GEMSTONES

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Gemstones have fascinated humans since prehistoric times. They have been valued as treasured objects throughout history by all societies in all parts of the world. The first stones known to have been used for making jewelry include amber, amethyst, coral, diamond, emerald, garnet, jade, jasper, lapis lazuli, pearl, rock crystal, ruby, serpentine, and turquoise. These stones served as status symbols for the wealthy. Today, gems are not worn to demonstrate wealth as much as they are for pleasure or in appreciation of their beauty (Schumann, 1998, p. 8). In this report, the terms “gem” and “gemstone” mean any mineral or organic material (such as amber, pearl, and petrified wood) used for personal adornment, display, or object of art because it possesses beauty, durability, and rarity. Of more than 4,000 mineral species, only about 100 possess all these attributes and are considered to be gemstones. Silicates other than quartz compose the largest group of gemstones; oxides and quartz compose the second largest (table 1). A further subcategory of gemstones is colored gemstone, which in this report designates all nondiamond gemstones, including amber, coral, and shell. In addition, synthetic gemstones, cultured pearls, and gemstone simulants are discussed but are treated separately from natural gemstones (table 2). Current information on industrial-grade diamond can be found in the U.S. Geological Survey (USGS) Minerals Yearbook chapter on industrial diamond.

Production

Commercial mining of gemstones has never been extensive in the United States. More than 60 varieties of gemstones have been produced commercially from domestic mines, but most of the deposits have been relatively small compared with other mining operations. In the United States, much of the current gemstone mining is conducted by hobbyists, collectors, and gem clubs rather than business organizations.

The commercial gemstone industry in the United States consists of (1) individuals and companies that mine gemstones or harvest shell and pearl, (2) firms that manufacture synthetic gemstones, and (3) individuals and companies that cut natural and synthetic gemstones. The domestic gemstone industry is focused on the production of colored gemstones and on the cutting of large diamonds. Industry employment is estimated to range from 1,000 to 1,500 workers (U.S. International Trade Commission, 1997, p. 1).

Most natural gemstone producers in the United States are small businesses that are widely dispersed and operate independently. The small producers probably have an average of less than three employees, including those who only work part time. The number of gemstone mines operating from year to year fluctuates because the inherent uncertainty associated with the discovery and marketing of gem-quality minerals makes it difficult to obtain financing for developing and sustaining economically viable deposits (U.S. International Trade Commission, 1997, p. 23).

The total value of natural gemstones produced in the United States during 2001 was estimated to be at least $15.1 million (table 3). The production value was 12% less than the preceding year. The production decrease was mostly because the 2001 shell harvest was 13% less than in 2000.

The estimate of 2001 U.S. gemstone production was based on a survey of more than 200 domestic gemstone producers conducted by the USGS. The survey provided a foundation for projecting the scope and level of domestic gemstone production during the year. However, the USGS survey did not represent all gemstone activity in the United States, which includes thousands of professional and amateur collectors. Consequently, the USGS supplemented its survey with estimates of domestic gemstone production from related published data, contacts with gemstone dealers and collectors, and information garnered at gem and mineral shows.

Natural gemstone materials indigenous to the United States are collected, produced, and/or marketed in every State. During 2001, all 50 States produced at least $1,000 worth of gemstone materials. Six States accounted for nearly 80% of the total value, as reported by survey respondents. These States, in order of declining value of production, were Tennessee, Arizona, California, Oregon, Utah, and Arkansas. Some States were known for the production of a single gemstone material—Tennessee for freshwater pearls and Arkansas for quartz, for example. Other States produced a variety of gemstones, like Arizona, whose gemstone deposits included agate, amethyst, azurite, chrysocolla, fire agate, garnet, jade, malachite, obsidian, onyx, peridot, petrified wood, opal, smithsonite, and turquoise. A wide variety of gemstones also are found in California, Idaho, Montana, and North Carolina.

There were only two operations in significant known diamond-bearing areas in the United States during 2001. The first, the Kelsey Lake Diamond Mine, is the only U.S. commercial diamond mine and is near Fort Collins, CO, in Colorado, close to the Wyoming State line. The mine is owned and operated by Great Western Diamond Co. (a subsidiary of McKenzie Bay International, Ltd., of Canada). The Kelsey Lake property includes nine known kimberlite pipes, of which three have been tested and have shown that diamonds are present. The remaining six pipes have yet to be fully explored and tested for their diamond potential. Of diamonds recovered, 50% to 65% were clear gem quality, and almost one-third were one carat or larger in size. The identified resources are at least 17 million metric tons (Mt) grading an average of 4 carats per hundred metric tons (Taylor Hard Money Advisers, 2000§[1])

[1]References that include a section twist (§) are found in the Internet References Cited section.

The second operation was in Crater of Diamonds State Park near Murfreesboro in Pike County, AR, where a dig-for-fee operation for tourists and rockhounds is maintained by the State. Crater of Diamonds is the only diamond mine in the world that is open to the public. The diamonds occur in a lamproite breccia tuff associated with an extinct volcanic pipe and in the soil developed from the lamproite breccia tuff. Since the diamond-bearing pipe and the adjoining area became a State park in 1972, over 21,000 diamonds have been recovered. Recent exploration demonstrated that there is about 78.5 Mt of diamond-bearing rock in this diamond deposit (Howard, 1999, p. 62). An Arkansas law, enacted early in 1999, prohibits commercial diamond mining in the park (Diamond Registry Bulletin, 1999).

Studies done by the Wyoming Geological Survey have shown that Wyoming has the potential for a $1 billion diamond mining business. Wyoming has many of the same geologic conditions as Canada, and there is evidence of hundreds of kimberlite pipes in the State. Twenty diamondiferous kimberlite pipes and one diamondiferous mafic breccia pipe have been identified in southern Wyoming. Two of the largest kimberlite fields, State Line and Iron Mountain, and the largest lamproite field, Leucite Hills, in the United States are located in Wyoming. There has been slight interest in the southern Wyoming and northern Colorado area by several diamond mining firms, but the only diamond mine developed in the area thus far is the Kelsey Lake mine. Individual diamond gems worth $89,000 and $300,000 have been found there (Montana Forum.com, 2002§).

In addition to natural gemstones, synthetic gemstones and gemstone simulants are produced in the United States. Synthetic gemstones have the same optical, physical, and chemical properties as the natural materials that they appear to be. Simulants have an appearance similar to that of a natural gemstone material, but they have different optical, physical, and chemical properties. Synthetic gemstones produced in the United States include alexandrite, diamond, emerald, moissanite, ruby, sapphire, turquoise, and zirconia. Simulants of coral, lapis lazuli, malachite, and turquoise also are manufactured in the United States. In addition, certain colors of synthetic sapphire and spinel, used to represent other gemstones, are classified as simulants.

Synthetic gemstone production in the United States was more than $24.7 million during 2001; simulant gemstone output was even greater and was estimated to be more than $100 million. Five firms in five States, representing virtually the entire U.S. synthetic gemstone industry, reported production to the USGS. The States with reported synthetic gemstone production were Arizona, California, Florida, New York, and North Carolina.

At least one U.S. company, Gemesis Corp., produces consistent quality and quantities of synthetic gem diamond and reported a second year of production in 2001. The synthetic diamonds are produced using technology, equipment, and expertise developed by a team of scientists from Russia and the University of Florida. The weight of the synthetic diamond stones ranged from 1.5 to 2 carats, and the stones are yellow, brownish yellow, colorless, and green (Weldon, 1999§).

In 2001, a North Carolina firm entered its fourth year of marketing moissanite, a gem-quality synthetic silicon carbide it produces. Moissanite is also an excellent diamond simulant, but it is being marketed for its own gem qualities.

Consumption

Although the United States accounts for less than 1% of total global gemstone production, it is the world's leading gemstone market. U.S. gemstone markets apparently accounted for about 35% of world gemstone demand in 2001. The U.S. market for unset gem-quality diamonds during the year was estimated to have exceeded $10.5 billion, the largest in the world. Domestic markets for natural, unset nondiamond gemstones totaled about $696 million.

A poll conducted by a U.S. jewelry retailers association in the mid-1990s showed that about two-thirds of domestic consumers who were surveyed designated diamond as their favorite gemstone (ICA Gazette, 1996). In 2001, the top-selling colored gemstones, in descending order, were blue sapphire, pearl, tanzanite, ruby, emerald, amethyst, green tourmaline, rhodolite garnet, fancy sapphire and pink tourmaline (tied), and blue topaz. During 2001, there was a shift in the price ranges of retail gemstone jewelry purchases from the $500 to $2,000 price range down to purchases in the under $500 price range (Wade, 2002§). Following terrorist attacks on September 11, consumer confidence was shaken, but the fourth quarter U.S. retail sales were up by 4% (by value), and Christmas season retail jewelry sales showed a 0.6% increase over Christmas 2000 (Diamond Registry Bulletin, 2002c; Donahue, 2002§). An unexpected effect on diamond and jewelry sales of the September 11 terrorist attacks was that purchases of engagement rings shot up enormously, and that trend continued through the end of 2001 (Diamond Registry Bulletin, 2001e). Despite the economic slowdown of the first half of 2001 and the economic effects of the events of September 11, the overall U.S. diamond jewelry sales for the year were $26.1 billion, down by only 1% from those of 2000. The small size of this drop was due to the stronger than expected fourth quarter (Diamond Registry Bulletin, 2002d; Donahue, 2002§).

In addition to jewelry, gemstones are used for collections, exhibits, and decorative art objects.

Prices

Gemstone prices are governed by many factors and qualitative characteristics, including beauty, clarity, defects, demand, durability, and rarity. Diamond pricing, in particular, is complex; values can vary significantly depending on time, place, and the subjective evaluations of buyers and sellers. There are more than 14,000 categories used to assess rough diamond and more than 100,000 different combinations of carat, clarity, color, and cut values used to assess polished diamond (Pearson, 1998).

Colored gemstone prices are generally influenced by market supply and demand considerations, and diamond prices are supported by producer controls on the quantity and quality of supply. Values and prices of gemstones produced and/or sold in the United States are listed in tables 3 through 5. In addition, customs values for diamonds and other gemstones imported, exported, or reexported are listed in tables 6 through 10.

De Beers Group companies are a significant force affecting gem diamond prices worldwide because they mine about one-half of the diamonds produced each year. The companies also sort and valuate about two-thirds (by value) of the world's annual supply of rough diamonds through De Beers' subsidiary

Diamond Trading Co. (DTC), which has marketing agreements with other producers.

Foreign Trade

During 2001, total U.S. gemstone trade with all countries and territories exceeded $15.5 billion, which was approximately 11% less (by value) than gemstone trade of the previous year. Diamonds accounted for about 94% of the 2001 gemstone trade total. In 2001, U.S. exports and reexports of diamond were shipped to 61 countries and territories, and imports of all gemstones were received from 107 countries and territories (tables 6-10).

During 2001, U.S. trade in cut diamonds decreased by about 8% compared with the previous year; however, the United States remained the world's leading diamond importer. These decreases in trade amounts were attributed to the slowdown in the economy and the economic effects of the September 11 terrorist attacks.

The United States is a significant international diamond transit center as well as the world's largest gem diamond market. The large volume of reexports shipped to other centers reveals the significance that the United States has in the world's diamond supply network (table 6).

Synthetic gemstone trade also decreased for the United States in 2001. Imports of synthetic gems decreased by almost 13% during the year. Synthetic gemstone imports from Austria, China, Germany, Hong Kong, and Switzerland made up almost 83% (by value) of the total domestic imports of synthetic gemstones during the year. Prices of certain synthetic gemstone imports, such as amethyst, were very competitive. The marketing of synthetic imports and enhanced gemstones as natural gemstones and the mixing of synthetic materials with natural stones in imported parcels continued to be problems for some domestic producers in 2001. There were also problems with some simulants being marketed as synthetic gemstones during the year.

World Review

The gemstone industry worldwide has two distinct sectors—(1) diamond mining and marketing and (2) the production and sale of colored gemstones. Most diamond supplies are controlled by a few major mining companies; prices are supported by managing the quantity and quality of the gemstones relative to demand, a function performed by De Beers through DTC. Unlike diamonds, colored gemstones are primarily produced at relatively small, low-cost operations with few dominant producers; prices are influenced by consumer demand in addition to supply availability.

In 2001, world diamond production totaled about 117 million carats (table 11). Most production was concentrated in a few regions—Africa [Angola, Botswana, Congo (Kinshasa), Namibia, and South Africa], Asia (northeastern Siberia and Yakutia in Russia), Australia, North America (Northwest Territories in Canada), and South America (Brazil and Venezuela). In 2001, Botswana was the world's leading diamond producer in terms of output value and quantity.

De Beers reported that its sales of rough diamonds for 2001 were $4.45 billion, which was down by 21.5% from $5.7 billion in 2000. De Beers officials said that global retail diamond sales decreased by 5% in 2001 from those of the previous year. This consumption figure was higher than initially had been expected following events on September 11 (Weldon and Donahue, 2002§).

Statistics of the Diamond High Council of Belgium show that sales in the Antwerp diamond sector suffered a 12% drop in 2001 to $25.8 billion. Imports of diamonds into Antwerp decreased by 17% to $6.15 billion, and exports decreased by 18% to $5.72 billion (Diamond Registry Bulletin, 2002a).

Additional events in 2001 significant to diamond mining, production, and marketing worldwide include the following:

- The Ekati Diamond Mine, Canada's first and only operating commercial diamond mine, completed its third full year of production. In 2001, Ekati produced 3.7 million carats of diamonds from 3.3 Mt of ore mined (Darren R. Dyck, senior project geoscientist, BHP Billiton Diamonds Inc., written commun., 2002). The mine, located in the Northwest Territories in Canada, was a joint venture between BHP Diamonds Inc. (BHP) and Dia Met Minerals Ltd. In June, BHP's parent company BHP Ltd., merged with Billiton plc to create BHP Billiton Ltd., the world's largest mining company (BHP Billiton Ltd., 2001a; Diamond Registry Bulletin, 2001b). In July, BHP Billiton announced that it had agreed to purchase Dia Met (BHP Billiton Ltd., 2001b). Buying out Dia Met gave BHP Billiton an 80%, controling ownership of the Ekati mine (Diamond Registry Bulletin, 2001c). Ekati has estimated reserves of 60.3 Mt of ore in kimberlite pipes, containing 54.3 million carats of diamonds, and the mine life is projected to be 25 years. Operating at full capacity, Ekati production is expected to range from 3.5 to 4.5 million carats per year. Ekati diamonds are sold by the BHP Billiton Diamonds Inc. sales office in Antwerp (65%) and by DTC (35%) (Rombouts, 2001§). Near the end of 2001, BHP Billiton Diamonds started producing from the Misery kimberlite pipe (BHP Billiton Ltd., 2001c). The Ekati already accounts for 4% of the world market by weight and 6% by value (Law-West, 2002). In 2002, BHP Billiton will begin using underground mining techniques to recover diamonds from deeper portions of two of the Ekati kimberlite pipes— Koala and Panda—which were first open pit mined (Diamond Registry Bulletin, 2002b).
- The Diavik Diamonds Project also is located in the Northwest Territories. Diavik has estimated reserves of 25.6 Mt of ore in kimberlite pipes, containing 102 million carats of diamonds, and the mine life is projected to be 20 years. Diavik received the required permits and regulatory approval in 2000 and began site infrastructure development and project construction. Diavik is an unincorporated joint venture between Diavik Diamond Mines Inc. (60%) and Aber Diamond Mines Ltd. (40%), and it is expected to commence diamond production in the first half of 2003. The mine is expected to produce about 102 million carats of diamond at a rate of 6 million carats per year worth about $63 per carat (Diavik Diamond Mines Inc., 2000, p. 10-12).
- There is another Canadian commercial diamond project located in the Northwest Territories—the Snap Lake diamond project. De Beers Canada Mining Inc. acquired a 68% interest in the Snap Lake diamond project from Winspear Diamonds Inc. in 2000, and in early 2001, De Beers acquired the remaining 32% interest in the project from Aber Diamond Corp. Snap Lake will be De Beers' first mine outside southern Africa and the first underground diamond mine in Canada. In August, De Beers Canada announced that Snap Lake would begin

production in 2006 (Law-West, 2002; De Beers Canada Mining Inc., 2001§). Snap Lake has estimated reserves of 22.8 Mt of ore in a kimberlite dike, containing 38.8 million carats of diamonds, and the mine life is projected to be 20 years or more (De Beers Canada Mining Inc., [2000]§; Jack T. Haynes, assistant site manager, De Beers Canada Mining Inc., oral commun., 2001).

Another Canadian commercial diamond project is the Jericho diamond project located in Nunavut. In 2000, Tahera Corp. completed a feasibility study that indicated that Jericho will produce 3 million carats over an 8-year mine life. Tahera has discovered five kimberlite pipes, of which three are landbased. Geological models indicate a resource of approximately 17 Mt to a depth of 300 meters, with grades ranging from 0.3 carats per metric ton to 1.0 carats per ton for the kimberlite pipes. In early 2001, Tahera filed a formal project proposal and a draft environmental impact statement for the Jericho project. These filings marked the beginning of the environmental assessment and regulatory approval process for the proposed Jericho diamond mine (Law-West, 2002; Tahera Corp., 2002§).

- In May, De Beers Consolidated Mines Ltd. completed its privatization and was delisted from the Johannesburg Stock Exchange. The company was purchased by a consortium that included the Oppenheimer family, Anglo American plc, and Debswana Diamond Co. (Pty) Ltd. The company is now the world's largest private diamond mining company. The privatization left De Beers heavily in debt, made the company much less transparent, and had no effect on the company's antitrust issues (Diamond Registry Bulletin, 2001d).
- In 2001, conflict diamonds—those rough diamonds used by rebel forces and their allies to help finance warfare aimed at subverting governments recognized as legitimate by the United Nations (U.N.)—continued to partially finance conflicts in Angola, Congo (Kinshasa), and Sierra Leone.

The United Nations Security Council (UNSC) has enacted sanctions against exports of diamonds from Angola and Sierra Leone without official government-issued certificates of origin into U.N. member countries. Any export of rough diamonds from Liberia also is currently under UNSC sanction because Liberia was allowing the export of conflict diamonds through their country.

In November, an international diamond certification system called the Kimberley process was mandated by the U.N. to deal with the problem of conflict diamonds (Diamond Registry Bulletin, 2001f). The Kimberley process was acceptable to the U.N., the U.S. Congress, the diamond industry, and involved nongovernmental organizations (Diamond Registry Bulletin, 2001a). The certification system includes the following key elements: the use of forgery-resistant certificates and tamper-proof containers for shipments of rough diamonds; internal controls and procedures that provide credible assurance that conflict diamonds do not enter the legitimate diamond market; a certification process for all exports of rough diamonds; the gathering, organizing, and sharing of import and export data on rough diamonds with other participants of relevant production; credible monitoring and oversight of the international certification scheme for rough diamonds; effective enforcement of the provisions of the certification scheme through dissuasive and proportional penalties for violations; self-regulation by the diamond industry that fulfills minimum requirements; and the sharing of information with all other participants on relevant rules, procedures, and legislation as well as examples of national certificates used to accompany shipments of rough diamonds (Weldon, 2001§). The Kimberley process will be fully implemented by the end of 2002 (Law-West, 2002).

- In the United States, the Clean Diamond Trade Act, which will implement effective measures to stop trade in conflict diamonds, was introduced in the House of Representatives on August 2, and passed on November 28. The act has already been introduced in the Senate and is expected to pass in the fall of 2002.
- Gemesis Corp., a synthetic gem diamond producer based in Florida, announced that it will be opening a $25 million manufacturing plant in the summer of 2002. In 2½ years, the plant could house 300 diamond-producing machines and could produce 30,000 to 40,000 stones each year. Gemesis' revenues could reach $70 to $80 million per year (Diamond Registry Bulletin, 2001g).
- Towards the end of 2001, De Beers quietly settled private civil class actions related to the industrial diamonds case in Ohio against De Beers Industrial Diamonds Division (Pty) Ltd. and General Electric Co. The settlement establishes a $20 million cash fund plus interest and also provides for payment of an in-kind rebate of industrial diamonds that "class members" purchase from the plaintiffs during the period from January 1, 2002, to December 31, 2003; such a settlement does not legally constitute a formal admission of guilt. The settlement covered an alleged illegal price fixing that took place during a period from November 1, 1987, through May 23, 1994. The timing of the settlement should be viewed in the context of the current policy of De Beers to conform with local laws of each jurisdiction in which the company conducts business. This settlement might be used as a precedent for a present gem-quality diamond class action still before courts in New York (Tacy Diamond Intelligence, 2002§).

Worldwide production of natural gemstones other than diamond was estimated to have exceeded $2 billion per year in the late 1990s. Most nondiamond gemstone mines are small, low-cost, and widely dispersed operations in remote regions of developing nations. Foreign countries with major gemstone deposits other than diamond are Afghanistan (aquamarine, beryl, emerald, kunzite, lapis lazuli, ruby, and tourmaline); Australia (beryl, opal, and sapphire); Brazil (agate, amethyst, beryl, ruby, sapphire, topaz, and tourmaline); Burma (beryl, jade, ruby, sapphire, and topaz); Colombia (beryl, emerald, and sapphire); Kenya (beryl, garnet, and sapphire); Madagascar (beryl, rose quartz, sapphire, and tourmaline); Mexico (agate, opal, and topaz); Sri Lanka (beryl, ruby, sapphire, and topaz); Tanzania (garnet, ruby, sapphire, tanzanite, and tourmaline); and Zambia (amethyst and beryl). In addition, pearls are cultured throughout the South Pacific and in other equatorial waters; Australia, China, French Polynesia, and Japan are key producers.

Colored gemstone producers continued their recovery from the weakened markets created by the Asian economic crisis of 1997 through 1998. Mining and sales reportedly were disrupted in many nations, particularly in Southeast Asia. Prices of high-quality colored gemstones, however, did not decline dramatically (Cavey, 1998).

Additional noteworthy items in the colored gemstone industry during 2001 included the following:

● The fighting and political chaos that followed September 11 disrupted the production and supply of gemstones in Afghanistan. Gem dealers are optimistic that the interim government will stabilize Afghanistan and the disruption will be temporary. Many Afghani gemstones mentioned above are mined in the northern areas of the country (Prost, 2001§).
● The popularity of colorful gemstones, colored synthetic gemstones, and "fancy" colored diamonds (even black diamonds) continued to increase. This was evidenced by increased sales in 2001 (Jewelers' Circular Keystone, 2001).

Outlook

While it is hard to determine from the mixed indicators whether or not the 2002 U.S. economy is in recovery, there are early indications that there will be growth in U.S. diamond and jewelry markets in 2002 (Diamond Registry Bulletin, 2002e). Historically, diamonds have proven to hold their value despite wars or depressions in the economy (Schumann, 1998, p. 8).

Diamond exploration is continuing in Canada, and many new deposits are being found. There have been additional discoveries in both the core and buffer zones of the Ekati lease as well as additional discoveries in the Northwest Territories and Nunavut. Many diamond-bearing deposits also have been discovered in Alberta, Ontario, Quebec, and Saskatchewan (Rombouts, 2001§). When the Diavik, Snap Lake, and Jericho mines begin production, Canada will be producing at least 15% to 20% of the total world diamond production. This means that Canada will probably eclipse South Africa's diamond production within a decade.

Independent producers, such as Argyle Diamond Mines in Australia and new mines in Canada, will continue to bring a greater measure of competition to global markets. More competition presumably will bring more supplies and lower prices. Further consolidation of diamond producers and larger amounts of rough diamond being sold outside the DTC will continue as the diamond industry continues to adjust to De Beers giving up its control of the industry.

Numerous synthetics, simulants, and treated gemstones will enter the marketplace and necessitate more transparent trade industry standards to maintain customer confidence.

Pending enactment of the Clean Diamond Trade Act by the U.S. Congress by the end of 2002 and the final outcome of the Kimberley process and its international certification scheme, the way business is done in the diamond industry will be impacted so that conflict diamonds hopefully will no longer be a problem for the industry.

More diamonds, gemstones, and jewelry will be sold through online marketplaces and other forms of e-commerce that emerge to serve the diamond and gemstone industry. This will take place as the industry and its customers become more comfortable with and learn the best applications of new e-commerce tools for the gemstone industry (Authority on Jewelry Manufacturing, 2001).

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TABLE 1
GUIDE TO SELECTED GEMSTONES AND GEM MATERIALS USED IN JEWELRY

Name	Composition	Color	Practical size 1/	Cost 2/	Mohs	Specific gravity	Refraction	Refractive index	May be confused with	Recognition characteristics
Amber	Hydrocarbon	Yellow, red, green, blue	Any	Low to medium	2.0-2.5	1.0-1.1	Single	1.54	Synthetic or pressed plastics, kaurigum	Fossil resin, color, low density, soft and trapped insects.
Apatite	Chloro-calcium phosphate	Colorless, pink, yellow, green, blue, violet	Small	Low	5.0	3.16-3.23	Double	1.63-1.65	Amblygonite, andalusite, brazilianite, precious beryl, titanite, topaz, tourmaline	Crystal habit, color, hardness, and appearance.
Azurite	Copper carbonate hydroxide	Azure, dark blue, pale blue	Small to medium	do.	3.5-4.0	3.7-3.9	do.	1.72-1.85	Dumortierite, hauynite, lapis lazuli, lazulite, sodalite	Color, softness, crystal habits and associated minerals.
Benitoite	Barium titanium silicate	Blue, purple, pink, colorless	do.	High	6.0-6.5	3.64-3.68	do.	1.76-1.80	Sapphire, tanzanite, blue diamond, blue tourmaline, cordierite	Strong blue in ultraviolet light.
Beryl:										
Aquamarine	Beryllium aluminum silicate	Blue-green to light blue	Any	Medium to high	7.5-8.0	2.63-2.80	do.	1.58	Synthetic spinel, blue topaz	Double refraction, refractive index.
Bixbite	do.	Red	Small	Very high	7.5-8.0	2.63-2.80	do.	1.58	Pressed plastics, tourmaline	Refractive index.
Emerald	do.	Green	Medium	do.	7.5	2.63-2.80	do.	1.58	Fused emerald, glass, tourmaline, peridot, green garnet doublets	Emerald filter, dichroism, refractive index.
Emerald, synthetic	do.	do.	Small	High	7.5-8.0	2.63-2.80	do.	1.58	Genuine emerald	Lack of flaws, brilliant fluorescence in ultraviolet light.
Golden (heliodor)	do.	Yellow to golden	Any	Low to medium	7.5-8.0	2.63-2.80	do.	1.58	Citrine, topaz, glass, doublets	Weak-colored.
Goshenite	do.	Colorless	do.	Low	7.5-8.0	2.63-2.80	do.	1.58	Quartz, glass, white sapphire, white topaz	Refractive index.
Morganite	do.	Pink to rose	do.	do.	7.5-8.0	2.63-2.80	do.	1.58	Kunzite, tourmaline, pink sapphire	Do.
Calcite:										
Marble	Calcium carbonate	White, pink, red, blue, green, or brown	do.	do.	3.0	2.72	Double (strong)	1.49-1.66	Silicates, banded agate, alabaster gypsum	Translucent.
Mexican onyx	do.	do.	do.	do.	3.0	2.72	do.	1.60	do.	Banded, translucent.
Charoite	Hydrated sodium calcium hydroxi-fluoro-silicate	Lilac, violet, or white	Small to medium	do.	5.0-6.0	2.54-2.78	XX	1.55-1.56	Purple marble	Color, locality
Chrysoberyl:										
Alexandrite	Beryllium aluminate	Green by day light, red by artificial light	Small (former U.S.S.R.) Medium (Sri Lanka)	High	8.5	3.50-3.84	Double	1.75	Synthetic	Strong dichroism, color varies from red to green, hardness.
Cats-eye	do.	Greenish to brownish	Small to large	do.	8.5	3.50-3.84	do.	1.75	Synthetic, shell	Density, translucence, chatoyance.
Chrysolite	Beryllium aluminate	Yellow, green, and/or brown	Medium	Medium	8.5	3.50-3.84	Double	1.75	Tourmaline, peridot	Refractive index, silky.

See footnotes at end of table.

TABLE 1--Continued
GUIDE TO SELECTED GEMSTONES AND GEM MATERIALS USED IN JEWELRY

Name	Composition	Color	Practical size 1/	Cost 2/	Mohs	Specific gravity	Refraction	Refractive index	May be confused with	Recognition characteristics
Chrysoberyl--Continued:										
Chrysocolla	Hydrated copper silicate	Green, blue	Any	Low	2.0-4.0	2.0-2.4	XX	1.46-1.57	Azurite, dyed chalcedony, malachite, turquoise, variscite	Lack of crystals, color, fracture, low density and softness.
Coral	Calcium carbonate	Orange, red, white, black, purple, or green	Branching, medium	do.	3.5-4.0	2.6-2.7	Double	1.49-1.66	False coral	Dull translucent.
Corundum:										
Ruby	Aluminum oxide	Rose to deep purplish red	Small	Very high	9.0	3.95-4.10	do.	1.78	Synthetics, including spinel, garnet	Inclusions, fluorescence.
Sapphire, blue	do.	Blue	Medium	High	9.0	3.95-4.10	do.	1.78	do.	Inclusions, double refraction, dichroism.
Sapphire, fancy	do.	Yellow, pink, colorless, orange, green, or violet	Medium to large	Medium	9.0	3.95-4.10	do.	1.78	Synthetics, glass and doublets, morganite	Inclusions, double refraction, refractive index.
Sapphire and ruby, stars	do.	Red, pink, violet, blue, or gray	do.	High to low	9.0	3.95-4.10	do.	1.78	Star quartz, synthetic stars	Shows asterism, color side view.
Sapphire or ruby, synthetic	do.	Yellow, pink, or blue	Up to 20 carats	Low	9.0	3.95-4.10	do.	1.78	Synthetic spinel, glass	Curved striae, bubble inclusions.
Cubic zirconia	Zirconium and yttrium oxides	Colorless, pink, blue, lavender, yellow	Small	do.	8.25-8.5	5.8	Single	2.17	Diamond, zircon, titania, moissanite	Hardness, density, refractive index, lack of flaws and inclusions.
Diamond	Carbon	White, blue-white, yellow, brown, green, red, pink, blue	Any	Very high	10.0	3.516-3.525	do.	2.42	Zircon, titania, cubic zirconia, moissanite	High index, dispersion, hardness, luster.
Feldspar:										
Amazonite	Alkali aluminum silicate	Green-blue	Large	Low	6.0-6.5	2.56	XX	1.52	Jade, turquoise	Cleavage, sheen, vitreous to pearly, opaque, grid.
Labradorite	do.	Gray with blue and bronze sheen color play (schiller)	do.	do.	6.0-6.5	2.56	XX	1.56	do.	Do.
Moonstone	do.	Colorless, white, gray, or yellow with white, blue, or bronze schiller	do.	do.	6.0-6.5	2.77	XX	1.52-1.54	Glass, chalcedony, opal	Pale sheen, opalescent.
Sunstone	do.	Orange, red brown, colorless with gold or red glittery schiller	Small to medium	do.	6.0-6.5	2.77	XX	1.53-1.55	Aventurine, glass	Red glittery schiller.
Garnet	Complex silicate	Brown, black, yellow, green, red, or orange	do.	Low to high	6.5-7.5	3.15-4.30	Single strained	1.79-1.98	Synthetics, spinel, glass	Single refraction, anomalous strain.
Hematite	Iron oxide	Black, black-gray, brown-red	Medium to large	Low	5.5-6.5	5.12-5.28	XX	2.94-3.22	Davidite, cassiterite, magnetite, neptunite, pyrolusite, wolframite	Crystal habit, streak and hardness.
Jade:										
Jadeite	Complex silicate	Green, yellow, black, white, or mauve	Large	Low to very high	6.5-7.0	3.3-3.5	Crypto-crystalline	1.65-1.68	Nephrite, chalcedony, onyx, bowenite, vesuvianite, grossularite	Luster, spectrum, translucent to opaque.

See footnotes at end of table.

TABLE 1--Continued
GUIDE TO SELECTED GEMSTONES AND GEM MATERIALS USED IN JEWELRY

Name	Composition	Color	Practical size 1/	Cost 2/	Mohs	Specific gravity	Refraction	Refractive index	May be confused with	Recognition characteristics
Jade--Continued:										
Nephrite	Complex hydrous silicate	Green, yellow, black, white, or mauve	Large	Low to very high	6.0-6.5	2.96-3.10	Crypto-crystalline	1.61-1.63	Jadeite, chalcedony, onyx, bowenite, vesuvianite, grossularite	Luster, spectrum, translucent to opaque.
Jet (gagate)	Lignite	Deep black, dark brown	do.	Low	2.5-4.0	1.19-1.35	XX	1.64-1.68	Anthracite, asphalt, cannel coal, onyx, schorl, glass, rubber	Luster, color.
Lapis lazuli	Sodium calcium aluminum silicate	Dark azure-blue to bright indigo blue or even a pale sky blue.	do.	do.	5.0-6.0	2.50-3.0	XX	1.50	Azurite, dumortierite, dyed howlite, lazulite, sodalite, glass	Color, crystal habit, associated minerals, luster, and localities.
Malachite	Hydrated copper carbonate	Light to black-green banded	do.	do.	3.5-4.0	3.25-4.10	XX	1.66-1.91	Brochantite, chrysoprase, opaque green gemstones	Color banding, softness, associated minerals.
Moissanite	Silicon carbide	Colorless and pale shades of green, blue, yellow	Small	Low to medium	9.25	3.21	Double	2.65-2.69	Diamond, zircon, titania, cubic zirconia	Hardness, dispersion, refractive index, lack of flaws and inclusions.
Obsidian	Amorphous, variable (usually felsic)	Black, gray, brown, dark green, white, transparent	Large	Low	5.0-5.5	2.35-2.60	XX	1.45-1.55	Aegirine-augite, gadolinite gagate, hematite, pyrolusite, wolframite	Color, conchoidal fracture, flow bubbles, softness, and lack of crystal faces.
Opal	Hydrated silica	Reddish orange, colors flash in white gray, black, red, or yellow	do.	Low to high	5.5-6.5	1.9-2.3	Single	1.45	Glass, synthetics, triplets, chalcedony	Color play (opalescence).
Peridot	Iron magnesium silicate	Yellow and/or green	Any	Medium	6.5-7.0	3.27-3.37	Double (strong)	1.65-1.69	Tourmaline, chrysoberyl	Strong double refraction, low dichroism.
Quartz:										
Agate	Silicon dioxide	Any	Large	Low	7.0	2.58-2.64	XX	XX	Glass, plastic, Mexican onyx	Cryptocrystalline, irregularly banded, dendritic inclusions.
Amethyst	do.	Purple	do.	Medium	7.0	2.65-2.66	Double	1.55	Glass, plastic, fluorite	Macrocrystalline, refractive index, color, transparent, hardness.
Aventurine	do.	Green, red-brown, gold-brown, with metallic iridescent reflection	do.	Low	7.0	2.64-2.69	do.	1.54-1.55	Iridescent analcime, aventurine feldspar, emerald, aventurine glass	Macrocrystalline, color, metallic iridescent flake reflections, hardness.
Cairngorm	do.	Smoky orange or yellow	do.	do.	7.0	2.65-2.66	do.	1.55	do.	Macrocrystalline, refractive index, color, transparent, hardness.
Carnelian	do.	Flesh red to brown red	do.	do.	6.5-7.0	2.58-2.64	do.	1.53-1.54	Jasper	Cryptocrystalline, color, hardness.
Chalcedony	do.	Bluish, white, gray	do.	do.	6.5-7.0	2.58-2.64	do.	1.53-1.54	Tanzanite	Do.
Chrysoprase	do.	Green, apple-green	do.	do.	6.5-7.0	2.58-2.64	do.	1.53-1.54	Chrome chalcedony, jade, prase opal, prehnite, smithsonite, variscite, artifically colored green chalcedony	Do.
Citrine	Silica	Yellow	Large	Low	7.0	2.65-2.66	Double	1.55	do.	Macrocrystalline, refractive index, color, transparent, hardness.
Crystal, rock	do.	Colorless	do.	do.	7.0	2.65-2.66	do.	1.55	Topaz, colorless sapphire	Do.
Jasper	Silica	Any, striped, spotted, or sometimes uniform	do.	do.	7.0	2.58-2.66	XX	XX	Topaz, colorless sapphire	Cryptocrystalline, opaque, vitreous luster, hardness.

See footnotes at end of table.

TABLE 1--Continued
GUIDE TO SELECTED GEMSTONES AND GEM MATERIALS USED IN JEWELRY

Name	Composition	Color	Practical size 1/	Cost 2/	Mohs	Specific gravity	Refraction	Refractive index	May be confused with	Recognition characteristics
Quartz--Continued:										
Onyx	Silica	Many colors	Large	Low	7.0	2.58-2.64	XX	XX	Topaz, colorless sapphire	Cryptocrystalline, uniformly banded, hardness.
Petrified wood	do.	Brown, gray, red, yellow	do.	do.	6.5-7.0	2.58-2.91	Double	1.54	Agate, jasper	Color, hardness, wood grain.
Rose	do.	Pink, rose red	do.	do.	7.0	2.65-2.66	do.	1.55	do.	Macrocrystalline, refractive index, color, transparent, hardness.
Tiger's eye	do.	Golden yellow, brown, red, blue-black	do.	do.	6.5-7.0	2.58-2.64	XX	1.53-1.54	XX	Macrocrystalline, color, hardness, chatoyancy.
Rhodochrosite	Manganese carbonate	Rose-red to yellowish, stripped	do.	do.	4.0	3.45-3.7	Double	1.6-1.82	Fire opal, rhodonite, tugtupite, tourmaline	Color, crystal habit, reaction to acid, and perfect rhombohedral cleavage.
Rhodonite	Manganese iron calcium silicate	Dark red, flesh red, with dendritic inclusions of black manganese oxide	do.	do.	5.5-6.5	3.40-3.74	do.	1.72-1.75	Rhodochrosite, thulite, hessonite, pyroxmangite, spessartine, spinel, tourmaline	Color, black inclusions, lack of reaction to acid and hardness.
Shell:										
Mother-of-pearl	Calcium carbonate	White, cream, green, blue-green, with iridescent play of color	Small	Low	3.5	2.6-2.85	XX	XX	Glass and plastic imitation	Luster, iridescent play of color.
Pearl	do.	White, cream to black, sometimes with hint of pink, green, purple	do.	Low to high	2.5-4.5	2.6-2.85	XX	XX	Cultured and glass or plastic imitation	Luster, iridescence, structure, x ray.
Spinel	Magnesium aluminum oxide	Any	Small to medium	Medium	8.0	3.5-3.7	Single	1.72	Synthetic, garnet	Refractive index, single refraction, inclusions.
Spinel, synthetic	do.	do.	Up to 40 carats	Low	8.0	3.5-3.7	Double	1.73	Spinel, corundum, beryl, topaz, alexandrite	Weak double refraction, curved striae, bubbles.
Spodumene:										
Hiddenite	Lithium aluminum silicate	Yellow to green	Medium	Medium	6.5-7.0	3.13-3.20	do.	1.66	Synthetic spinel	Refractive index, color, pleochroism.
Kunzite	do.	Pink to lilac	do.	do.	6.5-7.0	3.13-3.20	do.	1.66	Amethyst, morganite	Refractive index, color, pleochroism.
Tanzanite	Complex silicate	Blue to lavender	Small	High	6.0-7.0	3.30	do.	1.69	Sapphire, synthetics	Strong trichroism, color.
Topaz	do.	White, blue, green, pink, yellow, gold	Medium	Low to medium	8.0	3.4-3.6	do.	1.62	Beryl, quartz	Color, density, hardness, refractive index, perfect in basal cleavage.
Tourmaline	do.	Any, including mixed	do.	do.	7.0-7.5	2.98-3.20	do.	1.63	Peridot, beryl, garnet corundum, glass	Double refraction, color, refractive index.
Turquoise	Copper aluminum phosphate	Blue to green with black, brown-red inclusions	Large	Low	6.0	2.60-2.83	Double	1.63	Glass, plastics, variscite, dumortierite, chrysocolla, dyed howlite	Difficult if matrix not present, matrix usually limonitic.
Unakite	Granitic rock, feldspar, epidote, quartz	Olive green, pink, and blue-gray	do.	do.	6.0-7.0	2.60-3.20	XX	XX	XX	Olive green, pink, and gray-blue colors.
Zircon	Zirconium silicate	White, blue, brown, yellow, or green	Small to medium	Low to medium	6.0-7.5	4.0-4.8	Double (strong)	1.79-1.98	Diamond, synthetics, topaz, aquamarine	Double refraction, strongly dichroic, wear on facet edges.

XX Not applicable.
1/ Small: up to 5 carats; medium: 5 to 50 carats; large: more than 50 carats.
2/ Low: up to $25 per carat; medium: up to $200 per carat; high: more than $200 per carat.

TABLE 2
SYNTHETIC GEMSTONE PRODUCTION METHODS

Gemstone	Production method	Company/producer	Date of first production
Alexandrite	Flux	Creative Crystals	1970s
Do.	Melt pulling	J.O. Crystal	1990s
Do.	do.	Kyocera	1980s
Do.	Zone melt	Seiko	1980s
Cubic zirconia	Skull melt	Various producers	1970s
Emerald	Flux	Chatham	1930s
Do.	do.	Gilson	1960s
Do.	do.	Kyocera	1970s
Do.	do.	Seiko	1980s
Do.	do.	Lennix	1980s
Do.	do.	Russia	1980s
Do.	Hydrothermal	Lechleitner	1960s
Do.	do.	Regency	1980s
Do.	do.	Biron	1980s
Do.	do.	Russia	1980s
Ruby	Flux	Chatham	1950s
Do.	do.	Kashan	1960s
Do.	do.	J.O. Crystal	1980s
Do.	do.	Douras	1990s
Do.	Zone melt	Seiko	1980s
Do.	Melt pulling	Kyocera	1970s
Do.	Verneuil	Various producers	1900s
Sapphire	Flux	Chatham	1970s
Do.	Zone melt	Seiko	1980s
Do.	Melt pulling	Kyocera	1980s
Do.	Verneuil	Various producers	1900s
Star ruby	do.	Linde	1940s
Do.	Melt pulling	Kyocera	1980s
Do.	do.	Nakazumi	1980s
Star sapphire	Verneuil	Linde	1940s

TABLE 3
VALUE OF U.S. GEMSTONE PRODUCTION, BY TYPE 1/

(Thousand dollars)

Gem materials	2000	2001
Agate	(2/)	(2/)
Beryl	(2/)	(2/)
Coral (all types)	(2/)	83
Diamond	(3/)	(3/)
Garnet	78	294
Gem feldspar	314	(2/)
Geode/nodules	59	375
Jasper	30	43
Opal	219	44
Quartz	416	308
Sapphire/ruby	65	152
Shell	3,270	2,860
Topaz	8	(2/)
Tourmaline	54	334
Turquoise	(2/)	(2/)
Other	9,210	8,350
Total	17,200	15,100

1/ Data are rounded to no more than three significant digits; may not add to totals shown.
2/ Included in "Total."
3/ Included with "Other."

TABLE 4
PRICES OF U.S. CUT DIAMONDS, BY SIZE AND QUALITY IN 2001 1/

Carat weight	Description, color 3/	Clarity 2/ (GIA terms)	Representative prices January 4/	June 5/	December 6/
0.25	G	VS1	$1,500	$1,500	$1,200
.25	G	VS2	1,380	1,380	1,150
.25	G	SI1	1,130	1,130	975
.25	H	VS1	1,400	1,400	1,100
.25	H	VS2	1,250	1,250	1,000
.25	H	SI1	1,050	1,050	925
.50	G	VS1	3,400	3,400	3,200
.50	G	VS2	3,000	3,000	2,800
.50	G	SI1	2,500	2,500	2,400
.50	H	VS1	3,000	3,000	2,800
.50	H	VS2	2,700	2,700	2,400
.50	H	SI1	2,400	2,400	2,200
.75	G	VS1	3,800	3,800	3,800
.75	G	VS2	3,600	3,600	3,600
.75	G	SI1	3,300	3,300	3,300
.75	H	VS1	3,650	3,650	3,500
.75	H	VS2	3,450	3,450	3,450
.75	H	SI1	3,100	3,100	3,000
1.00	G	VS1	5,900	5,900	5,800
1.00	G	VS2	5,700	5,700	5,500
1.00	G	SI1	5,000	5,000	4,800
1.00	H	VS1	5,500	5,500	5,200
1.00	H	VS2	5,300	5,300	4,900
1.00	H	SI1	4,800	4,800	4,700

1/ Data are rounded to no more than three significant digits.
2/ Gemological Institute of America (GIA) color grades: D—colorless; E—rare white; G, H, I—traces of color.
3/ Clarity: IF—no blemishes; VVS1—very, very slightly included; VS1—very slightly included; VS2—very slightly included, but not visible; SI1—slightly included.
4/ Source: Jewelers' Circular Keystone, v. 172, no. 2, February 2001, p. 66.
5/ Source: Jewelers' Circular Keystone, v. 172, no. 7, July 2001, p. 50.
6/ Source: Jewelers' Circular Keystone, v. 173, no. 1, January 2002, p. 49.

TABLE 5
PRICES PER CARAT OF U.S. CUT COLORED GEMSTONES IN 2001

Gemstone	Price range per carat January 1/	December 2/
Amethyst	$7-$14	$7-$14
Blue sapphire	800-1,300	800-1,300
Blue topaz	3-5	3-5
Emerald	1,300-2,000	1,300-2,000
Green tourmaline	70-125	70-125
Pearl: 3/		
Cultured saltwater	5	5
Natural	210	210
Pink tourmaline	75-125	75-125
Rhodolite garnet	18-30	18-30
Ruby	1,700-2,200	1,700-2,200
Tanzanite	250-350	300-400

1/ Source: The Guide, spring/summer 2001, p. 14, 30, 43, 59, 71, 85, 95, 97, 103, 125, and 137. These figures are approximate current wholesale purchase prices paid by retail jewelers on a per stone basis for fine-quality stones.
2/ Source: The Guide, fall/winter 2001-2002, p. 14, 30, 43, 59, 71, 85, 95, 97, 103, 125, and 137. These figures are approximate wholesale purchase prices paid by retail jewelers on a per stone basis for fine-quality stones.
3/ Prices are per 4.6 mm pearl.

TABLE 6
U.S. EXPORTS AND REEXPORTS OF DIAMOND (EXCLUSIVE OF INDUSTRIAL DIAMOND), BY COUNTRY 1/

	2000		2001	
Country	Quantity (carats)	Value 2/ (millions)	Quantity (carats)	Value 2/ (millions)
Exports:				
Belgium	114,000	$248	573,000	$454
Canada	123,000	39	98,800	29
France	30,300	67	35,400	135
Germany	17,300	6	23,400	4
Guatemala	34,300	8	135,000	13
Hong Kong	111,000	150	336,000	125
India	109,000	36	294,000	35
Israel	268,000	354	575,000	512
Japan	23,100	60	35,400	27
Mexico	155,000	23	91,500	20
Netherlands	12,400	3	36,600	7
Switzerland	73,100	143	102,000	163
Thailand	13,100	12	85,500	15
United Kingdom	74,600	64	42,300	68
Other	117,000 r/	70 r/	133,000	96
Total	1,270,000	1,280	2,600,000	1,700
Reexports:				
Belgium	3,850,000	666	1,340,000	565
Canada	105,000	49	117,000	47
Dominican Republic	24,700	3	52,600	7
Hong Kong	3,260,000	396	1,390,000	347
India	600,000	79	723,000	92
Israel	4,770,000	1,010	1,760,000	899
Japan	259,000	34	91,100	32
Malaysia	56,800	4	16,700	4
Mexico	190,000	27	29,100	4
Singapore	259,000	32	76,400	14
Switzerland	477,000	187	277,000	130
Thailand	247,000	28	185,000	25
United Arab Emirates	72,100	13	194,000	27
United Kingdom	455,000	94	103,000	102
Other	354,000 r/	76 r/	68,100	49
Total	15,000,000	2,700	6,420,000	2,340
Grand total	16,300,000	3,980	9,010,000	4,050

r/ Revised.
1/ Data are rounded to no more than three significant digits; may not add to totals shown.
2/ Customs value.

Source: U.S. Census Bureau.

TABLE 7

U.S. IMPORTS FOR CONSUMPTION OF DIAMOND, BY KIND, WEIGHT, AND COUNTRY 1/

	2000		2001	
Kind, range, and country of origin	Quantity (carat)	Value 2/ (millions)	Quantity (carat)	Value 2/ (millions)
Rough or uncut, natural: 3/				
Belgium	431,000	$190	73,800	$75
Botswana	--	--	4,880	12
Brazil	29,500	9	16,800	8
Canada	10,900	2	8,650	9
Congo (Brazzaville)	7,860	15	4,750	10
Congo (Kinshasa)	2,290	10	15,200	10
Ghana	699,000	36	20,400	3
Guinea	4,390	8	7,060	14
Guyana	14,700	1	34,500	4
Hong Kong	635	1	3,780	4
Israel	19,200	20	9,120	10
Russia	4,240	1	24,400	11
South Africa	136,000	194	297,000	290
United Kingdom	538,000	185	367,000	84
Venezuela	6,870	2	6,110	3
Other	372,000 r/	68 r/	6,880	5
Total	2,280,000	741	900,000	550
Cut but unset, not more than 0.5 carat:				
Australia	520	(4/)	3,440	(4/)
Belgium	769,000	221	731,000	216
Brazil	13,400	3	12,600	2
Canada	2,070	1	3,320	1
China	34,100	8	33,800	7
Dominican Republic	1,010	(4/)	6,970	1
Hong Kong	466,000	79	316,000	59
India	11,600,000	2,050	9,050,000	1,510
Israel	1,150,000	693	992,000	535
Japan	3,950	2	7,980	3
Mexico	3,900	3	140,000	12
Singapore	6,210	2	9,240	2
Sri Lanka	5,600	1	10,500	2
Switzerland	133,000	9	10,900	4
Thailand	127,000	18	77,700	14
United Arab Emirates	132,000	19	86,500	21
United Kingdom	11,700	3	7,490	7
Other	38,800 r/	12 r/	22,000	9
Total	14,500,000	3,120	11,500,000	2,410
Cut but unset, more than 0.5 carat:				
Belgium	1,330,000	2,170	1,100,000	1,840
Canada	2,830	9	3,910	14
France	2,110	16	7,150	31
Hong Kong	105,000	139	192,000	145
India	639,000	461	673,000	406
Israel	2,740,000	4,630	2,550,000	4,560
Japan	14,800	13	5,110	13
Mauritius	3,240	7	3,770	7
Russia	45,100	61	62,900	112
South Africa	34,100	140	24,100	161
Switzerland	34,200	263	13,700	118
Thailand	23,800	27	9,100	9
United Arab Emirates	7,190	8	19,700	17
United Kingdom	22,100	100	15,700	118
Other	42,300 r/	89 r/	23,300	72
Total	5,040,000	8,140	4,710,000	7,630

r/ Revised. -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Customs value.

3/ Includes some natural advanced diamond.

4/ Less than 1/2 unit.

Source: U.S. Census Bureau.

TABLE 8
U.S. IMPORTS FOR CONSUMPTION OF GEMSTONES, OTHER THAN DIAMOND, BY KIND AND COUNTRY 1/

Kind and country	2000 Quantity (carats)	2000 Value 2/ (millions)	2001 Quantity (carats)	2001 Value 2/ (millions)
Emerald:				
Australia	2	(3/)	161,000	(3/)
Belgium	10,600	$2	11,700	$2
Brazil	6,750,000	8	2,050,000	6
China	1,060	(3/)	2,120	(3/)
Colombia	1,620,000 r/	66	1,070,000	58
Germany	40,700	2	29,700	1
Hong Kong	240,000	9	354,000	6
India	3,110,000	32	2,040,000	20
Israel	181,000	30	127,000	26
Japan	48	(3/)	16,900	1
Sri Lanka	29,100	1	41,000	2
Switzerland	137,000	15	36,300	10
Taiwan	526	(3/)	83	(3/)
Thailand	258,000	4	287,000	5
United Kingdom	3,630	1	5,770	1
Zambia	15,300	2	106,000	1
Other	36,300 r/	5	32,000	3
Total	12,400,000 r/	176	6,370,000	141
Ruby:				
Belgium	2,120	1	500	1
Brazil	6,020	(3/)	134	(3/)
Burma	55,900	4	9,740	3
China	1,170	(3/)	8,940	(3/)
Colombia	1,840	(3/)	328	(3/)
Germany	16,300	1	24,800	(3/)
Hong Kong	253,000	10	123,000	4
India	1,600,000	5	762,000	2
Israel	37,800	3	26,500	1
Japan	9,280	(3/)	28,400	(3/)
Pakistan	6,400	(3/)	1,400	(3/)
Sri Lanka	5,660	1	4,260	1
Switzerland	32,100	7	26,400	10
Thailand	2,450,000	46	1,940,000	43
United Kingdom	5,590	4	21,800	2
Other	21,000 r/	4	25,700	2
Total	4,500,000	85	3,000,000	69
Sapphire:				
Australia	7,320	1	3,270	(3/)
Belgium	3,000	1	1,720	1
Brazil	6,590	(3/)	642	(3/)
Burma	8,720	2	395	1
Canada	699	1	250	(3/)
China	30,000	(3/)	15,100	(3/)
Colombia	43,100	(3/)	3,680	(3/)
France	1,740	1	1,670	1
Germany	53,700	1	42,500	1
Hong Kong	326,000	11	281,000	8
India	1,160,000	4	873,000	5
Israel	63,100	5	40,700	3
Sri Lanka	492,000	25	294,000	20
Switzerland	50,400	17	36,900	12
Thailand	6,000,000	81	4,470,000	66
United Kingdom	13,800	3	17,500	3
Other	134,000 r/	5 r/	65,900	2
Total	8,400,000	156	6,150,000	122

See footnotes at end of table.

TABLE 8--Continued
U.S. IMPORTS FOR CONSUMPTION OF GEMSTONES, OTHER THAN DIAMOND, BY KIND AND COUNTRY 1/

Kind and country	2000 Quantity (carats)	2000 Value 2/ (millions)	2001 Quantity (carats)	2001 Value 2/ (millions)
Other:				
Rough, uncut:				
Australia	NA	$4	NA	$4
Brazil	NA	15	NA	13
China	NA	1	NA	1
Colombia	NA	2	NA	(3/)
Fiji	NA	2	NA	2
Hong Kong	NA	1	NA	1
India	NA	1	NA	2
Indonesia	NA	2	NA	2
Kenya	NA	(3/)	NA	(3/)
Nigeria	NA	(3/)	NA	(3/)
Pakistan	NA	1	NA	1
Philippines	NA	1	NA	1
Russia	NA	(3/)	NA	(3/)
South Africa	NA	2	NA	1
Switzerland	NA	(3/)	NA	(3/)
Taiwan	NA	(3/)	NA	(3/)
Tanzania	NA	1	NA	1
Thailand	NA	11	NA	1
United Kingdom	NA	1	NA	1
Zambia	NA	5	NA	(3/)
Other	NA	9	NA	7
Total	NA	56	NA	38
Cut, set and unset:				
Australia	NA	18	NA	16
Austria	NA	1	NA	1
Brazil	NA	10	NA	7
Canada	NA	1	NA	1
China	NA	13	NA	12
Columbia	NA	(3/)	NA	1
French Polynesia	NA	5	NA	5
Germany	NA	17	NA	15
Hong Kong	NA	56	NA	44
India	NA	81	NA	82
Indonesia	NA	1	NA	1
Israel	NA	11	NA	5
Japan	NA	10	NA	20
Mexico	NA	1	NA	2
South Africa	NA	2	NA	1
Sri Lanka	NA	6	NA	6
Switzerland	NA	3	NA	2
Taiwan	NA	2	NA	1
Tanzania	NA	13	NA	10
Thailand	NA	33	NA	27
United Kingdom	NA	6	NA	8
Other	NA	4 r/	NA	3
Total	NA	294	NA	268

r/ Revised. NA Not available.
1/ Data are rounded to no more than three significant digits; may not add to totals shown.
2/ Customs value.
3/ Less than 1/2 unit.

Source: U.S. Census Bureau.

TABLE 9
VALUE OF U.S. IMPORTS OF SYNTHETIC AND
IMITATION GEMSTONES, BY COUNTRY 1/

(Thousand dollars) 2/

Country	2000	2001
Synthetic, cut but unset:		
Australia	97	224
Austria	6,670	2,980
Belgium	11	80
Brazil	136	62
China	13,500	13,700
France	1,020	974
Germany	10,300	10,000
Hong Kong	2,990	2,410
India	795	819
Italy	289	43
Japan	69	53
Korea, Republic of	2,510	1,360
Netherlands	231	74
Singapore	148	157
Spain	10	31
Sri Lanka	612	1,250
Switzerland	6,410	7,530
Taiwan	708	464
Thailand	3,820	1,970
Other	610 r/	165
Total	50,900	44,300
Imitation: 3/		
Austria	59,100	64,800
China	990	1,330
Czech Republic	11,200	13,700
Germany	1,250	1,140
Hong Kong	161	255
India	850	355
Italy	167	207
Japan	756	400
Korea, Republic of	859	1,120
Spain	45	147
Taiwan	274	245
Other	540 r/	497
Total	76,200	84,300

r/ Revised.
1/ Data are rounded to no more than three significant digits; not add to totals shown.
2/ Customs value.
3/ Includes pearls.

Source: U.S. Census Bureau.

TABLE 10
U.S. IMPORTS FOR CONSUMPTION OF GEMSTONES 1/

(Thousand carats and thousand dollars)

Stones	2000 Quantity	2000 Value 2/	2001 Quantity	2001 Value 2/
Diamonds:				
Rough or uncut	2,280	741,000	900	550,000
Cut but unset	19,500	11,300,000	16,200	10,000,000
Emeralds, cut but unset	22,100	176,000	6,370	141,000
Coral and similar materials, unworked	NA	8,920	NA	10,900
Rubies and sapphires, cut but unset	12,900	241,000	9,150	191,000
Pearls:				
Natural	NA	960	NA	8,520
Cultured	NA	46,100	NA	47,200
Imitation	NA	2,020	NA	1,290
Other precious and semiprecious stones:				
Rough, uncut	1,070,000	39,400	1,020,000	22,200
Cut, set and unset	NA	247,000	NA	213,000
Other	NA	7,840	NA	5,070
Synthetic:				
Cut but unset	329,000	50,900	345,000	44,300
Other	NA	6,190	NA	5,760
Imitation gemstone 3/	NA	74,200	NA	83,000
Total	XX	12,900,000	XX	11,400,000

NA Not available. XX Not applicable.
1/ Data are rounded to no more than three significant digits; may not add to totals shown.
2/ Customs value.
3/ Does not include pearls.

Source: U.S. Census Bureau.

TABLE 11

NATURAL DIAMOND: ESTIMATED WORLD PRODUCTION, BY TYPE AND COUNTRY 1/ 2/ 3/

(Thousand carats)

Country	1997	1998	1999	2000	2001
Gemstones: 4/					
Angola	1,110	2,400	3,360 r/	3,914 r/ 5/	4,653 5/
Australia	18,100	18,400	13,403 5/	11,992 r/ 5/	10,700
Botswana	15,111 5/	14,772 5/	16,000	19,368 r/ 5/	20,100
Brazil	100 r/	100 r/	900 r/	1,000 r/	1,000
Canada	--	203 r/ 5/	2,429 r/ 5/	2,558 r/ 5/	2,600
Central African Republic	400	330	311 r/	346 r/	360
China	230	230	230	230	235
Congo (Kinshasa)	3,300	5,080	4,120	3,500	9,100
Cote d' Ivoire	207	210	270 r/	210 r/	210
Ghana	664	649	282 r/	178	700
Guinea	165	294 r/	410	278 r/	270
Liberia	80	150	120	100 r/	100
Namibia	1,350	1,390	1,550	1,520	1,490
Russia	11,200	11,500	11,500	11,600	11,600
Sierra Leone	300	200	450	450	450
South Africa	4,500	4,300	4,000	4,300	4,470
Tanzania	82	83	200	301	302
Venezuela	-- r/ 5/	80 5/	59 5/	80 r/ 5/	85
Zimbabwe	321	10	15	7	5
Other	33 r/	32 r/	29 r/	44 r/	70
Total	57,200 r/	60,400 r/	59,600 r/	62,000 r/	68,500
Industrial:					
Angola	124	364	373 r/	435 r/	517
Australia	22,100	22,500	16,381 5/	14,700 r/	13,100
Botswana	5,000	5,000	5,350	5,850 r/	5,060
Brazil	-- r/	-- r/	-- r/	-- r/	--
Central African Republic	100	200	120 r/	115 r/	120
China	900	900	920	920	950
Congo (Kinshasa)	18,677 5/	21,000	16,000	14,200	9,100
Cote d' Ivoire	100	100	128 r/	110 r/	110
Ghana	166	160	101 r/	712	170
Guinea	40	98 r/	140	91 r/	90
Liberia	120	150	80	70 r/	70
Namibia	71	73	89	80	--
Russia	11,200	11,600	11,500	11,600	11,600
Sierra Leone	100	50	150	150	150
South Africa	5,540	6,460	6,020	6,480	6,700
Tanzania	35	15	35	55	53
Venezuela	85 r/ 5/	17 5/	36 5/	29 r/ 5/	40
Zimbabwe	100	19	30	13	10
Other	79 r/	80 r/	87 r/	126 r/	200
Total	64,500 r/	68,700 r/	57,500 r/	55,700 r/	48,000
Grand total	122,000 r/	129,000 r/	117,000	118,000	117,000

r/ Revised. -- Zero.

1/ World totals and estimated data are rounded to no more than three significant digits; may not add to totals shown.

2/ Table includes data available through May 27, 2002.

3/ In addition to the countries listed, natural diamond is produced in Nigeria, but information is inadequate to estimate output.

4/ Includes near- and cheap-gem qualities.

5/ Reported figure.