded a 2001 Polish edition, is intended for a broad audience. It is lavishly illustrated with several hundred color photos, many by celebrated gem and mineral photographers Harold and Erica Van Pelt, with exceptional gem mining photos by Dr. Gübelin.



Photoatlas of Inclusions in Gemstones, Volumes 2 [2005] *and 3* [scheduled for late 2006] (with John I. Koivula): These two new volumes add to the already comprehensive work contained in the *Photoatlas of Gemstone Inclusions* (1986). They cover the many new localities for natural gems, the latest synthetics, and all the treatments that the authors encountered in the 20 years since the publication of the first *Photoatlas*. Thousands of original photomicrographs have been included, along with an expanded inclusion classification system and a chapter focusing on geologic correlations in origin determinations. A first draft for this work as a single volume was prepared shortly before Dr. Gübelin's passing. Due to its length, however, the manuscript was divided into two separate volumes.

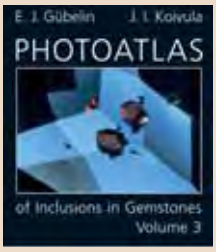


Figure 12. The 1988 "World Map of Gem Deposits," with more than 750 localities and color-coded designations for the type of gem as well as its geologic environment, remains the most comprehensive map of its kind. On the back are 40 photos of gem localities with descriptions of the mines and mining operations, as well as 24 photos of gems from Dr. Gübelin's collection. Inset: One of the locality photos, taken by Dr. Gübelin, which shows the alluvial mining of gems in Southeast Asia.

more of a pictorial, while the *Photoatlas* is more of a study book," he recalled (Berenblatt, 1991, p. 30). "But I am most proud of the *Photoatlas*, which I co-authored with John Koivula. I would call it the crown of my work of investigation of inclusions in gemstones."

Dr. Gübelin also contributed entire chapters to other authors' books. A few examples include: *The Great Book of Jewels* (Heiniger and Heiniger, 1974); *Diamonds: Myth, Magic, and Reality* (Legrand, 1980); *Edelsteine und ihre Mineralieneinschlüsse* (Weibel, 1985); and *Emeralds of Pakistan* (Kazmi and Snee, 1989).

World Map of Gem Deposits. In 1988, Dr. Gübelin published a remarkable reference guide, the "World Map of Gem Deposits" (figure 12). The map, which took two years to produce, was designed to commemorate the 50th anniversary of the Swiss Gemmological Society in 1992. It shows more than 750 deposits worldwide, with color-coded designations for the type of gem as well as its geologic environment. The text was presented in English, French, German, Italian, Spanish, and Portuguese. The reverse side of the map contains 65 photos of gems and gem localities, with descriptions of the mines, mining operations, and the gems themselves.

This world map was one of Dr. Gübelin's proudest achievements. "It's the work that gave me the greatest pleasure to accomplish," he recalled (Berenblatt, 1991, p. 30). "It was just like traveling around the world, though I never left my desk in my living room. Traveling and visiting these deposits always gave me great pleasure."

It remains the most complete gem deposit map ever produced, and can be seen in jewelry stores and gemological laboratories around the world.

Articles. During his career, Dr. Gübelin published more than 250 scholarly articles (visit www.gia.edu/

gemsandgemology and click on "*G&G* Data Depository" for a complete list). He was a frequent contributor to a host of gemological journals from Australia, Austria, France, Germany, Great Britain, India, Switzerland, and the U.S.

Dr. Gübelin's longest affiliation, however, was with *Gems & Gemology*. From 1940 to 2003, he contributed 54 articles to the journal. Dr. Gübelin's first report, "Differences between Burma and Siam rubies," featured inclusion photomicrographs and engaging, descriptive text. This began a popular six-year series in *Gems & Gemology* on inclusions in gemstones, which in 1953 was compiled into the book *Inclusions as a Means of Gemstone Identification*. His last contribution to *Gems & Gemology*, which he co-authored with six other researchers, was "Poudretteite: A rare gem species from the Mogok Valley" (Smith et al., 2003). The article was published in the Spring 2003 edition, a special issue celebrating Dr. Gübelin's 90th birthday.

The Dr. Edward J. Gübelin Most Valuable Article Award. Dr. Gübelin also exerted a lasting influence on the gemological literature with his support of *Gems & Gemology*'s annual Most Valuable Article Award. The award was established in 1982 to recognize outstanding contributions, as voted by the journal's readers. (Dr. Gübelin himself received an award for his 1982 article "The gemstones of Pakistan: Emerald, ruby, and spinel.") In 1996, GIA officials approached the eminent gemologist about renaming the award in his honor. Dr. Gübelin accepted, and 1997 marked the first Dr. Edward J. Gübelin Most Valuable Article Award.

Dr. Gübelin's generosity went beyond just lending his name and prestige to the award. Each year, he insisted on writing a check that would cover the prize money. In 2003, he established a fund that would be used in perpetuity to provide a financial award for the winning authors and thus promote continuing excellence in gemological writing.

INTERNATIONAL EDUCATOR AND MENTOR

> *Dr. Gübelin's charm, elegance and intellect combined with an artist's eye, a poet's heart and a philosopher's approach to life has instilled in him a unique talent to convey complex topics in a manner which is readily understood and the ability to inject others with his infectious adoration of gemstones.*
>
> Gübelin Gem Lab, 2005

Over the years, Dr. Gübelin delivered hundreds of lectures on various aspects of gemstones for both scientific and popular audiences (figure 13). Some were at regularly occurring events, such as the annual meetings of the Swiss Gemmological Society and the biennial International Gemmological Conference. Other speaking venues included the American Gem Society Conclaves in North America, the CISGEM Gemmologia Europa in Milan, the Gemmological Association of Great Britain meetings, the 1981 International Gemological Symposium in Los Angeles (figure 14), and assemblies of gemological associations and trade shows worldwide. His "superabundance of enthusiasm" (Ruff, 1948, p. 125) was infectious for the many thousands who attended his lectures and courses over the decades.

Dr. Gübelin took pains to combine scientific reasoning with ethics to protect consumer confidence and promote the economic vitality of the gem and jewelry trade. He invariably stressed that "the consequence of applied gemology should culminate

Figure 13. In this photo from a 1967 Swiss Gemmological Society meeting, Dr. Gübelin uses a pair of models to demonstrate crystal structure. His diagrams on the blackboard illustrate refractive indices of various gem materials. Photo by Jürg H. Meyer.

Figure 14. In addition to speaking on inclusions at the 1981 International Gemological Symposium hosted by GIA in Los Angeles, Dr. Gübelin also participated in this panel with other prominent gemologists. From right to left: Richard T. Liddicoat, Edward J. Gübelin, Edward Tiffany, Bert Krashes, and G. Robert Crowningshield. Photo © GIA.

in ethical behavior for the benefit of the clientele" (Hays, 1989, p. 20).

As far as gemology was concerned, Dr. Gübelin had no competitors, only colleagues. His work with the Swiss Gemmological Society illustrates his dedication to training other gemologists. Each summer he would devote one or (in later years) two weeks to teaching gemology at the national meeting. Then he would travel to each of the regional chapters and lecture on a specific gem or other gem-related topic. He could conduct the courses equally well in English, French, German, or Italian.

His friend and colleague from the Swiss Gemmological Society, Daniel Gallopin, recently marveled that Dr. Gübelin could give an hour-long lecture (in perfect French) illustrated with 100 inclusion slides and accurately identify all the obscure mineral inclusions without any notes or script. "Dr. Gübelin exemplified the 'Universal Spirit,'" said Mr. Gallopin (pers. comm., 2005). "It was not enough that he knew and could state the scientific details accurately, but he could also say it and write it in the proper manner."

Even as he limited his appearances in later years, Dr. Gübelin still maintained an avid correspondence with fellow gemologists around the world. Colleagues, including many of the authors of this article, have retained those letters, which are unique in their professional wisdom, kindness, and encouragement. Just as the legendary Profs. Michel and Schlossmacher helped guide his own professional development as a gemological researcher, Dr. Gübelin served as an inspiration and mentor to countless gemologists for more than six decades.

INTREPID EXPLORER

His academic pursuits made Edward J. Gübelin a scholar, but his travels to hundreds of gem localities and trading centers across the globe for nearly 50 years gave him rare practical experience (figure 15). Dr. Gübelin relished these extensive, often rugged expeditions to remote locales. Indeed, he was as comfortable at a gem mine in mud-splashed khakis as he was in a freshly pressed tuxedo at a symphony. He and his wife, Idda, also journeyed the world as tourists interested in art and culture, to places such as Afghanistan, Egypt, Greece, and South Africa. Sometimes they were accompanied by one of their five daughters, all of whom became world travelers themselves.

Dr. Gübelin was often one of the first gemologists to write a detailed study about a major gem locality. Many were classic sources, such as Mogok and the jadeite mines of Upper Burma (see, e.g., Gübelin, 1964–1965, 1965, 1966c, 1978); the ancient turquoise mines of Iran (see, e.g., Gübelin, 1966a,b); the gem-rich island of Ceylon (Gübelin, 1968); and Zabargad, the ancient peridot island in the Red Sea (Gübelin, 1981). Among the newer localities he documented were the emerald and alexandrite deposits at Lake Manyara in Tanzania (Gübelin, 1974b, 1976), and later the Merelani tanzanite mines in that same country (Gübelin and Weibel, 1976); the tsavorite mines in Kenya (Gübelin, 1975; Gübelin and Weibel, 1975); the emerald, ruby, spinel, and topaz areas of Pakistan (Gübelin, 1982; Gübelin et al., 1986); and the sapphires of Andranondambo, Madagascar (Gübelin, 1996; Gübelin and Peretti, 1997).

For nearly 50 years, he repeatedly visited the most important gem sources on five continents, examining the inclusions in gemstones and field-collecting or purchasing material for subsequent investigations back in his Lucerne laboratory. The knowledge he acquired from his many journeys to gem deposits in Asia, Africa, North and South America, and Australia appeared in his books, articles, lectures, and films.

Not only did Edward Gübelin have a passion for the photomicrography of gemstone inclusions, but he also mastered landscape, still life, and action photography, as well as motion picture

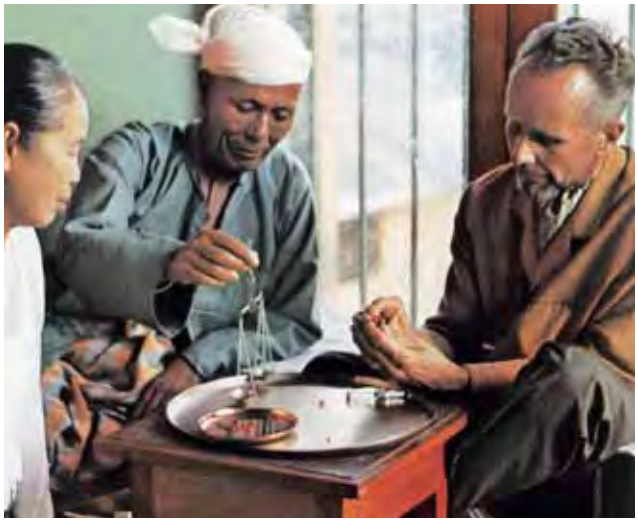


Figure 15. Over the course of more than 50 years, Dr. Gübelin's travels took him to hundreds of gem localities and trading centers across the globe. Upper left: Purchasing rubies in Mogok, Burma, 1963 (photo by Marie-Helen Gübelin Boehm). Upper right: Buying gems in Bangkok with C. Supanya, 1970 (photo by Daniela Gübelin Strub). Lower left: Sailing in 1980 to the oldest known source of peridot, the Red Sea island of Zabargad (photo by Peter Bancroft).

filming (see the "Filmmaker" section below). During these trips, he excelled at capturing on film the occurrence, mining, and recovery of gems at their source (figure 16). What comes through most vividly in Dr. Gübelin's travel photography, however, is his fondness for people and their unique cultures.

As a gem collector and, for more than 30 years, the co-owner and president of the Gübelin group of jewelry stores, Dr. Gübelin was also a major buyer of fine gemstones for nearly five decades—a unique situation for a research gemologist. One notable incident occurred during a single 24-hour visit to Rangoon, Burma, in 1964. Dr. Gübelin later recounted, "They showed me their goods . . . Burmese rubies and sapphires and spinels, and whatever the heart could ask for, and I just purchased like that. . . . I purchased for $2 million that day between 11:00 a.m. and 6:00 p.m." (Gübelin, 2001).

Figure 16. After washing of the illam *(gem-bearing gravels), miners in Sri Lanka examine them for gem rough. Today, these time-honored recovery methods are still used by many gem miners in Sri Lanka and elsewhere. Photo by Edward J. Gübelin, from the early 1960s.*

DEVELOPMENT OF PRACTICAL GEM-TESTING INSTRUMENTS

Edward J. Gübelin's accomplishments in instrument development, though typically overshadowed by his famed inclusion research and literary works, stand alone as monuments to his innovative genius. Much of Dr. Gübelin's early research was performed using instruments he invented or improved on during the 1940s and '50s. Gem-testing equipment was not readily available in those days, and Dr. Gübelin often recognized a need and filled it by developing a particular instrument. This impulse, he later recounted, grew out of his student days at GIA:

> I never had [seen] any of these instruments. I'd never seen a Diamondscope or other instruments [GIA] had developed. And that was a great experience for me. So these were my first activities when I returned to Switzerland, to improve instruments. (Gübelin, 2001)

Back in Lucerne, Dr. Gübelin was "full of enthusiasm," and soon gemological instruments began to emerge from his workshop. Many of the following instrument descriptions were from a January 20, 1983, letter to one of the authors (REK) from Dr. Gübelin, while others mentioned in the last paragraph of this section were cited in a curriculum vitae written by Dr. Gübelin in the early 1980s; copies of both documents are archived at GIA's Richard T. Liddicoat Library and Information Center.

The Horizontal Immersion Microscope. One of the existing instruments Dr. Gübelin modified and improved was the horizontal immersion microscope (figure 17A), which he later used to take many of the more than 250 photomicrographs that appeared in his 1953 classic *Inclusions as a Means of Gemstone Identification*. The main body of this instrument had been invented by his friend and colleague, Prof. Karl Schlossmacher. "With the help of a few changes and additional accessories," Dr. Gübelin later wrote in his 1983 letter to REK, "it became a very efficient photomicroscope."

The Koloriskop. The first instrument Dr. Gübelin designed and had built was the Koloriskop, a self-contained device that provided a controlled light source for color grading diamonds (figure 17B). His design was directly inspired by GIA's Diamolite (an early version of the modern DiamondLite). Dr. Gübelin had first used the Diamolite as a student at the Institute, and Robert Shipley granted him permission to develop a similar instrument. The GIA unit used an incandescent bulb (producing "yellowish" light) that was covered by a blue filter to simulate natural daylight. To improve the accuracy of diamond color grading, Dr. Gübelin utilized a daylight-equivalent fluorescent tube and created a trough with slots in which ring-mounted diamonds could be inserted in the proper position for color grading. Like most of the instruments he designed, the Koloriskop incorporated elements of practicality and ease of use.

The Detectoscope. Dr. Gübelin also made improvements to the Detectoscope (figure 17C), an instrument first created by Prof. Michel and Gustav Riedl in the mid-1920s (Eppler and Eppler, 1934) to examine the absorption of light in a gemstone when placed over filters of different colors or a luminescence filter. A magnifying lens and a dichroscope could also be inserted into a special holder in the original Detectoscope (Michel, 1929). Dr. Gübelin added a Chelsea color filter, a daylight filter, and to further improve the instrument's use in combination with a dichroscope, a "milk glass" diffuser (Pough, 1949).

The Gemmoscope. This darkfield illuminator–equipped binocular microscope (figure 17D) was devised by Dr. Gübelin in 1942. He drew upon newly developed Zeiss optics and improved the darkfield illumination from a GIA Diamondscope. Not only was this microscope useful for the observation and photography of inclusions, but it was also compatible with Prof. Michel's pearl-testing device, enabling the visual examination of half- or fully drilled pearls to determine whether they were natural or cultured. The Gemmoscope even featured an ergonomically designed base for resting the hands and forearms during use. It is interesting to note that the logo at the top of Dr. Gübelin's personal stationery was a stylized depiction of the microscope objectives on the Gemmoscope positioned over a round brilliant–cut gemstone.

The Cut-Measuring Device. That same year, Dr. Gübelin created the Schliffmessgerät für Edelsteine (gemstone cut measuring) diamond gauge (figure 17E). This innovative handheld device was designed to measure the facet angles and proportions of faceted diamonds. A mere 6.5 cm (2½ in.) in diameter, with a thickness of only 5 mm (3⁄16 in.),

Figure 17. Dr. Gübelin developed a number of diagnostic gem-testing instruments during the 1940s and '50s, including: (A) the horizontal immersion photomicroscope, (B) the Koloriskop, (C) the Detectoscope, (D) the Gemmoscope, (E) the cut measuring device, (F) the Jewelers' Spectroscope, and (G) an innovative device that allowed the user to magnify and then photograph a gem's spectrum. With the exception of photo E, which was taken by Harold & Erica Van Pelt, all the other photos were commissioned or taken by Dr. Gübelin shortly after the development of the instrument.

it could be used to measure crown angles and pavilion angles, as well as the girdle thickness, table diameter, crown height, pavilion height, and total height of a cut gem. The back of the gauge listed two separate sets of proportions—both the Tolkowsky and Eppler cut calculations—for handy reference. Along with his Swiss Army knife, Dr. Gübelin carried this instrument with him almost everywhere he went.

The Gemmolux. In 1945, Dr. Gübelin designed the Gemmolux (Gübelin, 1945), a small, portable light source for examining gemstones. This instrument had built-in darkfield illumination and could be fitted with a removable loupe or dichroscope. The Gemmolux was especially handy when the user was buying gems away from the office.

The Jewelers' Spectroscope. One of Dr. Gübelin's influential mentors and teachers was B. W. Anderson, the "father of gem spectroscopy," whom the young Edward Gübelin met on his return from the U.S. in 1939. Anderson inspired in Dr. Gübelin a great appreciation for the diagnostic value of spectra in gem identification. In 1950, Dr. Gübelin invented the world's first desk-model spectroscope unit (figure 17F) designed solely for use with rough and cut gemstones (Bruton, 1951; E.J. Gübelin, pers. comm., 1983). Prior to the introduction of this instrument, gemologists had to rely on handheld spectroscopes that were designed for use in other fields.

Dr. Gübelin's spectroscope unit featured a clip to hold the stone and a light built into the base of the instrument, which enabled the gemologist to position the gem and adjust the light intensity (with a rheostat knob on the side of the instrument) so as to bring out the clearest spectrum possible. The spectroscope tube could be raised to permit observation by reflected light. The design also allowed delicate opening and closing of the slit. In addition, the unit sat on a work surface and was inclined at such an angle that the gemologist could sit comfortably for long periods of time while examining spectra and still have both hands free to take notes or draw the spectrum being observed. Dr. Gübelin even added a forward-thinking ergonomic touch: special eyepiece lenses that could be used to lengthen the blue end of the spectrum and accommodate an observer who wore eyeglasses.

Dr. Gübelin debuted his Jewelers' Spectroscope unit during the 1951 Gemmological Exhibition in London. On the second day of the exhibition, Dr. Gübelin and Dr. G. F. Herbert Smith of the Gemmological Association of Great Britain personally gave Queen Mary a special tour through the event (Bruton, 1951).

Photographing Absorption Spectra. In addition to the Jewelers' Spectroscope, Dr. Gübelin designed another innovative device that allowed him to magnify and then photograph a gem's spectrum (figure 17G). Dr. Gübelin was keen on being able to photograph spectra, and since such instruments were not available, he developed his own.

Zeiss Spectrometer Optical Bench. Working with the German optical company Zeiss, Dr. Gübelin developed an ingenious optical bench spectrometer setup, whereby two spectra could be observed simultaneously, one above the other. This was accomplished by using a comparison prism. This instrument was particularly useful for checking the spectrum of an unknown gem against those of standard reference stones (Pough, 1949). Not only could the spectra be observed through an eyepiece lens apparatus, but at the same time a 35 mm camera mounted perpendicular to the eyepiece could take photographs of the spectra.

Other Instruments. Dr. Gübelin also developed a custom-made polariscope, suspension equipment for specific gravity determination using heavy liquids, an electrical conductivity meter to differentiate treated blue diamonds from natural-color type IIb blue diamonds, a fluoroscope for measuring fluorescence emission lines, and an apparatus for examining the absorption spectra of gemstones while they were exposed to long-wave ultraviolet radiation. In addition, he was particularly adept at getting the most out of commercially available instruments. One example was his own Erb & Gray refractometer, which he mounted on a specially designed stand that had a compact sodium light source, providing sharper refractive index readings (Pough, 1949).

Some of Dr. Gübelin's state-of-the-art instruments, including the Koloriskop and Jewelers' Spectroscope, became important tools for gemologists around the world. Yet the place where these devices made their greatest contribution was in Lucerne, both at his personal home laboratory and at the Gübelin Gem Lab.

ROLE IN DEVELOPING THE GÜBELIN GEM LAB

In 1923, not long after young Edward J. Gübelin expressed his desire to become a jeweler, his father established a small but well-equipped gem-testing laboratory. This facility was staffed by Charles Salquin, whom the senior Gübelin also had sent to study with Prof. Michel. Having opened two years before the London Laboratory, it is credited with being one of the world's first privately owned gemological laboratories (Gübelin, 2001). The lab was added on to the firm's Lucerne headquarters (figure 18) to ensure consumer confidence in the authenticity of gems purchased from the Gübelin jewelry stores, at a time when the undisclosed sale of cultured pearls and synthetic rubies posed a major threat to the international jewelry industry.

In late 1939, after completing his studies at GIA, Dr. Gübelin assumed leadership of the laboratory. He immediately began acquiring more gem-testing instruments, and for many years it was considered the best-equipped gemological laboratory in the world (figure 19):

> The main laboratory . . . is probably without peer. Certainly, the GIA laboratories and the fine London Laboratory do not have the full variety of equipment that the Gübelin Laboratory boasts. Here Dr. Gübelin maintains X-ray diffraction and radiographic equipment; a quartz spectrograph; a variety of spectroscopes and spectroscope light sources, including a versatile light and spectroscope mount of his own design; a variety of ultraviolet light sources; separate balances for weighing and S.G. determinations; petrographic and binocular microscopes of recent vintage (and the only darkfield-illuminator-equipped binocular microscopes we saw in European laboratories); and many other instruments. Each of the three refractometers, including one of [only] three Rayner has made with a diamond hemisphere, is equipped with its individual monochromatic sodium light source. (Liddicoat, 1961, p. 138)

After taking over the laboratory, Dr. Gübelin began issuing written gemological reports for the customers of the Gübelin jewelry stores and gem dealers (Gübelin, 2001). These included diamond grading reports (figure 20), based on the system he had learned while studying at GIA, as well as locality-of-origin reports for colored stones.

By the early 1960s, demand for the Gübelin lab's locality-of-origin services was growing, and a number of auction houses, insurance companies, collectors, and museums were sending their gems to Lucerne for reports (*150 Years of Gübelin*, 2004). Today the Gübelin Gem Lab is a leader in ruby, sapphire, and emerald locality-of-origin determinations.

Figure 18. This photo provides a glimpse of the early Gübelin Gemological Laboratory, circa 1930s. Note the gemological property tables, which were handwritten by Dr. Gübelin when he was a 19-year-old student at the University of Zurich. Courtesy of the Edward J. Gübelin family.

Figure 19. This represents only some of the gem-testing equipment at the Gübelin Gemological Laboratory from 1946 to 1952. For many decades, it was the regarded as the world's best-equipped gem-testing lab. Courtesy of the Edward J. Gübelin family.

Figure 20. By 1940, Dr. Gübelin's expertise enabled the family firm to issue diamond grading reports. This certificate, signed by him, is dated May 28, 1940.

While Dr. Gübelin's early inclusion investigations relied primarily on the microscope, he later championed the application of advanced technologies in his laboratory's inclusion analyses and locality-of-origin determinations. As early as the mid-1960s, he began having lapidaries grind down rough and faceted research samples to expose mineral inclusions in order to have them analyzed by university scientists with an electron microprobe or by X-ray diffraction, methods that allowed definitive identification. He also had microthermal analyses performed on fluid inclusions (Gübelin and Koivula, 1986). UV-visible spectroscopy has been used in the Gübelin lab for origin determinations (particularly of sapphires) since the 1960s (see, e.g., Hänni, 1990; Schwieger, 1990). As technology advanced, lab gemologists were able to use features in the ultraviolet region of the spectrum and later in the near- and mid-infrared regions. Origin-of-color determination in fancy-color diamonds using spectral analyses was also an interest and a specialty of Dr. Gübelin's.

After his official retirement in 1976 until his passing in 2005, Dr. Gübelin remained a forceful advocate of integrating advanced technologies into gemological research. These included energy-dispersive X-ray fluorescence (EDXRF) analysis, Raman spectroscopy, and even laser ablation–inductively coupled plasma–mass spectroscopy (LA-ICP-MS). Once a particular analysis had been conducted on an inclusion or the host gem, Dr. Gübelin would incorporate the data into his ongoing research. Through his publications, lectures, and extensive correspondence, he broadcast the importance of these advanced analytical tools to the international gemological community.

LEADER OF THE GÜBELIN GROUP OF JEWELRY STORES

The Gübelin watch and jewelry company thrived during the 1920s and early '30s, opening stores in New York, St. Moritz, and Zurich, successively (*The House of Gübelin 1854–1954*, 1954). Under the senior Eduard Gübelin's leadership, the firm weathered the Great Depression and World War II. When the patriarch died suddenly in 1945, Dr. Gübelin and his younger brother Walter took over the family business. Walter was the watchmaker, while Dr. Gübelin was the driving force in the gem and jewelry realm. He led the company's gem purchasing activities, buying millions of dollars worth of fine stones from various sources (figure 21). He also combined his gem expertise and literary flair to pen Gübelin company promotional books and jewelry catalogs. During these years, the firm's reputation benefited from articles about Dr. Gübelin's gemological work and expertise that appeared in many popular magazines and newspapers (see, e.g., figure 22). In the words of the late Richard T. Liddicoat (1961, p. 138), "Dr. Gübelin's enthusiastic appreciation of the beauty of gemstones and fine jewelry craftsmanship, as well as his knowledge of both, permitted him to increase jewelry sales rapidly."

With the two brothers at the helm, the postwar years saw continued growth of the Gübelin company, which boasted nine retail stores by the time Dr. Gübelin retired from the business. Under the leadership of his nephew, Thomas Gübelin, the Gübelin group of watch and jewelry stores, the gem laboratory, and associated companies continue to flourish.

THE DR. EDWARD J. GÜBELIN GEM COLLECTION

Dr. Gübelin was a world-class collector of many objects, including books; antiques; paintings; Russian icons; stamps; Greek, Egyptian, Roman, Burmese, and Nepalese artifacts; and—not surprisingly—gemstones. His main gem collection, acquired over a period of more than 70 years from gem dealers and on-site at gem localities around the world, comprises approximately 2,700 gemstones, at a total weight of some 24,000 carats, representing

Figure 21. This circa 1963 Gübelin Atelier bracelet features exceptional natural-color Mogok rubies purchased in Burma by Dr. Gübelin in the early 1960s. Courtesy of JOEB Enterprises; photo © Harold & Erica Van Pelt.

more than 250 different gem varieties and mineral species (Boehm and Morelli, 2005).

When viewing any of the four main collections (see, e.g., figure 23), one is immediately impressed with the fact that there are as many as seven examples of each gemstone type. The vast majority of these gems are faceted. He arranged the main collection into four separate categories:

1. *The Geographic Collection.* This is the largest of the four major collections, with more than 1,000 gemstones from Brazil, India, Kenya, Madagascar, Mexico, Mozambique, Myanmar (figure 24), Namibia, Nepal, Sri Lanka, Switzerland, Tanzania, Thailand, the United States, and Zimbabwe. The total weight is more than 10,000 carats.

2. *The Species Collection.* This includes varieties of beryl, corundum, feldspar, fluorite, garnet, opal, quartz, sapphirine, spinel, topaz, tourmaline, and zircon. The total weight of the more

Figure 22. This 1956 photo of Dr. Gübelin sorting gemstones prior to setting into jewelry at the Gübelin company appeared in the weekly Swiss newspaper insert, Wochenblätter *(Zurich).*

Figure 23. Dr. Gübelin arranged his main gemstone collection into four categories (geographic, species, rare, and collector gems), comprising approximately 2,700 stones, at a total weight of some 24,000 carats. Shown here are a few of the more than 70 boxes in the main collection. Photo by Robert E. Kane.

Figure 24. Included in this 1993 photo are some of the many fine Burmese gemstones in Dr. Gübelin's collection. By vertical columns, from top to bottom: Column 1 (far left)—16.55 ct danburite, 14.18 ct kornerupine, 5.13 ct tourmaline, 6.23 ct citrine, and 3.15 ct amblygonite. Column 2—8.08 ct scapolite, 15.39 ct tourmaline, 8.98 ct aquamarine, 10.13 ct zircon, and 4.62 ct apatite. Column 3—25.30 ct danburite, 10.77 ct chrysoberyl, 11.31 ct apatite, 8.38 ct topaz, 4.84 ct zircon, and 1.69 ct chrysoberyl. Column 4 (far right)—11.79 ct sillimanite, 6.78 ct amethyst, 5.51 ct fluorite, 9.09 ct zircon, and 4.02 ct taaffeite. Note that the 15.39 ct tourmaline, 10.77 ct chrysoberyl, 5.13 ct tourmaline, and 1.69 ct chrysoberyl are part of the permanent collection at the British Museum (Natural History) London, and were part of a study Dr. Gübelin and one of the authors undertook (Kane, 1993). Photo by Shane F. McClure, © Robert E. Kane.

than 750 gems in this collection is approximately 7,800 carats.

3. *The Rare Gemstone Collection.* This consists of just under 500 gems, representing more than 38 different mineral species, from apatite to zoisite. The total weight is approximately 3,500 carats.
4. *The Collector Items Collection.* Many of the gem species in the Rare Gemstone Collection are also represented in this fourth collection, with more than 95 additional species; samples range from anglesite to zincite. It contains just over 300 gems for a total weight of over 2,000 carats.

Among the highlights of the Edward J. Gübelin Gem Collection are:

- 420 pieces from Sri Lanka, including a 6.22 ct ruby, an 18.86 ct sillimanite, and a 13.23 ct violet taaffeite
- 290 pieces from Brazil, including a 16.88 ct deep-red tourmaline and six different colors of Paraíba tourmaline
- 215 pieces from Myanmar (Burma), including a 3.16 ct Mogok ruby, a 9.98 ct red spinel, and a 4.02 ct violet taaffeite (see figure 24, bottom right)
- The largest gemstone in the collection, a 100.99 ct morganite from Minas Novas, Brazil

In addition to the main collections, there are several important specialty collections, comprising several thousand gems, which are organized under the headings of Ornamental, Synthetics, Treated Stones, Imitations, Opals, Organics, Testing, and Inclusion Research. These study and display collections contain virtually all materials ever cut for use as gemstones in the above categories. They contain at least one sample of each type of gem, and nearly all treated gems, synthetics, and imitations (in many cases, there are several to dozens of each).

Aside from the sheer beauty and rarity of the gems, this is one of the most important gemological research collections ever assembled. Much of its research value stems from its completeness and the known provenances, but it is also remarkable for the thoroughness of the documentation. Many gemstones in the various collections were used for research reported in Dr. Gübelin's various publications, as well as in his teaching seminars over the last six decades. In addition, among his records are much unpublished data collected from many of these gems. The fact that he personally obtained

many of these specimens at their sources—in large part before modern treatment techniques existed—greatly enhances our understanding of gems from the various localities.

The main gem collection and significant portions of the specialty collections are now part of the GIA Museum, where they will be used for public display, research, education, and as a source of inspiration for future generations of gemologists and other scientists. As part of the overall purchase, GIA also acquired Dr. Gübelin's vast collection of color slides and literature reference files, as well as a number of important early gemological instruments.

ESTABLISHMENT OF TRADE AND GEMOLOGICAL ORGANIZATIONS

An active member of virtually every gemological association in the world, Dr. Gübelin also founded or co-founded several professional and trade organizations, with the vision of fostering professional education in gemology, as well as the ethical promotion and sale of gemstones. He contributed his vast energy and intellect to these associations, which continue to thrive.

Swiss Gemmological Society. This organization, of which Edward Gübelin was a co-founder, emerged over a controversy. When the Gübelin company began issuing grading reports on diamonds in 1940, a practice then unheard of in Switzerland, many of the firm's Swiss competitors bitterly objected and began planning legal action. Learning of this, the senior Gübelin persuaded the jewelers to join him instead. He convinced them that forming an association and studying diamond grading and gem testing, in seminars taught by his eldest son, would actually benefit their businesses (Gübelin, 2001). The new organization, established in 1942 and modeled after the American Gem Society, was named the Swiss Gemmological Society.

The one condition Eduard M. Gübelin imposed was that his son could never be president of the organization, only an adviser. And so for the first 40 years, until 1982, Dr. Gübelin served as scientific counselor to the Swiss Gemmological Society. Beginning in the early 1940s, the new Society held annual five-day educational meetings, during which Dr. Gübelin gave lectures and taught hands-on practical diamond grading and gem testing (figure 25), generously sharing gemstones from his extraordinary collection and presenting his latest inclusion research (Pough, 1949). He would dazzle the audience with his colorful and didactic inclusion slides. As the decades passed, and gemology became increasingly complex, the annual teaching sessions were expanded to two weeks. Even after retiring from the post of scientific counselor in 1982, until October 2004, he continued to give lectures and courses at the Society's annual meetings.

Figure 25. Dr. Gübelin served as scientific counselor to the Swiss Gemmological Society from 1942 to 1982. In this 1940s photo, he is seen standing at the back of the classroom giving personal instruction to one of the attendees of the organization's annual five-day educational meetings, which were held in various Swiss cities.

International Gemmological Conference. Dr. Gübelin also helped found the International Gemmological Conference (IGC), one of the longest running academic gatherings in the field today. The conference was an outgrowth of the early Bureau International pour la Bijouterie, Orfèvrerie, Argenterie (BIBOA), which eventually became the present-day CIBJO, the World Jewellery Confederation. At a 1951 nomenclature meeting, Dr. Gübelin and fellow BIBOA members such as Prof. Schlossmacher and B. W. Anderson agreed to gather regularly to share their latest gemological research, thereby establishing the framework of the IGC (figure 26).

The first International Gemmological Conference took place in October 1952 in Locarno, Switzerland. At this inaugural assembly, Dr. Gübelin was joined by seven other leading European researchers. Initially an annual event, the IGC became biennial after 1958, held in a different country alternating between Europe and the rest of the world.

Dr. Gübelin regularly attended the IGC conferences for nearly 50 years. He remained a member of the executive committee through the 29th IGC, held in September 2004 in Wuhan, China, which was attended by delegates invited from 33 countries on six continents.

Figure 26. Dr. Gübelin and B. W. Anderson, seen in a lighthearted exchange at the 1951 BIBOA Congress in London, were two of the founders of the International Gemmological Conference the following year.

International Colored Gemstone Association. Dr. Gübelin was also a founding organizer of the nonprofit International Colored Gemstone Association (ICA), established in 1984. Headquartered in New York City with bureaus in Idar-Oberstein and Israel, ICA is a trade association that has more than 500 members in 45 countries worldwide.

Dr. Eduard Gübelin Association for Research and Identification of Precious Stones. In 2003, Dr. Gübelin co-founded, with other members of the Swiss gem trade and scientific community, what is now known as the Dr. Eduard Gübelin Association for Research and Identification of Precious Stones. This nonprofit organization, based in Lucerne, was established to initiate, promote, and support gemological research projects.

FILMMAKER

An accomplished filmmaker (figure 27), Dr. Gübelin narrated and produced a number of high-quality 16 mm films, which were shown to lecture groups around the world and in public theaters in Lucerne and elsewhere. One of them, "Mogok, Valley of Rubies," (1963) appeared in German, French, and English and was sold internationally as a videotape.

His other films include:

- "Ceylon, Fairyland of Gemstones" (German, English, and French versions)
- "Ceylon, Island of the Lion Folk" (German)
- "Jade: Prehistoric Tool Material, Present-Day Gem Material" (German and French versions)
- "Sri Lanka: Pearl of the Tropics, Island of Gems" (German and French versions)
- "Ruby Mining in Burma" (German and French versions)

In addition to the films he produced, Dr. Gübelin shot hundreds of hours of raw footage during worldwide travels to gem deposits. Occasionally, he would film other aspects of a country that interested him. One entire reel of film captures a traditional Burmese folk dance accompanied by native music. Part of this footage is featured in "Mogok, Valley of Rubies."

HONORS AND AWARDS

In recognition of his achievements, Dr. Gübelin received many awards, honorary memberships, and commendations. Among the most prestigious are:

- Honorary memberships in the gemological associations of many different countries, including Australia, Germany, Great Britain, Japan, Poland, South Africa, Sweden, his native Switzerland, and the United States
- First Research Member of GIA (1943)
- Research Diploma of the Gemmological Association of Great Britain (1957)
- Honorary Professor at the University of Stellenbosch in South Africa (1973)
- Jewelers of America International Award for Jewelry Leadership (1980; figure 28)
- First honorary member of the American Gem Trade Association (1982)
- ICA Lifetime Achievement Award (1991)
- The Medal of the City of Paris (1993)
- The American Gem Society Robert M. Shipley Award (1994)
- GIA League of Honor (2003)

ENDURING LEGACY

Long after he had revolutionized gemology, Edward J. Gübelin was voted one of *JCK* magazine's "Gemstone People of the Century" (Roskin, 1999). Yet even into the 21st century, until his passing on March 15, 2005, one day shy of his 92nd birthday, Dr. Gübelin remained closely involved in the science he had helped pioneer (figure 29). He still exuded palpable enthusiasm when discussing his gem collection, a recent trip, a fine gemstone, or a new discovery. Dr. Gübelin's abiding passion for gemology was captured in these words, which hung on the wall in his home laboratory for many years:

> *The job of a laboratory trade gemologist is an interesting occupation—we seldom see the same thing twice and feel constantly the challenge or possibility of something new, unusual or demanding.*

Dr. Gübelin will be remembered not only for his monumental contributions to gemology over more than seven decades, but also for his extraordinary humanity. Despite the often solitary nature of his research, he touched the lives of thousands around the world. Whether you were his colleague, his friend, his student, or simply one of the thousands of people around the globe who once met him, you would undoubtedly remember his courteous way, his warmth and quick wit, and how he

Figure 27. Dr. Gübelin, shown filming in Mogok in 1963, shot hundreds of hours of footage from his travels and produced several gem-related films. This photo was taken by his daughter Marie-Helen Gübelin Boehm, with whom he published the 1967 book Burma, Land der Pagoden.

Figure 28. Among his many honors, Dr. Gübelin received the Jewelers of America International Award for Jewelry Leadership in 1980. (Harry Winston also received this award, posthumously, that same year.) Presenting the award is former JA president Michael Roman.

Figure 29. Dr. Edward J. Gübelin had an enthusiasm that never diminished, as evident in this 1997 photo of him riding along the Ngorongoro Crater, Tanzania, at the age of 84. This gem and animal safari trip was organized by the Gemmological Association of Great Britain. Photo by Eric Van Valkenburg.

treated even the youngest colleague with respect. Gem dealer David Atkinson said it well: "He was a 19th century gentleman, with 20th century mobility."

Dr. Gübelin and his wife of 51 years, Idda, had five daughters and many grandchildren and great-grandchildren. He instilled in them an appreciation of nature, including gems and minerals. In fact, two of his grandchildren have followed in his footsteps, one as a goldsmith and the other as a gemologist.

Edward J. Gübelin has left behind an indelible legacy through his writings and photomicrographs, his laboratory, his gem collection, the instruments he developed, the organizations he helped establish, and the future generations of gemologists he will inspire.

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