Gem Stones

By Gordon T. Austin[1]

The value of natural gem stones, mineral specimens, and freshwater pearls, natural and cultured, produced in the United States was estimated to be $9.3 million, an increase of 26% over that of 1985. Small mine owners and amateur collectors accounted for most of the production. Small mines produced tourmaline, jade, opal, sapphire, turquoise, agates, lapis lazuli, garnet, beryl, and quartz.

The combined value of synthetic and simulant gem stones was reported to be $10.3 million. This was the first year that the domestic production of synthetic and simulant gem stones was reported by the Bureau of Mines. Synthetic gem stones are manmade and have the same optical, physical, and chemical properties and the same appearance as the natural gem stone. Synthetic gem stones produced in the United States include ruby, sapphire, garnet, spinel, alexandrite, quartz, emerald, and diamond. Simulants are manmade gem stones that have an appearance similar to that of a natural gem stone but have different optical, chemical, and physical properties. The major gem stone simulant produced in the United States was cubic zirconia.

The gem stone materials are sold to wholesale and retail outlets, in gem and mineral shops, at gem and mineral shows, and to jewelry manufacturers.

Domestic Data Coverage.—Domestic production statistics for gem stones were developed by the Bureau of Mines from the "Gem Stones" survey, a voluntary survey of U.S. operations, and from Bureau estimates of amateur collectors' production. Of the 105 operations to which a survey request was sent, 93% responded, accounting for 78% of the total production.

The 105 operations surveyed in 1986 were an increase of about 144% compared with operations surveyed in 1985, and the response rate represents an increase of 182%. Production by the nonresponding operations and by amateur collectors was estimated based on information from published data, gem and mineral dealers, gem and mineral shows, and collectors.

DOMESTIC PRODUCTION

Mines and collectors in all 50 States produced natural gem stones and/or freshwater pearls with an estimated value of $1,000 or more in each State. Ten States supplied 84% of the total value of the natural gem material. The States, in order of declining value of production, were Arizona, Tennessee, North Carolina, Arkansas, Montana, California, Oregon, Idaho, Texas, and Wyoming. Production of synthetic and simulant gem stone materials was valued at $10.3 million. Seven firms, four in California and one each in three other States, accounted for the production. The States, in order of declining value of production, were California, Massachusetts, New Jersey, and Michigan.

Vortex Mining Co. of Utica, MT, completed construction of a sapphire washing plant situated on the continuation of the Yogo sapphire dike in central Montana. Most of the sapphires found by Vortex were the highly prized cornflower-blue color and less than 1 carat in size. The sapphires found to date have been cut either by Vortex or in Thailand. No rough material was offered for sale.[2]

The Dow Chemical Co.; Amselco Exploration Inc., a subsidiary of British Petroleum Co. of Canada; and Exmin Corp., a sub-

sidiary of the Belgian company Sibeka (Société d'Entreprises et d'Investissements S.A.); conducted exploration for diamond on approximately 60,000 acres of land in Iron and Dickinson Counties, MI. The same three firms continued to explore for diamond in Wisconsin, and Exmin leased land for diamond exploration in Minnesota.

The joint venture between Lac Minerals Ltd. and Mobil Oil Co. for diamond exploration has not discovered any economically recoverable diamond deposits. However, exploration continued during 1986 in the State line district on the Colorado-Wyoming border. One kimberlite project was explored and evaluated to the extent that it was determined that the grade of the deposit, diamonds per ton of kimberlite, was sufficient to be of interest. However, it was determined that the quality of the diamonds recovered would not make the project profitable. Hanvey-Boulle Ltd., a mining company from Dallas, TX, submitted a plan to the State of Arkansas in October 1985 to sample the Crater of Diamonds State Park at Murfreesboro to determine the feasibility of constructing a diamond mining operation. A special committee, appointed by the Governor, completed a study of the proposed plan in late 1986. The committee recommended that the Governor appoint an "expert" committee of engineers and other mining experts to study the technical aspects of the proposed project. A committee of experts was appointed at yearend.[3] In June, a milestone was reached at the Crater of Diamonds State Park, when the 10,000th diamond was found since the park was established in 1972.[4]

In 1986, the world's largest diamond gem stone was cut and polished in the United States. The stone, known as the Zales Diamond and owned by Zales Corp., is a 535-carat, nontraditional shaped stone, which was cut from an 890-carat rough. In addition, 22 satellite stones, some as large as 20 carats, were cut from the same piece of rough, the origin of which was unclear. The world's largest star sapphire, 1,154 carats, was cut in the United States from a 1,905-carat rough reportedly found in the State of Idaho.[5] The world's largest cut gem stone, a smoky quartz that measures 10.0 by 5.6 by 4.0 inches, was cut in the United States from Brazilian rough. The stone was named the "Eye of the Idol" after the cut of the same name. The finished gem stone was valued at approximately $20,000. The world's largest gem stone by weight is the Brazilian Princess, a blue topaz, 5.7 by 5.7 by 4.7 inches, that weighs 21,005 carats. It was cut in the United States in 1976. A Miami Beach, FL, resident discovered an apple-sized pink sapphire at a dig-for-fee gem mine in North Carolina.

CONSUMPTION

Domestic gem and gem stone production was consumed in commercial and amateur gem and mineral collections, the production of objects of art, and the manufacture of jewelry. Value of U.S. apparent consumption increased 10% to $3,296 million.

U.S. imports for consumption of colored gem stones, led by emerald, ruby, and sapphire, increased 16% over those of 1985. The value of annual imports of emerald continued as the largest of any single colored gem stone. However, the combined value of imported ruby and sapphire exceeded that of emerald by 17%. The value of pearls imported into the United States continued to decline, decreasing 15% compared with that of 1985. The value of all imported gem stones, other than diamond, increased 7%.

According to data reported by the U.S. Department of Commerce, the sales value of all jewelry, costume jewelry, gold, and precious and semiprecious stones was about $24 billion, an increase of 11% over that of 1985. The same source reported that sales in jewelry stores increased 12% over that of 1985 to $12.4 billion.

PRICES

The U.S. price of a 1-carat, D-flawless diamond fluctuated between $9,500 and $16,500, and at yearend was $16,000. However, only a few hundred of these high-quality, 1-carat stones have been available each year, and their value has accounted for less than 0.2% of the total U.S. market. Prices of ruby, blue sapphire, and emerald experienced slight increases, while other colored stones experienced little change

during the year. The average price of choker-length strands of 6.0- to 6.5-millimeter imported pearls increased approximately 10% compared with that of 1985. The price of American freshwater pearls increased 15% over that of 1985.

Table 1.—Prices of U.S. cut diamonds, by size and quality

Carat weight	Description, color[1]	Clarity[2] (GIA terms)	Price range per carat[3] in 1986	Average price per carat[4] June 1985	Average price per carat[4] June 1986
0.04-0.07	H-I	VS	$440- $420	$420	$420
.04- .07	H-I	SI_1	420- 380	380	380
.08- .14	H-I	VS	470- 460	460	460
.08- .14	H-I	SI_1	440- 420	420	420
.18- .22	H-I	VS	850- 680	750	750
.18- .22	H-I	SI_1	700- 600	700	700
.23- .29	H-I	VS	1,200- 900	900	11,750
.23- .29	H-I	SI_1	900- 750	750	900
.30- .37	H-I	VS	1,400- 1,000	1,175	1,475
.30- .37	H-I	SI_1	1,000- 800	900	1,250
.46- .49	H-I	VS	1,700- 1,300	1,475	--
.46- .49	H-I	SI_1	1,400- 1,100	1,250	--
.70- .89	H-I	VS	2,200- 1,800	2,000	2,175
.70- .89	H-I	SI_1	2,000- 1,400	1,600	1,800
1.00[5]	D	IF	16,500- 9,500	[6]11,500	[6]12,000
1.00	E	VVS_1	9,450- 4,100	[6]4,550	[6]5,000
1.00	G	VS	3,700- 2,500	[6]3,000	[6]3,150
1.00	H	VS_2	3,100- 2,000	[6]2,400	[6]2,525

[1]Gemological Institute of America (GIA) color grades: D—colorless; E—rare white; and HG-I—traces of color.
[2]Clarity: IF—no blemishes; VVS_1—very, very slightly included; VS—very slightly included; VS_2—very slightly included, but more visible; and SI_1—slightly included.
[3]Rapaport Diamond Report. V. 9, No. 1, Jan. 10, 1986; and v. 9, No. 45, Dec. 26, 1986. These figures represent Rapaport Diamond Report opinion of New York wholesale asking price.
[4]Rapaport Diamond Report. V. 8, No. 26, July 12, 1985; and v. 9, No. 22, July 11, 1986.
[5]The Diamond Registry Bulletin. V. 17, No. 1, Dec. 1985, p. 8; and v. 17, No. 11, Dec. 1986, p. 8.
[6]The Diamond Registry Bulletin. V. 16, No. 7, July 1985, p. 8; and v. 17, No. 7, July 1986, p. 8.

Table 2.—Prices of U.S. cut colored gem stones, by size[1]

Gem stone	Carat weight	Price range per carat in 1986[2]	Average price per carat,[3] June 1986
Amethyst	1	$6- $10	$8
Aquamarine	1	100- 250	175
Emerald	1	1,350-3,000	1,775
Garnet, tsavorite	1	700-1,200	950
Ruby	1	1,800-3,300	2,150
Sapphire	1	450-1,300	725
Tanzanite	1	275- 450	354
Topaz	1	6- 9	7.50
Tourmaline, green[4]	1	40- 250	145
Tourmaline, pink[4]	1	50- 300	175

[1]Fine quality.
[2]Jewelers' Circular-Keystone. V. 157, No. 5, May 1986, p. 166; and v. 158, No. 2, Feb. 1987, p. 340. These figures represent a sampling of net prices that wholesale colored stone dealers in various U.S. cities charged their cash customers during the month.
[3]Jewelers' Circular-Keystone. V. 157, No. 8, Aug. 1986, p. 430.
[4]The Gemstone Registry Bulletin. V. 3, No. 11, Dec. 30, 1985, p. 8; and v. 4, No. 11, Dec. 31, 1986, p. 8.

FOREIGN TRADE

Export value of all gem materials was $584.9 million. Export value of all gem materials other than diamond decreased slightly to $59.3 million. Of this total, other precious and semiprecious stones, cut but unset, were valued at $31.5 million; other precious and semiprecious stones, not set or cut, $16.5 million; synthetic gem stones and materials for jewelry, cut, $4.7 million; pearls, natural, cultured, and imitation, not strung or set, $2.6 million; and other, $3.9 million. Reexports of all gem materials was $317.1 million. Reexports of all gem materials other than diamond increased 38% to

$55 million. Reexport categories were synthetic gem stones and materials for jewelry, cut, $0.5 million; precious and semiprecious stones, cut but not set, $44.5 million; and other precious and semiprecious stones, natural, not cut or set, $10 million.

The customs value of U.S. imports of rough and polished natural diamond, excluding industrial diamond, was up 15% to about $3.5 billion. Total imports of polished diamond, principally from Israel, 32%; Belgium, 28%; and India, 21%; were valued at $3.0 billion, an 11% increase over those of 1985. Imports of diamond greater than 0.5 carat, mostly from Israel, 34%; Belgium, 30%; and Switzerland, 14%; increased 10% in value to $1.3 billion. The value of imports in the less-than-0.5-carat category, mostly from India, 35%; Israel, 31%; and Belgium, 27%; increased 15% to $1.8 billion. The imports of rough diamond, 52% in value from the Republic of South Africa, decreased 19% in caratage and increased 19% in value. A 46% increase in South African carat value, from $341 to $499, was indicated by custom values.

The total customs value of imported emerald increased 10% to $152.4 million. The total value of ruby imports increased 20% to $83.5 million, and sapphire imports increased 34% to $95.1 million. Average carat values increased 8% for emerald to $55, 16% for ruby to $22, and 16% for sapphire to $22.

Table 3.—U.S. exports and reexports of diamond (exclusive of industrial diamond), by country

Country	1985		1986	
	Quantity (carats)	Value[1] (millions)	Quantity (carats)	Value[1] (millions)
Exports:				
Belgium-Luxembourg	179,829	$82.3	205,565	$108.9
Canada	23,012	12.2	19,176	13.7
France	1,763	8.3	3,148	6.9
Germany, Federal Republic of	2,937	2.5	2,286	3.1
Hong Kong	42,302	61.7	67,393	97.1
Israel	109,842	56.7	156,819	87.2
Japan	31,218	46.5	48,266	93.6
Singapore	2,039	4.4	5,810	7.5
Sweden	21	(2)	--	--
Switzerland	29,025	95.6	19,318	85.4
Thailand	5,226	2.8	16,958	6.4
United Kingdom	3,966	4.0	6,405	7.8
Other	6,865	8.3	9,915	8.0
Total	438,045	385.3	561,059	525.6
Reexports:[3]				
Belgium-Luxembourg	839,257	56.7	806,945	89.5
Canada	4,243	.3	6,516	.5
China	8,120	.4	10,392	.6
Germany, Federal Republic of	53,318	1.6	39,479	2.7
Hong Kong	42,021	14.0	59,969	20.3
India	153,323	3.9	127,221	3.3
Israel	196,743	31.4	210,333	59.2
Japan	114,713	8.5	105,827	8.8
Netherlands	106,819	5.2	68,079	5.1
Switzerland	41,953	41.2	30,797	35.1
United Kingdom	297,044	12.2	398,044	27.6
Other	82,324	10.6	102,348	9.4
Total	1,939,878	186.0	1,965,950	262.1

[1]Customs value.
[2]Less than 1/10 unit.
[3]Artificially inflated in 1985 and 1986 by auction of approximately 1 million carats of U.S. Government stockpile industrial diamond stones with subsequent reexports as gem stones to Belgium-Luxembourg and India.

Source: Bureau of the Census.

Table 4.—U.S. imports for consumption of diamond, by kind, weight, and country

Kind, weight, and country of origin	1985		1986	
	Quantity (carats)	Value[1] (millions)	Quantity (carats)	Value[1] (millions)
Rough or uncut, natural:[2]				
Belgium-Luxembourg	130,996	$32.9	418,782	$73.8
Brazil	90,280	6.6	29,444	3.4
Cape Verde	21	(3)	940	1.0
Congo	80	.2	--	--
Guyana	636	(3)	2,122	.3
Israel	27,198	8.3	45,240	12.2
Netherlands	9,643	8.0	7,318	3.7
South Africa, Republic of	555,907	189.4	452,973	225.9
Switzerland	15,106	10.4	22,629	8.1
United Kingdom	116,601	52.0	135,099	66.0
Venezuela	21,036	.8	37,096	1.0
Other	75,309	8.9	155,618	39.7
Total	1,042,813	317.5	1,307,261	435.1
Cut but unset, not over 0.5 carat:				
Belgium-Luxembourg	1,466,325	444.8	1,540,601	471.9
Brazil	22,790	2.5	23,013	7.5
Canada	19,607	6.6	30,485	4.0
Hong Kong	146,416	39.4	131,717	25.0
India	2,667,906	486.8	2,886,722	629.0
Israel	1,237,123	448.2	1,555,742	542.7
Malaysia	17,772	6.0	2,151	.7
Netherlands	85,811	26.9	28,296	11.0
South Africa, Republic of	48,074	16.9	139,692	19.1
Switzerland	153,329	38.7	75,629	28.7
United Kingdom	35,138	13.4	36,714	17.9
Other	68,754	22.2	172,873	21.9
Total	5,969,045	1,552.4	6,623,635	1,779.4
Cut but unset, over 0.5 carat:				
Belgium-Luxembourg	369,838	314.7	412,645	371.1
Hong Kong	24,259	37.0	34,236	45.4
India	47,709	16.1	50,098	13.2
Israel	439,038	340.9	529,226	429.0
Netherlands	34,951	35.5	24,673	23.8
South Africa, Republic of	76,025	77.4	65,180	73.7
Switzerland	46,098	148.5	48,898	169.6
United Kingdom	46,832	75.1	35,303	63.8
Other	54,397	91.5	60,871	55.9
Total	1,139,147	1,136.7	1,261,130	1,245.5

[1]Customs value.
[2]Includes some natural advanced diamond.
[3]Less than 1/10 unit.

Table 5.—U.S. imports for consumption of natural precious and semiprecious gem stones, other than diamond, by kind and country

Kind and country	1985		1986	
	Quantity (carats)	Value[1] (millions)	Quantity (carats)	Value[1] (millions)
Emerald:				
Argentina	122	(2)	437	(2)
Belgium-Luxembourg	106,895	$3.4	16,262	$3.1
Brazil	219,068	6.0	144,899	6.4
Colombia	197,249	56.1	199,935	52.3
France	20,928	3.8	10,674	3.0
Germany, Federal Republic of	26,176	1.7	60,471	3.2
Hong Kong	317,142	10.8	187,525	12.0
India	1,413,167	11.0	1,267,481	14.5
Israel	101,683	11.5	59,724	14.1
Japan	12,661	1.4	3,816	.8
South Africa, Republic of	2,436	.4	37,795	1.8
Switzerland	163,048	23.9	448,580	27.4
Taiwan	1	(2)	5,056	.3
Thailand	74,418	1.1	138,284	2.6
United Kingdom	20,403	2.8	20,461	6.1
Other	65,916	5.1	155,735	4.8
Total	2,741,313	139.0	2,757,135	152.4

See footnotes at end of table.

Table 5.—U.S. imports for consumption of natural precious and semiprecious gem stones, other than diamond, by kind and country —Continued

Kind and country	1985		1986	
	Quantity (carats)	Value[1] (millions)	Quantity (carats)	Value[1] (millions)
Ruby:				
Belgium-Luxembourg	11,381	$1.7	16,528	$4.3
Brazil	18,993	(2)	579	(2)
Colombia	4,701	.1	1,558	.1
France	9,712	1.9	4,563	1.9
Germany, Federal Republic of	35,204	1.6	14,412	.9
Hong Kong	110,033	3.7	85,954	3.4
India	221,923	1.3	247,687	2.1
Israel	42,921	1.2	35,433	1.3
Japan	21,242	.5	82,786	.4
Switzerland	296,877	15.6	256,921	16.5
Thailand	2,770,136	31.2	3,020,440	44.4
United Kingdom	33,713	6.4	19,496	5.8
Other	r103,861	4.5	82,677	2.4
Total	3,680,697	69.7	3,869,034	83.5
Sapphire:				
Australia	1,070	(2)	2,219	.2
Austria	122	(2)	--	--
Belgium-Luxembourg	32,047	.9	19,152	3.0
Brazil	1,424	(2)	28,604	(2)
Canada	2,717	.5	4,643	.7
Colombia	2,057	.1	1,769	(2)
France	18,973	1.9	26,764	1.9
Germany, Federal Republic of	32,028	1.2	20,699	1.2
Hong Kong	166,329	4.8	132,201	4.9
India	92,456	1.0	127,121	1.0
Israel	56,909	1.2	40,322	1.2
Japan	50,770	.8	29,157	.5
Korea, Republic of	2,664	(2)	7,527	.1
Singapore	5,910	.4	946	(2)
Sri Lanka	32,464	1.5	22,149	2.2
Switzerland	431,909	17.0	370,520	21.0
Thailand	2,765,371	32.4	3,394,602	50.3
United Kingdom	60,549	6.1	60,736	5.5
Other	72,000	1.0	71,587	1.4
Total	3,827,769	70.8	4,360,718	95.1
Other:				
Rough, uncut:				
Australia	NA	1.5	NA	.6
Brazil		14.0		15.9
Colombia		9.8		7.5
Hong Kong		.9		1.1
Nigeria		.3		.3
Pakistan		.4		.6
South Africa, Republic of		.2		.7
Switzerland		.1		.4
United Kingdom		.8		.4
Zambia		.3		.7
Other		4.8		3.0
Total	NA	33.1	NA	31.2
Cut, set and unset:				
Australia	NA	4.1	NA	4.6
Brazil		10.5		11.0
Canada		1.0		.8
China		4.5		5.1
Germany, Federal Republic of		12.3		11.4
Hong Kong		29.5		29.3
India		5.2		4.8
Japan		200.9		161.9
Switzerland		4.7		2.9
Taiwan		6.2		12.1
Thailand		3.4		6.1
United Kingdom		1.7		2.5
Other		12.6		19.3
Total	NA	296.6	NA	271.8

rRevised. NA Not available.
[1]Customs value.
[2]Less than 1/10 unit.

Source: Bureau of the Census.

Table 6.—Value of U.S. imports of synthetic and imitation gem stones, including pearls, by country

(Million dollars[1])

Country	1985	1986
Synthetic, cut but unset:		
Austria	0.4	0.5
France	.9	.9
Germany, Federal Republic of	5.5	6.4
Korea, Republic of	7.1	9.0
Switzerland	2.2	2.8
Thailand	.8	1.5
Other	r.7	1.0
Total	17.6	22.1
Imitation:		
Austria	23.0	34.4
Czechoslovakia	1.7	2.0
Germany, Federal Republic of	8.9	12.0
Japan	6.3	7.2
Other	3.6	7.0
Total	43.5	62.6

[r]Revised.
[1]Customs value.

Source: Bureau of the Census.

Table 7.—U.S. imports for consumption of precious and semiprecious gem stones

(Thousand carats and thousand dollars)

Stones	1985		1986	
	Quantity	Value[1]	Quantity	Value[1]
Diamonds:				
Rough or uncut[2]	1,043	317,584	1,307	435,029
Cut but unset	7,108	2,689,178	7,885	3,024,902
Emeralds: Cut but unset	2,741	139,045	2,757	152,396
Coral: Cut but unset, and cameos suitable for use in jewelry	NA	2,224	NA	2,291
Rubies and sapphires: Cut but unset	7,509	140,618	8,230	178,655
Marcasites	NA	256	NA	139
Pearls:				
Natural	NA	2,997	NA	3,406
Cultured	NA	228,004	NA	190,497
Imitation	NA	8,396	NA	9,655
Other precious and semiprecious stones:				
Rough, uncut	NA	33,168	NA	30,589
Cut, set and unset	NA	63,070	NA	65,392
Other	NA	NA	NA	8,102
Synthetic:				
Cut but unset[3]	52,164	17,590	63,532	22,074
Other	NA	2,457	NA	2,586
Imitation gem stones	NA	35,333	NA	52,939
Total	XX	3,679,920	XX	4,178,652

NA Not available. XX Not applicable.
[1]Customs value.
[2]Includes 630 carats of other natural diamond, advanced, valued at $1,062,100 in 1985, and 19,243 carats valued at $675,326 in 1986.
[3]Quantity in thousands of stones.

Source: Bureau of the Census.

WORLD REVIEW

De Beers Consolidated Mines Ltd.'s sales of uncut diamonds through the Central Selling Organization in 1986 were reported to be $2.56 billion compared with $1.83 billion in 1985, an increase of 40%. Sales of colored gem stones also increased.

Emerald was mined in Australia, Brazil, Colombia, Mozambique, Pakistan, the Republic of South Africa, the U.S.S.R., Zambia, and Zimbabwe. Sapphire was produced in Australia, Kenya, Sri Lanka, Tanzania, Thailand, and the United States. Aquama-

rine was produced in Afghanistan, Brazil, China, India, Nigeria, Pakistan, Tanzania, and the United States.

Angola.—The Government of Angola liquidated Companhia de Diamantes de Angola, the state-owned diamond mining company, and stopped mining diamonds. The Government formed a new corporation called Empresa Nacional de Diamantes de Angola to oversee Angolan diamond operations. Under the new system, Angola's diamond-bearing areas would be parceled into concessions and allocated to foreign companies. The Angolan Civil War totally disrupted the production of diamonds. Production fell from 1.5 million carats in 1979 to approximately 0.3 million carats in 1986. The average price fell from $158 per carat in 1980 to $45 per carat in 1986. Production costs increased greatly because the mining areas were not secured, and all equipment, supplies, and personnel had to be airlifted to the mines.[6]

Australia.—Argyle Diamond Mines Joint Venture completed the first year of production from the AK-1 lamproite pipe. The production of 29.2 million carats exceeded the planned production of 25 million carats. Argyle Diamond Sales Ltd. held the first sale of the rare pink diamond. The 56 cut stones sold for $1.54 million.[7]

Freeport Bow River Properties Inc. and Gem Exploration and Minerals Ltd. completed trial mining and feasibility studies on the Bow River alluvial diamond deposit. Plans were announced for construction of a mine and processing plant.

Australian Ores & Minerals Ltd. Div. and De Beers, Afro West Mining Ltd. and Aracca Petroleum Corp., and Ashton Mining Ltd. all continued exploration and testing of their diamond projects.

Australia accounted for about 70% of world sapphire production and 80% of the world opal production.[8]

China.—The Chinese Corp. of the People's Republic of China opened overseas offices of the China National Arts and Crafts Import and Export Corp. in the Federal Republic of Germany and the United States. The offices were established to improve the marketing of freshwater pearls.

Exports of rough and polished diamonds greatly increased the first half of 1986. Diamond exports from China were valued at $12 million during the period of January through June 1986, compared with $10 million for all of 1985.[9]

Ruby and sapphire deposits of record size were discovered in Wemchange County on Hainan Island off the southern coast of China. The largest find was an oriental sapphire deposit with reserves calculated at over 820 kilograms (4.1 million carats).

The Government of China and Chicester Diamonds Services, a firm associated with De Beers, signed a diamond prospecting agreement to explore for diamond in Shandong Province.

China also produced aquamarine, rock crystal, citrine, turquoise, peridot, sapphire, jet, and jade.

Ghana.—Ghana Consolidated Diamonds Ltd. began mining operations in January in the Birim Valley. The operations were established as the main source of gravel for milling, replacing the almost depleted Akwatia deposits. The continued use of obsolete, inefficient machinery resulted in a decrease in the number of carats produced. Gold was recovered as a byproduct of the diamond production.

The Government of Ghana published the Minerals and Mining Law of 1986, modifying existing laws. It ruled that all minerals in Ghana in their natural state would be vested in the Provisions National Defense Council for and on behalf of the people of Ghana. The Government shall also have the right of preemption of all minerals recovered in Ghana or any waters controlled by Ghana.

Guinea.—Bridge Oil Ltd. reported that Aredor diamond production was 203,788 carats, an increase of 54% compared with 1985 production. A single 100.2-carat, high-quality gem diamond from the project was sold for $3.62 million.[10] This was the most valuable diamond mined from Aredor to date. A second stone of 121.1 carats also was found but was not sold. Feasibility studies and design work were completed for a system to recover gold from the diamondiferous gravel.

Indonesia.—Australian-based Pelsart Resources NL, part of the Parry Corp., negotiated a joint venture with Ashton Mining NL to explore for diamond in the Pujon area of central Kalimantan. Alluvial diamonds have been found in this area for many years. The source of the diamonds and the delineation of the extent of the diamond-bearing alluvials are the primary objectives of the exploration.

Acorn Securities Ltd. of Australia reported that the joint venture of Acorn, 65%; P.T. Aneka Tambang, 20%; and Keymead Ltd. of London, 15%, the Indonesian state-owned mining company, was exploring allu-

Table 8.—Diamond (natural): World production, by country[1]

(Thousand carats)

Country	1982			1983			1984			1985[p]			1986[e]		
	Gem	Industrial	Total	Gem	Industrial	Total	Gem[2]	Industrial	Total	Gem[2]	Industrial	Total	Gem[2]	Industrial	Total
Angola	915	310	1,225	775	259	1,034	652	250	902	464	250	714	240	10	250
Australia	274	183	457	3,720	2,480	6,200	3,415	2,277	5,692	4,242	2,828	7,070	[3]13,145	[3]16,066	[3]29,211
Botswana	1,165	6,604	7,769	4,829	5,902	10,731	5,810	7,104	12,914	6,318	6,317	12,635	[3]9,610	3,500	13,110
Brazil	80	450	530	80	450	530	200	550	750	233	217	450	300	250	550
Central African Republic	186	91	277	230	65	295	236	101	337	245	105	350	245	105	350
China[e]	200	800	1,000	200	800	1,000	200	800	1,000	200	800	1,000	200	800	1,000
Ghana	68	616	684	34	306	340	35	311	346	65	585	650	60	540	600
Guinea	13	27	[e]40	23	17	[e]40	44	3	47	123	9	132	[3]190	[3]14	[3]204
Guyana[e]	4	7	11	5	5	10	6	8	14	4	7	11	3	6	[3]9
India	11	2	13	12	2	14	13	2	15	14	2	16	14	2	16
Indonesia[e]	3	12	15	5	22	27	5	22	27	5	22	27	5	22	27
Ivory Coast	--	--	--	--	--	--	--	--	--	--	--	--	4	6	10
Lesotho	39	3	42	--	--	--	--	--	--	--	--	--	--	--	--
Liberia	170	263	433	132	198	330	108	132	240	66	72	138	[3]63	[3]189	[3]252
Namibia	963	51	1,014	915	48	963	884	46	930	865	45	910	900	50	950
Sierra Leone	203	87	290	242	103	345	240	105	[e]345	243	106	349	215	100	315
South Africa, Republic of:															
Finsch Mine	847	3,003	3,850	1,765	3,278	5,043	1,714	3,184	4,898	1,770	3,184	4,954	1,800	3,172	4,972
Premier Mine	615	1,845	2,460	800	1,844	2,644	765	1,785	2,550	820	1,864	2,684	834	1,869	2,703
Other De Beers' properties[4]	1,359	906	2,265	1,400	569	1,969	1,452	593	2,045	1,500	569	2,069	1,529	567	2,096
Other	521	58	579	589	66	655	585	65	650	460	35	495	472	57	529
Total	3,342	5,812	9,154	4,554	5,757	10,311	4,516	5,627	10,143	4,550	5,652	10,202	4,635	5,665	10,300
Swaziland	--	--	--	--	--	--	7	10	17	9	12	21	17	23	40
Tanzania	100	120	[e]220	183	78	261	193	84	277	207	89	[r e]296	210	90	300
U.S.S.R.[e]	2,100	8,500	10,600	3,700	7,000	10,700	4,300	6,400	10,700	4,400	6,400	10,800	4,400	6,400	10,800
Venezuela	99	394	[e]493	45	234	279	40	232	272	35	180	215	40	195	235
Zaire	308	5,856	6,164	3,355	8,627	11,982	5,169	13,290	18,459	5,493	14,124	19,617	4,661	18,643	[3]23,304
World total	10,243	30,188	40,431	23,039	32,353	55,392	26,073	37,354	63,427	27,781	37,822	65,603	39,157	52,676	91,833

[e]Estimated. [p]Preliminary. [r]Revised.

[1]Table includes data available through June 2, 1987. Total diamond output (gem plus industrial) for each country is actually reported except where indicated by a footnote to be estimated. In contrast, the detailed separate production data for gem and industrial diamond are Bureau of Mines estimates in the case of every country except Australia (1982-86), Central African Republic (1983-85), Guinea (1984-86), and Liberia (1984-86), for which source publications give details on grade as well as totals. The estimated distribution of total output between gem and industrial diamond is conjectural, and for most countries, is based on the best available data at time of publication.

[2]Includes near-gem and cheap-gem qualities.

[3]Reported figure.

[4]Other De Beers Group output from the Republic of South Africa includes Kimberley Pool, Koffiefontein Mine, and the Namaqualand Mines.

vial diamond claims in the Danan Seran area of southern Kalimantan and had completed a successful sampling program. Results to date yielded 992 stones weighing 144.76 carats. The stones ranged in size from 0.01 to 2.31 carats, and 19 of the stones exceeded 1.0 carat. The stones appeared to be 95% gem quality.

South Africa, Republic of.—De Beers made the decision to deepen its operations and switch from the long-established block-caving system to sublevel caving in the Dutoitspan and Bultfontein Mines. The project would extend the economic life of both mines and would reduce labor costs. The two mines share a common shaft system. Both mines were developed about 100 years ago.

The Gravelotte emerald mine continued to produce a limited number of very-high-quality emeralds in 1986. The mine accumulated an inventory of 1.5 million carats because of the weakness of the market. The Republic of South Africa also produced aquamarine and tourmaline.

Syria.—The Ministry of Syrian Oil and Minerals Resources confirmed the existence of a project to exploit diamond deposits discovered in the Homs area.[11]

Zaire.—Diamond production set a record high for the second consecutive year. Production was reported to be 23,303,739 carats, an increase of about 19%. The average price per carat was $8.26, well above the $7.90-per-carat floor price established by the agreement entered into with De Beers in 1985.

TECHNOLOGY

The Gemological Institute of America perfected a new set of testing procedures to determine whether an amethyst is natural or synthetic. Polarized light is used to determine if Brazil law twinning is present. If Brazil law twinning is present, the stone is natural amethyst. In the absence of any twinning, a synthetic origin is probable, but further testing is needed to correctly identify the stone as synthetic. Angular or straight color zoning with colorless or violetish zones next to purple areas identify natural amethyst. The presence of only light and dark purple zoning or the complete absence of zoning indicates a synthetic stone. These procedures have made it possible for the first time for the average dealer to determine if stones represented as natural amethyst are truly natural.[12]

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[1]Physical scientist, Division of Industrial Minerals.

[2]Jewelers' Circular-Keystone. Gemstones. V. 158, No. 2, Feb. 1987, p. 337.

[3]Arkansas Gazette. Gem of a Plan Awaits Study. Feb. 8, 1987, p. 2.

[4]Murfreesboro Diamond. Nashville Man Finds Crater's 10,000th Gem. June 18, 1986, p. 1.

[5]Jewelers' Circular-Keystone. Gemstones. V. 157, No. 11, Nov. 1986, p. 159.

[6]———. V. 157, No. 9, Sept. 1986, p. 118.

[7]Where necessary, values have been converted from Australian dollars ($A) to U.S. dollars at the Dec. 3, 1986, rate of $A1.00=US$1.54.

[8]Australian Bureau of Mineral Resources. Australian Mineral Industry Annual Review. Preliminary Summary 1986. Gemstones, Feb. 1987.

[9]Page 158 of work cited in footnote 5.

[10]Where necessary, values have been converted from Australian dollars ($A) to U.S. dollars at the Dec. 3, 1986, rate of $A1.00=US$1.54.

[11]Mining Journal (London). Development. V. 308, No. 7903, Feb. 6, 1987, p. 95.

[12]Crowningshield, R., H. Cornelius, and C. W. Fryer. A Simple Procedure To Separate Natural From Synthetic Amethyst on the Basis of Twinning. Gems & Gemology, v. 22, No. 3, 1986, pp. 130-139.