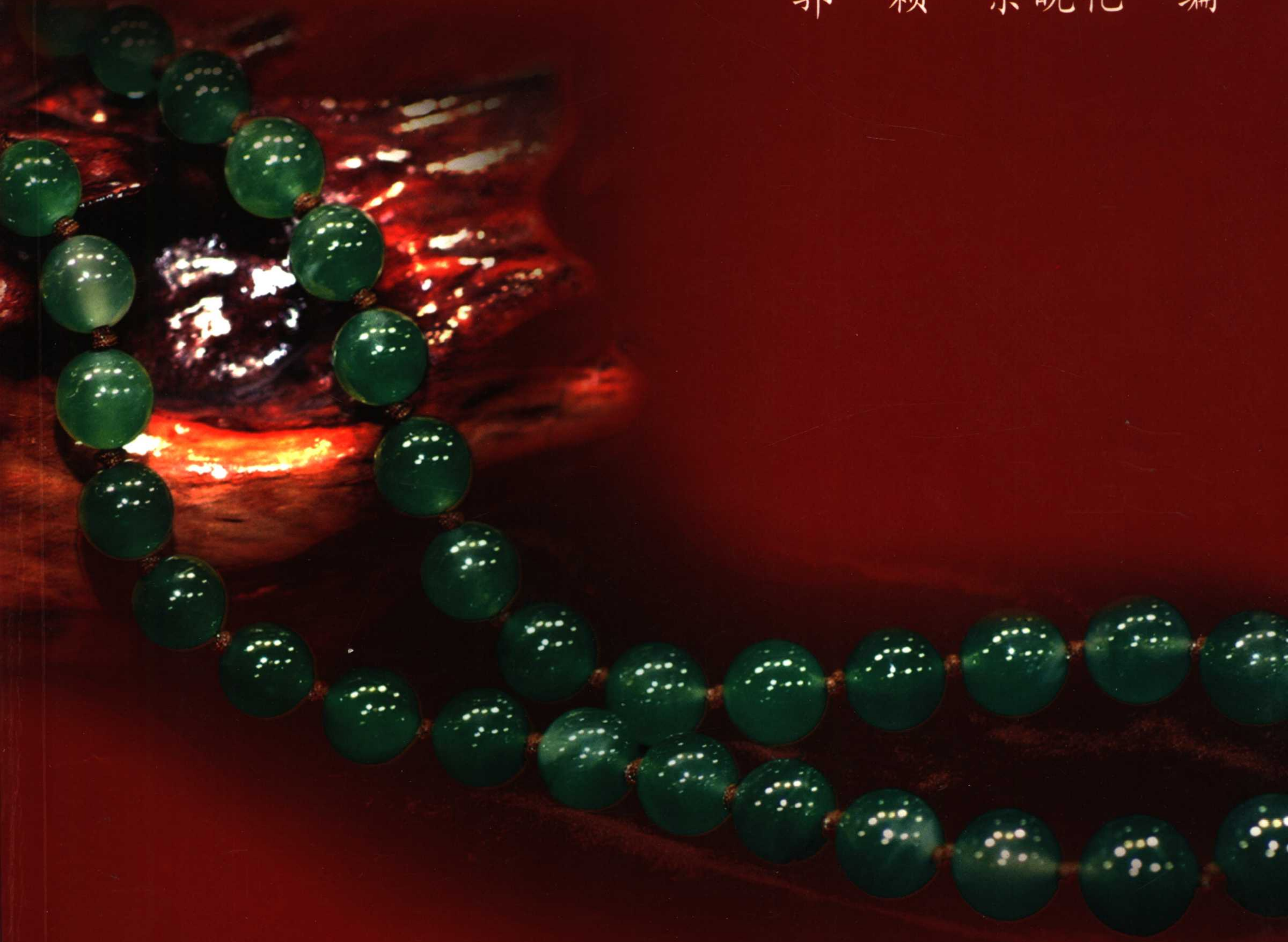
珠宝专业英语

EXPERTISE ENGLISH FOR GEMOLOGY

郭 颖 余晓艳 编



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前　言

古人曰：工欲善其事，必先利其器。如今的信息时代，外语是学习国外先进经验、获取新知识与第一手资料的锐利武器。熟练地掌握有关外语，是作为一名合格的珠宝专业人员必不可少的条件之一。加强专业外语教学，是使学生在具备了一定外语基础之后，尽快向实际应用阶段转化的桥梁，是大学外语教学的重要环节。

珠宝专业是近年兴起的一门新的地学分支，其专业性，知识更新快。由于该专业在国内起步较晚，国际上最新的资料基本都是以英语发表出来的，因此从事该领域工作的珠宝专业工作者专业外语的素养也就格外重要。

珠宝专业英语是综合珠宝专业知识和英语运用能力的课程，是宝石工艺与材料学、宝石鉴定与营销等专业的重要工具课。通过本课程的学习，使学生掌握较多的专业词汇和基本概念；同时能掌握用英语表达专业知识的方法；提高阅读及理解专业英文资料的能力；掌握珠宝专业文章翻译的方法和技巧，为阅读珠宝专业文献和书籍打下坚实的基础，同时为以后工作中解决与珠宝专业英语相关的问题提供必要的知识保证。

本教材的编写特色如下：珠宝专业知识丰富；介绍了必要的语法知识与专业文章的翻译方法及技巧；注意与珠宝专业课程的协调性；注重实践性和实用性；难度适当；每章配有单词注释与音标、难句翻译及部分习题；书后附有三个专业词汇附录，由易到难。

本教材采用最新的珠宝专业技术资料，涵盖了珠宝专业中钻石宝石的基础知识等二十个方面的内容。本书共分20课：第1课介绍宝石学发展历史、第2课介绍宝石切割、第3课介绍钻石的宝石学特征及评估、第4课介绍宝石光的折射与反射、第5课至第7课介绍各种宝石如红宝石与祖母绿的宝石学属性与特征、第8课介绍具有变彩效应的欧泊矿藏的开采、第9课介绍在首饰设计中常见到的一些问题、第10课介绍特殊的首饰镶嵌工艺、第11课以高温焊枪为代表介绍了首饰制造工具、第12课介绍有机宝石、第13课介绍黄金饰品到镶宝首饰的发展过程、第14课介绍特殊工艺切割的宝石、第15课介绍珠宝首饰度量工具的使用、第16课介绍宝石包裹体的特征、第17课介绍钻石的合成、第18课介绍宝石合成品与仿制品的鉴别、第19课介绍世界著名首饰的历史典故、第20课介绍时尚的芳香首饰。

本书适合于珠宝及相关专业的本专科生与研究生使用，也可供广大珠宝首饰爱好者学习和参考。

本书编写阶段受到了余晓艳老师的大力帮助，戴稚璇硕士对本书稿的注释给予了认真地校对，田莉硕士对本书图件做了整理工作，在此一并表示感谢。由于编者水平有限，缺乏编写经验，因此，疏漏难免，不当之处恳请读者不吝赐教、指正。

Dialog

Unit 1 Introduction of Gemology

Part Ⅰ Text

1. The evolution of the science of gemology

The science of gemology is concerned with the study of the technical aspects of gemstones and gem materials. For well over 2000 years, philosophers and scientists have been captivated by the beauty and the enigma of gems, and down the years have left records of their observations on these ornamental products of nature. (**Fig. 1**)

Although one of the first gemstone books in English was written by Thomas Nichols as long ago as 1652, it was only in the last half of the nineteenth century that the science of gemology began to emerge as a specialize offshoot of an already established-branch of science, mineralogy. [1]

2. Highlights of the last 160 years

In view of the important part that gemology plays today in the identification of modern synthetic gems, it is perhaps appropriate that we go back just over 170 years in time and begin this summary of the highpoints in gemological history with the first attempt at gemstone synthesis[3]. In 1837, the French chemist Mare Gaudin managed to grow some small crystal of ruby by melting together potassium aluminum sulphate and potassium chromate. This was in the period when there was much interest in reproducing the growth of crystalline substances, and when the first experiments were being made to dissolve the constituents in a solvent "flux" of lower melting point.

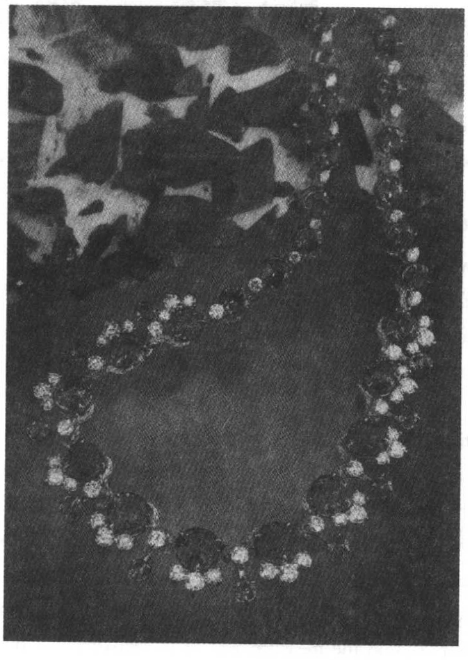

Fig. 1 Necklace of nature sapphire

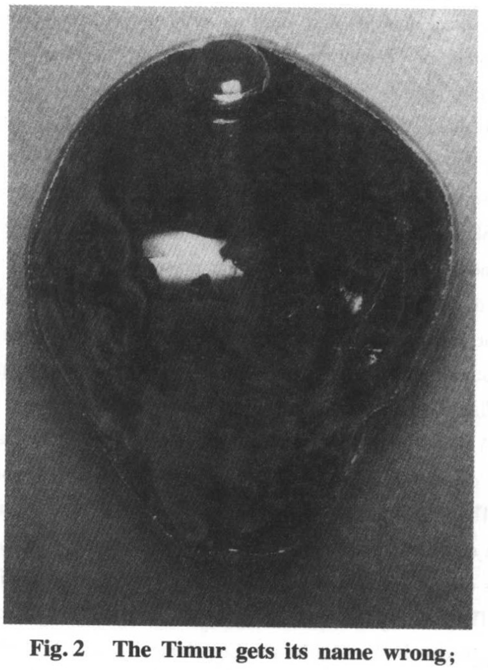

Fig. 2 The Timur gets its name wrong; it is not aruby but a red spinel

In view of the importance of spectroscopy in present-day gemology, it is also appropriate to mention the letter written by Sir Arthur Church in 1866 to the learned English periodical, *The Intellectual Observer*. In this he describes his experiments with an early spectroscope and his discovery of absorption bands in the spectrum of Ceylon zircons and almandine garnets. However, it was not until 1932 that a comprehensive study of gemstone spectra for identification purposes was to be undertaken by Basil Anderson.

Some 5 years after Church's letter appeared in print, the South African diamond rush was in full spate, and 5000 diggers were reported to be working along the banks of the Vaal. Modder and Orange Rivers. In 1873, the primitive mining town that had sprung up around the site of De Beers farm was formally named Kimberley after the British Secretary for the Colonies the Earl of Kimberley.

Early in 1935, news appeared in the London's press of a synthetic gemstone having "all the qualities of diamond" and capable of "deceiving 99 percent of the experts". Today the story has an all-too-familiar ring, but back in the 1930s this new product caused quite a stir. The stimulant behind the scare story was colorless synthetic spinel, which was though to have been manufactured in Germany.

The same news caused similar consternation when it appeared in the North American press. There was further dismay in the trade on the announcement of successful synthesis of diamond in gem qualities and sizes by a Mr. Jourado, a self-styled gem expert. The Jourado stone was identified as a spinel by Anderson and reports by him of the stone's characteristics appeared in several of the leading gemological journals and jewellery magazines. (**Fig. 2**)

Another significant event that occurred in 1935 was the pilot-scale synthesis of emerald by the German firm L. G. Farbenindustrie which had developed a new flux-melt process[3]. Although many samples were produced, the advent of World War Ⅱ interrupted the company's work. The "Igmarald" synthetic emerald was never launched commercially, and production was finally discontinued in 1942.

Because of its high value, the synthesis of emerald became the aim of several laboratories, and in 1940 the American chemist Carroll Chatham also succeeded in growing gem-quality crystal. Although the method of manufacture was kept secret, the Chatham emeralds were close enough in character to German Igmarald to indicate that they were grown by a flux process. (In a move to avoid the use of the word "synthetic", in 1963 Chatham finally obtained permission from the US Federal Trade Commission to market his product as "Chatham created emerald").

After World War Ⅱ, Anderson and Payne were joined in the Hatton Garden laboratory by Robert Webster and Alec Farm, and the work of gemstone identification continued. During the following years, Robert Webster was to carry out pioneering work on the sue of ultraviolet light in the identification gem minerals, and Alec Farn was to become, among other things, the UK's leading expert on pearl testing.

Soon the Hatton Garden laboratory was working at full capacity again as parcels of rubies and sapphires containing up to 10% synthetic stones started to arrive in London[4]. In1946, more than 100000 stones were tested in the laboratory and a year later its problems were further increased by the successful production of star rubies an sapphires by the Linde Division of the Union Carbide Corporation of America.

Synthetic rutile, the first of a series of man-made diamond simulants appeared in 1948 and was marketed under the trade names "Rainbow Gem" and "Titania". In 1951, a new rare gem species was confirmed and named taafeite after its discoverer Count Taafe. X-ray and chemical analysis were used to verify its principal constituents as beryllium, magnesium and aluminum (except for double refraction, taafeite closely resembles spinel). Although still a rare species, a few taafeites have since been found in Sri Lanka. (**Fig. 3**)

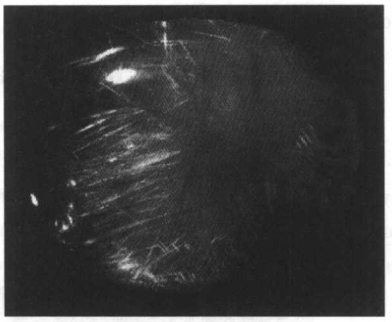

Fig. 3 Rutile hair like in rock crystal (Xinjiang China)

In the 1950s, strontium titanate was introduced as yet another diamond simulant under the trade names "Fabuliter" and "Diagem". Unlike the earlier simulant, synthetic rutile, there appeared to be no counterpart for this material in nature. During this period, progress was also being made in the field of diamond synthesis. Although failing to have their work verified at the time by an independent investigator, the ASEA group of Sweden claimed to have developed a repeatable process in 1951. As they were unaware of any other company working on diamond synthesis, ASEA kept their process secret while they worked on improving the size and quality of their product. They were also unaware of the great importance of grit-size synthetic diamonds industrially. ASEA only revealed their earlier breakthrough after the General Electric group in the USA announced its own successful synthesis of diamond grit in 1955. Four years later, the De Beers Diamond Research Laboratories in Johannesburg also succeeded in synthesizing industrial diamonds. Since then many countries have developed this capability including Russia, Japan and the People's Republic China.

A brown gemstone from Sri Lanka formerly classified as a peridot was identified in 1954 as a new mineral species and named sinhalite after its country of origin. In 1957, yet another new gem species was identified and named Painite after its discoverer A. C. D. Pain.

The first issue of the Australian Gemologist, the official journal of the Gemological Association of Australia, appeared in 1958. It carried a report that the British Atomic Energy Research Establishment at Harwell was undertaking the commercial irradiation of diamonds (as a means of enhancing their color). It also contained news of Australia's first pearl-culturing venture using the molluse Pinctada maxima.

The first experimental reflectance instrument for the identification of gemstones was developed in 1959 by L. C. Trumper, who was awarded a Research Diploma by the Gemological Association of Great Britain for his thesis on the measurement of refractive index by reflection. His instrument took the form of an optical comparator in which the intensity of reflection from a gem's surface was visually matched against a calibrated and manually adjustable source of illumination[5]. In the same year, Caroll Chatham in the USA began marketing synthetic rubies produced by a type of flux-melt process.

A new type of synthetic emerald, first called "Emerita" and then "symerald" was produced by the Austrian chemist J. Lechleitner in 1960. He used the hydrothermal method to deposit a thin coat of synthetic emerald on to a faceted beryl gem of poor color. The Lechleitner emerald process was later acquired by the Linde Company of America, who subsequently marketed the product as the "Linde" synthetic emerald.

In 1963, Pierre Gilson in France marketed his Gilson synthetic emerald which he manufactured using an improved version of flux-melt process originally developed by I. G. Farbenindustrie. A year later, Lechleitner produced hydro-thermally grown emeralds from seed crystals and this was followed in 1965 by a similar product from Linde. (**Fig. 4**)

During this period of intensive work on emerald synthesis, a new thorium-rich radioactive gem mineral was found in the alluvial gravels of Sri Lanka. The metamict gem was named ekanite after its discoverer F. D. Ekanayake.

Fig. 4 Emerald hexag on a Prismatic (Xinjiang China)

In 1967, deposits of gem-quality transparent blue zoisite were discovered Tanzania and given the name tanzanite. Two years later, another two diamond simulants having no counterpart in nature were introduced. The first of these was yttrium aluminum garnet (YAG), which was lithium niobate, marketed as "Linobate".

In 1970, synthetic gem-quality carat-size diamonds were grown under laboratory conditions by General Electric of America, but the resulting tabular crystals were not economically viable as a commercial product[6]. In 1971, Russian research workers announced that they too had synthesized gem-quality diamond crystals, but they also decided that their product was too costly to market.

In 1974 the publication of Dr Eduard Gubelin's book *Internal World of Gemstones* set new standards in the microphotography of gem inclusions (a worth successor, *Photoatlas of Inclusions in Gemstones* was published in 1986 as the result of a collaboration between Dr Gubelin and J. Koivula of the GIA).

In 1975 the rare alexandrite variety of chrysoberyl was successfully synthesized by means of both the crystal-pulling and flux-melt processes. This was followed by the introduction of Gilson synthetic opals, which produced yet another identification problem for the jeweler and gemologist.

The 1970s and 1980s saw the marketing of an increasing number of sophisticated new synthetics (including the Kashan, Knischka, Ramaura and Seiko rubies, the Cresent Vert, Regency, Biron/Pool and Lennix emeralds, and flux-melt Chatham sapphires). Identification challenges also appeared in the form of new diamond simulants. Gadolinium gallium garnet (GGG) was marketed in 1973, and cubic zirconium oxide (CZ), which virtually superseded all previous diamond simulants, appeared in 1976[7].

During this period, the need for help with the identification and appraisal of gems at the jeweler level resulted in a proliferation of new gem test equipment. Perhaps the most frequently used of these is the reflectance meter and the thermal conductance tester, which have been developed mainly for the detection of diamond and its many simulants[8]. The first commercial reflectance meters were marketed in 1975, and the first commercial thermal tester appeared in 1978. Because of the useful complementary features of these two types of test instrument, dual versions were introduced in 1984.

In 1986, Sumitomo Electric Industries of Japan announced that it was able to produce economically viable gem-quality synthetic diamonds in sizes up to 2 carats. Although these stones were deep yellow in color and were marketed for industrial application only, at least one faceted Sumitomo synthetic diamond was identified in Hatton Garden 2 years later! In 1987, the De Beers Diamond Research Laboratory in Johannesburg, South Africa, revealed that it had also developed a method of growing commercial quantities of gem-quality synthetic diamonds[9]. Using a high-pressure flux-vessel, crystals had been grown up to 11 carats in size for specialized industrial applications. In the same year a report by the Soviet news agency Tass claimed that Soviet scientists had manufactured synthetic diamonds weighing 3 kilograms. However, it was subsequently revealed that these crystals were cubic zirconium oxide-the misquote had occurred because the Russian word for simulant and synthetic is the same[10]!

In March 1987, timed to coincide with their centenary celebrations, De Beers announced the recovery (in 1986) of a 599 carat diamond from the Premier mine. The same year saw the introduction of the first commercial computer program for gemstone identification (developed by the author).

In 1990 the Gemological Association of Great Britain ended its long association with the National Association merged with the London Gem Testing Laboratory to become the Gemological Association and *Gem Testing Laboratory of Great Britain* (GATGL).

By 1993, yellow gem-quality synthetic diamonds were being commercially grown in Russia for use in the jewellery trade. In 1996, De Beers DTC Research Centre in the UK announced that they had developed two instruments "Diamond Sure" and "Diamond View" specifically for the identification of synthetic and natural diamonds. In the same year, a new diamond simulant contender, synthetic moissanite (silicon carbide), was introduced by C3 Incorporated of the USA.

During recent years, the identification problems associated with the growing range of sophisticated synthetic gems have been partly solved by increased reliance on the detection of diagnostic inclusions and growth characteristics using the hand lens and microscope. Where this fails, use must be made of a range of hi-tech instruments including ultraviolet-visible-infrared spectrophotometers, electron microprobes, electron microscopes and cathodoluminescence equipment.

As we have seen in this brief review of selected highlights from the last 160 years of the science of gemology, there is an urgent and continuing need for the professional gemologist to discover ways and means to identify new synthetics as they are introduced. This has become what is perhaps the most exciting and challenging aspect of gemology, and one that has resulted in the development of a wide range of gem test equipment.

3. The essential qualities of a gem material

So far in this chapter we have attempted to convey some idea of the historical background to the science of gemology. Now it becomes relevant to consider the qualities that make gem materials suitable for use in jewellery. The first and most obvious of these qualities is beauty. (**Fig. 5**)

Unlike a gem's more tangible properties, its beauty cannot easily be quantified as it depends in the main on subjective factors to do with its appearance. If the stoneis a transparent colored gem, the depth of color and degree of transparency will be the prime factors. However, in the case of a gem such as a diamond, beauty will be determined by its brilliancy, fire, optical purity and, in general, the absence of any body color. With precious opal, the quality of its iridescent play of color will be the deciding factor.

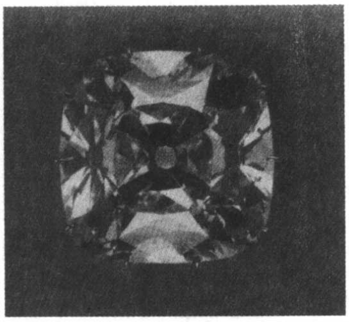

Fig. 5 The Regent was stolen by a slave in India. It originally weighted 400cts, but after cutting, only 140.50cts

Rarity is another quality which must be present in some degree in all gemstones worthy of the name (colored glass, while it may be quite beautiful in terms of hue and transparency, is by no means rear). Unlike beauty, however, the rarity of a gem can be affected by factors such as supply and demand, and by both fashion and the scarcity of the source material. Amber and pearls have become popular again and therefore more expensive, while amethyst was once a rare and expensive gemstone until the discovery of the extensive Brazilian sources in the eighteenth century.

Unusual optical properties add to a gem's rarity factor as with alexandrite and cat's-eye chrysoberyl. Diamonds are expensive, but as the total world production of all types of tough diamonds for 1987 ~ 1988 was in excess of 80 million carats, the cost of the finished product is hardly attributal to its rarity. In this case, De Beers' virtual control of the supply side of the supply/demand equation and the economics of the mining, polishing and marketing of the gem play a dominant part. (**Fig. 6**)

Fig. 6 The phenomenon of the apparently unreal cat's-eye effect is a special curiosity, seen here at its most attractive as a chrysoberyl cat's-eye

The third essential quality which must be present in a gem before it can be considered suitable for use in jewelers is its durability. This is a more practical quality than either beauty or rarity, but without it a gemstone would not be able to survive either the day-to-day wear and tear experienced by a piece of jewellery, or the chemical attack from pollutants in the atmosphere, and would soon lose its surface polish.

Durability, which includes the property of hardness and toughness, is therefore most important quality in a gemstone from the wearer's point of view. Equally important is the influence of a gem's hardness on the work of the lapidary and the diamond polisher, and this aspect will be discussed fully later.

4. Organic and inorganic gems

Jewellery has from the earliest times included gem materials which have and organic as well as a mineral content and because of this the science of gemology toady covers not only mineralogy, geology, optics and chemistry, but also overlaps into the fields of zoology, biology and botany[11]. Among the gem materials used in jewellery, the largest groups are those of the mineral kingdom. The first part of this book therefore deals principally with the characteristics of gemstones having a mineral origin. Gems having an organic origin, such as ivory, bone, pearl, coral, tortoiseshell, jet and amber are covered separately later, which also describes the methods of distinguishing them from their simulants.

Part Ⅱ Words and Expressions

Gemology: [dʒeˈmɔlədʒɪ] *n.* 宝石学

Enigma: [iˈnigmə] *n.* 谜，不可思议的东西

Offshoot: [ˈɔ (ː) fʃuːt] *n.* 分支，支流

Identification: [aiˌdentifiˈkeiʃən] *n.* 辨认，宝石鉴定

Crystal: [ˈkristl] *adj.* 结晶状的，*n.* 水晶，水晶饰品，结晶，晶体

Crystalline: [ˈkristəlain] *adj.* 水晶的

Sulphate: [ˈsʌlfeit] *n.* ［矿］硫酸盐

Potassium: [pəˈtæsjəm] *n.* ［化］钾（19号元素，符号K）

Chromate: [ˈkrəumeit] *n.* 铬酸盐

Spectroscopy: [spekˈtrɔskəpi] *n.* ［物］光谱学，波谱学，分光镜使用

Spectroscope: [ˈspektrəskəup] *n.* ［物］分光镜

Ceylon: [siˈlɔn] *n.* 锡兰，印度以南一岛国，现已更名为斯里兰卡 Srilanka

Mining: [ˈmainiŋ] *n.* 采矿，矿业

Kimberley: [ˈkɪmbəlɪ] *n.* 金伯利［南非（阿扎尼亚）中部城市］

Jewellery: [ˈdʒuːəlrɪ] *n.* （=jewelry）［总称］珠宝，镶嵌有宝石之饰物

Emerald: [ˈemərəld] *n.* ［矿］祖母绿，绿宝石，翠绿色；*adj.* 翠绿色的

Chatham: ['tʃætəm] *n.* 查塔姆（姓氏）; ~emerald: 查塔姆祖母绿
Ruby: ['ruːbi] *n.* 红宝石
Sapphire: ['sæfaiə] *n.* 蓝宝石
Rutile: ['ruːtaɪl'-tiːl] *n.* [矿] 金红石
Taafeite: ['tafei] *n.* [矿] 塔菲石
Beryllium: [bə'riljəm] *n.* [化] 铍（元素符号 Be）
Peridot: ['peridɔt] *n.* [矿] 橄榄石
Sinhalite: ['sɪnhəlaɪt] *n.* [矿] 硼铝镁石
Enhance: [in'hɑːns] *vt.* 提高，增强; *v.* 提高; gemstone ~，宝石改善
Refractive index: 反射率
Reflection: [ri'flekʃən] *n.* 反射
Symerald: ['sim mərəld] *n.* 合成祖母绿
Deposit: [di'pɔzit] *n.* 堆积物，沉淀物，矿藏的储量
Faceted: ['fæsitid] *adj.* 有小面的
Beryl: ['beril] *n.* 绿柱石
Thorium: ['θɔːriəm] *n.* 钍
Gravel ['grævəl] *n.* 砂砾，砂砾层
Metamict: ['metəˌmikt] *adj.* 变生的，蜕变质的，变生非晶质的; *n.* 蜕晶质
Zoisite: ['zɔisait] *n.* [矿] 黝帘石
Tanzanite: ['tænzənaɪt] *n.* [矿] 坦桑黝帘石（产于坦桑尼亚北部）
Simulant: ['simjulənt] *adj.* 模拟的; *n.* 仿制品
YAG: = Yttrium Aluminum garnet 钇铝石榴石（用于产生激光束的氧化铝合成晶石）
Yttrium: ['itriəm] *n.* [化] 钇，稀有金属元素，符号 Y
Niobate: ['naiəbeit] *n.* 铌酸盐
Carat: ['kærət] *n.* (= karat) 克拉（宝石的重量单位）
Tabular: ['tæbjulə] *adj.* 扁平的，板状的
Inclusion: [in'kluːʒən] *n.* 包含，内含物
Chrysoberyl: ['krisəberil] *n.* 金绿宝石
Opal: ['əupəl] *n.* [矿] 蛋白石，乳色玻璃
GGG = Gadolinium Gallium garnet: 钆镓榴石
Gadolinium: [ˌgædə'liniəm] *n.* 钆。一种从独居石和氟碳铈矿中获得的银白色、有韧性和延展性的稀有金属元素，用于改善铁、铬及有关合金的高温状态下的性能。
Gallium: ['gæliəm] *n.* 镓。一种在室温下是液体的稀有金属元素，通常膨胀成固化作为煤、铝土岩和其他矿中的微量元素而存在，用于半导体技术和各种低融合金的合成。
CZ = Cubic Zirconium: 立方氧化锆石
Appraisal: [ə'preizəl] *n.* 评价，估价（尤指估价财产，珠宝等的），鉴定
Cathodophosphorescence: [ˌkæθədəˌfɔsfə'resəns] *n.* 阴极射线磷光
Iridescent: [ˌiri'desnt] *adj.* 彩虹色的，闪光的
Amber: ['æmbə] *n.* 琥珀; *adj.* 琥珀制的，琥珀色（黄色）的
Alexandrite: [ˌælig'zɑːndrait] *n.* [矿] 亚历山大石
Hardness: ['hɑːdnis] *n.* 硬，硬度，艰难，难度
Toughness: ['tʌfnis] *n.* 韧性，坚韧，刚性
Lapidary: ['læpidəri] *n.* 宝石商
Tortoiseshell: ['tɔːtəʃel] *n.* 龟甲，玳瑁
Jet: [dʒet] *n.* 黑玉，墨玉; *adj.* 黑玉色的，墨黑的

Part Ⅲ Text Comprehension

1. Although one of the first gemstone books in English was written by Thomas Nichols as long ago as 1652, it was only in the last half of the nineteenth century that the science of gemology began to emerge as a specialize offshoot of an already established-branch of science, mineralogy.

   虽然早在 1652 年第一本英文的宝石学著作就由 Thomas Nichols 出版，但是直到 19 世纪，作为早已成为经典学科的矿物学的特殊分支，宝石学科学才逐渐被人们所认识。

2. In view of the important part that gemology plays today in the identification of modern synthetic gems, it is perhaps appropriate that we go back just over 170 years in time and begin this summary of the highpoints in gemological history with the first attempt at gemstone synthesis.

   鉴于宝石学在当代合成宝石鉴定中的重要作用，我们追溯到 170 多年前宝石学历史上第一次合成宝石的尝试并总结其要点是合理的。

   in view of…，考虑到，由于。如：in view of the importance of spectroscopy in present-day gemology…，考虑到光谱学在现代宝石学中的重要性……

3. Another significant event that occurred in 1935 was the pilot-scale synthesis of emerald by the German firm L. G. Farbenindustrie which had developed a new flux-melt process.

   1935 年发生的另一个重要事件就是由德国 L. G. Farbenindustrie 公司实现的祖母绿工业规模合成，该公司发明了一种新型的熔融体合成工艺。

4. Soon the Hatton Garden laboratory was working at full capacity again as parcels of rubies and sapphires containing up to 10% synthetic stones started to arrive in London.

   很快 Hatton Garden 实验室又全力工作，检测出在伦敦市场上，红宝石与蓝宝石有高达 10% 的合成品。

5. His instrument took the form of an optical comparator in which the intensity of reflection from a gem's surface was visually matched

against a calibrated and manually adjustable source of illumination.

他的仪器采用了一种光学比较仪的形式，这个仪器获得的来自宝石表面的反射强度能够真实地与精确的手调照明源获得的结果相媲美。

6. In 1970, synthetic gem-quality carat-size diamonds were grown under laboratory conditions by General Electric of America, but the resulting tabular crystals were not economically viable as a commercial product.

1970 年，美国通用公司的实验室成功地合成了达宝石级的克拉钻，但由于形成的是板状晶体，因此最终产品不具有商业推广价值。

7. Gadolinium gallium garnet (GGG) was marketed in 1973, and cubic zirconium oxide (CZ), which virtually superseded all previous diamond simulants, appeared in 1976.

钆镓榴石（GGG）于 1973 年面世，而作为早期钻石替代品真正代表的立方氧化锆石（CZ）出现于 1976 年。

8. During this period, the need for help with the identification and appraisal of gems at the jeweler level resulted in a proliferation of new gem test equipment. Perhaps the most frequently used of these is the reflectance meter and the thermal conductance tester, which have been developed mainly for the detection of diamond and its many simulants.

在这期间，对首饰级的宝石的鉴定与评估的需要导致了一系列新的宝石检测仪器的出现。也许这些仪器中使用最为频繁的就是反射仪与热导仪了，这两种仪器主要用来鉴别钻石及其替代品。

result in：导致，终于造成……结果。

9. In 1987, the De Beers Diamond Research Laboratory in Johannesburg, South Africa, revealed that it had also developed a method of growing commercial quantities of gem-quality synthetic diamonds.

1987 年，位于南非约翰内斯堡的戴比尔斯钻石研究实验室宣布他们也已开发出了一种合成具有商业品质的宝石级钻石的方法。

10. However, it was subsequently revealed that these crystals were cubic zirconium oxide-the misquote had occurred because the Russian word for simulant and synthetic is the same!

然而，后来人们发现：那些晶体其实是合成立方氧化锆石，导致错误引用的原因是因为俄语中的“仿制品”与“合成品”为同一个单词。

11. Jewellery has from the earliest times included gem materials which have an organic as well as a mineral content and because of this the science of gemology toady covers not only mineralogy, geology, optics and chemistry, but also overlaps into the fields of zoology, biology and botany.

珠宝首饰在早期包括宝石矿物，这里面同样也包括有机的宝石与无机的矿物两部分，因此，今日的宝石学不仅涵盖了矿物学、地质学、光学和化学等学科的内容，而且还包括了动物学、生物学、植物学等多个领域。

Part Ⅳ Grammar and Training

Grammar

科技文献常用语法方面 A (Tense)

1. 一般现在时

在所有的时态中，一般现在时形式最简单、使用最普遍，在科技著作中使用广泛。如：

A. 不受时间限制的客观事实和永恒的真理

The hardest gemstone is diamond.

B. 表达主语的能力、性格、特征等

Identificators should be impersonality

C. 习惯性动作或延续性状态

Systhetic methods often interfere with gem's propertities.

D. 介绍图表、定律、文摘、提要时

The De Beers reports that the coming years is a booming period of diamonds sales.

注：引述过去的言语，且过去的言语至今仍然真实有效时，用现在时，所用动词有 say, tell, write, learn, hear, see 等。

E. 在时间状语、条件状语从句中，表示将来的动作

If we compress a capstone, it will generate electric current.

当 if 或 when 从句不作状语而作宾语从句时，则不用现在时代替将来时，如：

We do not know how to enhance sapphire's color.

F. 表示安排好或计划好的将来的动作

常用的动词有：go, come, leave, start, begin, sail, arrive, be，并带有明确表示将来的状语。

We start for Tucson next Monday.

G. 有些非结束动词不能用现在进行时（或用了进行时含意改变），在这种情况下要用一般现在时。这种非结束动词有：

a）有关心理状态和心理活动过程

agree, believe, differ, disagree, disbelieve, distrust, doubt, find, foresee, forget, guess, imagines, know, mean, notice, recall, recognize, recollect, regard, remember, see, suppose.

b）有关感情状态

abhor, adore, astonish, desire, detest, dislike, displease, feel (that), forgive, hate, hope, like, love, mind (= object to please), prefer, want, wish.

c）其它

appear (= seem), belong, consist (of), contain, depend, deserve, equal, have, matter, possess, resemble, result (from), seem, suffice.

注：非结束动词用进行时态时，改变了原有的含意。如：

The indetificator is hearing the case.（审案子）

2. 现在完成时

在科技写作中该时态采用被动语态比主动语态出现得多，科技文献常用的现在完成时有以下四种：

A. 一件事在以前发生而没有确切的时间

Synthetic rutile, the first of a series of man-made diamond simulants has appeared in 1940's.

B. 一件事或一系列的事连续发生直到现在

Engineers have encountered many problems with synthetic gem materials.

C. 与 already, (not) yet, for, since 等连用时

Although still a rare species, a few taafeites have since been found in Sri Lanka.

D. 与 just, recently, lately 相关联时（也可用其它时态）

3. 短语动词

短语动词即“动词＋副词”（如 look, over, throw out 等），在口语里用得很多。有些短语动词具有严密的含意，有些具有抽象的含意，有些既具有严密含意又具有抽象含意。在谈论宝石专业内容时，常使用短语动词。在科技写作中，宝石学家们更偏重使用一个正式的动词，使文章更准确、更严肃。有些正式的动词在它的前缀中包含了副词的概念，例如前缀 ab-, ap-, circ-, com-, cor-, de-, ex-, ob-, per-, pro-, re-, sus-, trans-, …

但是仍有些短语动词在口语体与书面体都普通使用，没有正式的动词代替它们。例如：

In this chapter we shall deal with different kinds of gemstones.

“动词＋副词”的短语词组有时有割裂的现象：

Pl ease take out your book.（短语词组没有割裂）

The reaction can be speed up by taking some of the rods of cadmium out.（割裂）

“动词＋副词”的结构在英语中有数百条。使用正式动词是科技写作中的一个主要组成部分，在写作中需要掌握。

4. 无人称被动语态

科技写作中被动语态使用十分广泛。凡是需要着重说明谓语动词和它的动作对象之间的关系，或行为发出者没有必要说明以及难以说明时，往往使用被动语态。而多数被动句中没有行为的发出者，如果需要表示行为的发出者，则用介词 by 引出。

This is shown in Fig. 2.（无行为发出者）

在被动语态中，by 短语有时表示方式、方法或手段，而不是行为发出者。此点要注意：

Electricity is produced by various methods.

5. 不省略行为发出者的被动语态

受谓语动词的用法支配，不及物动词不能用于被动语态的结构，因为它们没有宾语。没有东西可充当被动语态谓语动词的主语。英语基本句型中有三个句型是用及物动词，即：主语＋及物动词＋宾语；主语＋及物动词＋间接宾语＋直接宾语；主语＋及物动词＋宾语＋宾语补足语。被动语态也适用于这三个基本句型。被动语态的公式是：代名词（名词）＋be＋过去分词＋by（名词）。

假如宾语补足语是不带 to 的动词不定式、句子变成被动结构时，作为主语补足语的不定式必须带 to，如：

（主动）Last Sunday，I saw him visit the exhibition of jewellery.
（被动）Last Sunday，he was seen to visit the exhibition of jewellery.

大多数及物动词以及一些相当于及物动词的不及物动词词组可用于被动语态。这些词组有：action，look at，meet with，carry out，give off，speed up，make use of，pay attention to 等。

有些及物动词只用于主动语态，不用于被动语态如 Everybody is acted upon by force.

有些表示状态、位置等变化的动词，例如：change，rotate，turn，transform 既可用作及物动词，也可用作不及物动词。这时主动句与被动句含意基本相同。

Writing Skills：*Information A*

句型 1 在某方面拥有××程度的信息

A. there is some (enough，sufficient，a great deal，a lot of，ample，precise，detailed，reliable，valuable) information

B. in literature，at present，nowadays

C. about the use of …，on the application of …，concerning the observation of…，regarding the fine structure of …，bearing on the action of …

注：或者以人为主语

A. at present we have，we now have，we now possess，we are now in possession of

B. some (enough，sufficient，a great deal of，a lot of，ample，complete，precise，detailed，reliable，valuable) information

C. about the nature of …，on the influence of …，concerning effects of …，regarding the consequences of …，bearing on the interaction of …

句型 2 在某方面缺乏信息

A. there's little detailed information in words concerning the changes in …

B. there hasn't been any information at presentr egarding the changes in …

C. we still have no information about the phenomenon of …

句型 3 在某方面至今仍在××程度上缺乏信息

A. we still have little information about (on) the evolution of …

B. until now we have scanty information concerning the evolution of …

C. we don't possess enough information

句型 4 在某方面缺乏××类型的信息

A. no adequate (detailed，exact，precise，reliable，valuable) information

B. on this subject，about these changes，concerning such effects，regarding this course of …

C. is available，is (so far) available

D. at present，in literature，in current literature

句型 5 现有的信息不够完善

A. the information we have (possess) is (very) incomplete

B. the information they have presented seems (obviously) insufficient

C. the information available at present seems (extremely) unreliable

句型 6 过去所占有的信息是不够完善的

A. until recently the information we had (we possessed，about it)

B. was very incomplete (scarce，etc)，was quite insufficient (inadequate，etc)

Unit 2 Virtual Facet Designing

Part Ⅰ Text

If your experience with gemstones is limited to admiring and wearing them, setting them, grinding cabochons, or only thinking about trying to facet, you might expect that only a very accomplished facetor would ever try to design a new cut [1]. It's a funny situation, though.

It's true that most beginning facetors do not design their own cuts right at the start - at least not on purpose. But beginning facetors, like beginners of all kinds, tend to make mistakes. Maybe they set their faceting machine index wrong for the design they were trying to cut, essentially reorienting the design, and Wow! - a new design with their very first stone (**Fig. 1**).

By accident or on purpose, once you get started on designing cuts, you'll want to continue with some basics in mind. Simple designs, such as a round, are usually easy to compose directly on the faceting machine. It's a matter of deciding how many facets will constitute the outline shape, or the girdle. Depending upon which index gear you installed on your machine, you'll need to divide the gear by the number of facets desired, and use the appropriate resulting indexing - very basic stuff, and nothing too mathematical[2]. But there are other considerations, too, especially those that pertain to your choice of material. For instance:

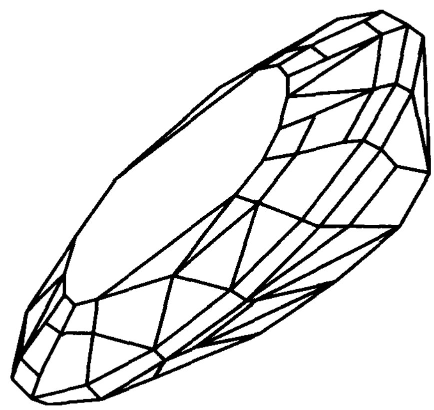

Fig. 1 In Step-by-Step of Lapidary Journal January2001, page 52, Jerry L. Capps explains how he used GemCad to improve one of his own designs, and then gives complete cutting instructions for his improved " Markova Interlochen. "

· Refractive index (R. I., a measure of the degree to which light is bent when it passes between media of different densities, such as going from air to a transparent gem material[3]). The R. I. determines the critical angle needed for pavilion facets to reflect light back out to the viewer. It's the job of the crown facets first to gather light into the stone, and then to chop the light up into pieces before it exits again, helping to give the stone "life." [4] In designing a gem, you need to pay special attention to the critical angle of your material and not exceed it on the pavilion.

· Cleavage: how readily does this material cleave, in how many directions, and which ones?

· Heat sensitivity: do you need to dop with wax, epoxy, or super glue?

· Singly or doubly refractive: If doubly, this increases the chances of better dispersion with a higher crown, as opposed to the best brightness of a lower crown.

· Proportion of crown height to pavilion depth: should you use the proportions set up many years ago for diamond? Ideal diamond proportions were determined for the dispersion capability of diamond and not necessarily maximum brightness, as well as for the looks of the stone when set protruding above the mount[5].

However, these proportions do not always apply to colored stones.

· C-axis (the "long" direction of a crystal): a dark c-axis dictates a rectangular design to maximize passage of light from limited directions.

· Hardness: do you have the appropriate polishing lap? Choices include ceramic, zinc, copper, tin, corian, Plexiglas ...and on and on.

· How light or dark the material is: do you cut it deep or shallow to maximize brightness or color?

All of these factors and more are important, and fortunately, a lot of the information you need is easy to find. Many facetors rely on Faceting for Amateurs, a hardcover book written and published by Glenn and Martha Vargas [the Vargases were recently inducted into the National Lapidary and Rockhound Hall of Fame for their contributions; see "2001 Hall of Fame", November 2001]. For many years, Glenn and Martha were teachers of a faceting course at the University of Texas. Besides the all-important refractive index, other properties of various gem materials are given, alphabetized, in their book, including heat sensitivity, suggested laps for polishing, hardness, color variety in each material, main locations where these materials are apt to be found, and so on. This book is considered the bible for beginning facetors and a valuable resource for advanced cutters.

1. Virtual Virtues

If you are designing as you cut an actual stone, keeping track of your trials and errors with pencil and paper can be tedious at best. Instead of drawing a diagram by hand, perhaps with the aid of a calculator, you might try using GemCad, a computer program developed by Robert W. Strickland specifically for designing gem cuts, along with GemCad's support programs GemPrint, GemRay, and GemFlick for analyzing, printing, and viewing GemCad designs[6]. GemCad computes all the mathematics automatically, and you don't have to write down or remember a thing: GemCad keeps track of it all for you.

If you've tried designing while faceting, you'll recall the difficulty you had remembering the index you chose, the angle, and precisely how deep you finally decided to cut.

WHERE TO GET GEMCAD?
GemCad homepage
http: //www. gemcad. com/
Larry Davis
ldavis3@ kscable. com
John and Barbara Franke
jfranke@ gemcutter. com

By the time you finished, the stone was probably much smaller than you expected or than it need have been. Using GemCad allows you to come up with the same initial design without the necessity of your memory or using up any materials. It further allows mistakes to be "undone," which saves a lot of material from going down the drain.

Besides making designing so much easier, Gem Cad can also "tangent ratio" a series of facets to maintain the same look at a higher or lower set of angles. For example, upon completing the pavilion, have you ever run out of enough material to cut the crown? Unfortunately, you can't just reduce all the angles by two or three degrees. It would destroy the look or configuration and proportion of the crown design. GemCad's tangent-ratio function can revise the entire crown - all angles, lower or higher - and by doing so will maintain the look and proportions of the design. You could also do this with a calculator, but it requires more math than I choose to undertake. GemCad works it all out perfectly with a single keystroke and in just a few seconds.

Another feature of GemCad is its ability to change the indices from vertical to horizontal - by 90 degrees. If an oval is designed and drawn vertically, and your V-dopstick transfers in the opposite direction, you have a really big problem. Assuming you're using a 96 gear, with GemCad, you simply assign the 96 to the right or left side instead of the top or bottom. This alters all indices so that while the drawing may be vertical, the indexing is horizontal. An alternative method is to use the "r" command and rotate the drawing, which leaves the index gear as originally specified, but turns the drawing by whatever amount you wish. Neat stuff, huh?

GemCad's advantages should start being obvious by now, but there's more. Besides automatically keeping track, calculating complex mathematics, and allowing you to correct mistakes without having to waste possibly valuable material, GemCad also saves you time, letting you figure out a version of a cut in a matter of minutes instead of what could be days[7].

How long does it take to facet a real stone? An experienced facetor using wax for dopping and transferring could finish a Standard Round Brilliant (SRB) in two hours. At the other end of the faceting spectrum are the Australian International competition facetors, who may require three months to finish one out of three competition stones. (Fortunately, competition facetors are not professional facetors - they'd starve, even if they did have a perfectly cut stone.) With GemCad, a facetor can cut a virtual gemstone in two minutes.

If I've managed to convince you that GemCad is the way to go for facet designing and you want to try it, read on. What follows are directions for obtaining the program, installing it on your PC, and very fundamental instructions for using the program to complete a simple diagram with your first GemCad design.

2. Dos Dilemma

Many facetors who also use computers have avoided getting involved with GemCad primarily because they don't want to have to bother with any DOS commands, which are executed by typing on the keyboard. Since the introduction in the early 1990s of Windows, which relies on icons, menus, and the use of a mouse, few new PC users have been familiar with DOS, and even those who remember the DOS days before Windows tend to think back on DOS with dread. This is unfortunate, since GemCad requires very few DOS commands: the program can be controlled almost 99.5 percent with a mouse.

Notice, though, that I said "controlled" - not installed. DOS commands may be required to install, and initially to open the program, and sometimes to configure the program for compatibility with an assortment of printers. After this, everything can be controlled with the familiar mouse and by simply answering the dialogue box.

GETTING STARTED
Start with the GemCad manual at www. gemcad. com/gemcad. htm
Read up on the GemCad Frequently Asked Questions at www. gemcutter. com/download/gemcad. txt
· **Faceting Patterns, from Rockhounds. com**
· **Search Orchid for Gemcad Discussions**

The GemCad author has ingeniously given the user a choice of operating methods, via a mouse or letter commands; even better, these can be used interchangeably. Although GemCad has an assortment of menus from which a mouse can control every operation, the menu-driven system seems slow to anyone who has a fundamental knowledge of the keyboard and can memorize 10 to 15 letter commands (of over 50), which speeds things up considerably. The letter commands were devised in a common-sense manner and are easy for a facetor to remember because they relate to using a faceting machine.

3. Getting GemCad

There are numerous sources for obtaining the latest version 4.51 of GemCad. These sources most often allow you to download a Zip file, which will require unzipping before the program can be used.