Gem Stones

By J. W. Pressler[1]

The value of gem stones and mineral specimens produced in the United States during 1982 was estimated to be $7.2 million, a 5% decrease compared with that of 1981. During the year, turquoise production decreased while tourmaline, sapphire, and opal production increased. Amateur collectors accounted for much of the activity in many States. Commercial operators produced agate, jade, jasper, opal, sapphire, tourmaline, and turquoise, which they sold mainly to wholesale or retail outlets and also to jewelry manufacturers.

Domestic Data Coverage.—Domestic production data for gem stones are developed by the Bureau of Mines from the production of Gem Stones survey, a voluntary survey of U.S. operations. Of the 46 operations to which a survey request was sent, 26% responded, representing an estimated 25% of the total production indicated in the text. Production for the 34 nonrespondents was estimated using reported prior year production levels adjusted by trends in employment and other guidelines.

DOMESTIC PRODUCTION

Mines and collectors in 46 States produced gem materials with an estimated value of $1,000 or more in each State in 1982. Eleven States supplied 91% of the total value as follows: Arizona, $2.8 million; Nevada, $1.2 million; Maine and Oregon, $500,000 each; California and Wyoming, $250,000 each; Montana, $225,000; and Arkansas, New Mexico, Texas, and Washington, $200,000 each. In 1982, estimated production increased 125% in Montana and 20% in Nevada, but decreased 29% in Maine, 17% in California and Oregon, and 14% in Arizona.

Park authorities at the Crater of Diamonds Park in Pike County, Ark., reported that 84,600 people visited the park in 1982 and found 1,382 diamonds with a total weight of 263 carats. This was a slight increase compared with the 1,327 diamonds found in 1981. The largest was a 3.48-carat brown stone of undetermined value. The next four largest diamonds, one brown, two whites, and one yellow, ranged from 2.43 to 3.40 carats. The new concentrating and screening techniques that enabled diggers to recover more of the smaller (1- to 24-point) diamonds contributed substantially to the total diamonds recovered, which averaged 19 points compared with 33 points 2 years ago. The "dig for fee" operations remained popular.

Prospecting and evaluation of kimberlite in Michigan and Kansas continued during 1982. Commercial interest and evaluation of the Murfreesboro diamond-bearing kimberlite was active.

The Geological Survey of Wyoming continued its research and exploration activities in the southern Laramie Range. Cominco American, Inc., and Superior Minerals Co. prospected several regions in the Laramie Range and Medicine Bow Mountains. Cominco American and Superior were committed to testing of kimberlite diatremes for commercial diamond mineralization near the Wyoming-Colorado border, with a pilot plant located in Fort Collins, Colo.

In Pala, San Diego County, Calif., Pala Gem Mines produced tourmaline at its Stewart lithia mine. Other small mines, in the same county, continued to produce fine gem-quality and specimen tourmaline, kunzite, and morganite.

Montana continued to lead the other

States in the production of corundum, particularly gem-quality sapphire. Intergem Inc., of Denver, Colo., was conducting sampling and hydraulic testing in June 1982 on the Yogo Gulch Sapphire Mine in Fergus County, Mont. No sapphire production was reported for the year. Three pay-as-you-dig or fee placer operations were active: Eldorado Bar and Castle's Sapphire Mine near Helena, and Gem Mountain Sapphire near Philipsburg. Gem-quality rubies and sapphires were also found in the Cowee Valley near Franklin, N.C. The Cherokee Mine near Franklin, N.C., was active, with many visitors buying gravel by the bucket, followed by washing and sorting.

The American Gem Co. operated the Rist Emerald Mine near Hiddenite, Alexander County, N.C. The dig-for-fee mine had produced a single-crystal emerald weighing more than 1,000 carats in 1980, with an estimated value of $30,000.

One of the most popular gem-hunting areas in the United States was Emerald Creek in northern Idaho where gem-quality and asteriated garnet continued to be produced. The U.S. Forest Service administered the riverbed and gravel area in Benewah County, Idaho, and charged prospectors and rock hounds a daily fee.

CONSUMPTION

Domestic gem stone output went to amateur and commercial rock, mineral, and gem stone collections, objects of art, and jewelry. Apparent consumption (domestic production plus imports minus exports and reexports) in 1982 was valued at $1,643 million, 10% less than the revised value of $1,816 million for 1981.

PRICES

A sampling of prices that diamond dealers in various U.S. cities charged their customers in January 1983 is shown in table 1.

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] 1982	Median price per carat[3] January 1982	Median price per carat[3] Early January 1983
0.04-0.08	G-I	VS_1	$400- $613	$532	$475
.04- .08	G-I	SI_1	365- 520	385	400
.09- .16	G-I	VS_1	450- 700	565	525
.09- .16	G-I	SI_1	400- 585	450	450
.17- .22	G-I	VS_1	600- 1,205	829	750
.17- .22	G-I	SI_1	490- 1,045	700	650
.23- .28	G-I	VS_1	675- 1,375	1,050	940
.23- .28	G-I	SI_1	580- 1,215	850	750
.29- .35	G-I	VS_1	690- 1,600	1,250	1,250
.29- .35	G-I	SI_1	600- 1,210	950	1,000
.46- .55	G-I	VS_1	1,200- 2,125	2,000	1,900
.46- .55	G-I	SI_1	885- 1,740	1,500	1,480
.69- .79	G-I	VS_1	1,500- 3,010	2,300	2,250
.69- .79	G-I	SI_1	1,000- 2,180	2,000	1,750
1.00-1.15[4]	D	FL	12,000-25,000	22,500	19,750
1.00-1.15	E	VVS_1	7,000- 7,500	12,500	7,300
1.00-1.15	G	VS_1	3,500- 4,500	5,350	3,900
1.00-1.15	H	VS_2	2,800- 4,050	4,400	3,200
1.00-1.15	I	SI_1	2,000- 3,000	2,775	2,600

[1]Gemological Institute of America color grades: D—colorless; E—rare white; G-I—traces of color.
[2]Clarity: FL—no blemishes; VVS_1—very, very slightly included; VS_1—very slightly included; VS_2—very slightly included, but more visible; SI_1—slightly included.
[3]Jewelers' Circular-Keystone, v. 154, No. 2, February 1983, p. 86. These figures represent a sampling of net prices that diamond dealers in various U.S. cities charged their customers during the month.
[4]The Diamond Registry Bulletin, v. 13, No. 1, Dec. 31, 1981, and v. 14, No. 1, Dec. 31, 1982.

Yearend domestic sales of commercial-grade gem diamonds and inexpensive commercial-grade stones up to 1 carat, had its traditional Christmas season surge. In 1982, total sales of gold jewelry, in which the value of the precious stone, principally diamond, was over 50% of the total value, decreased 3% compared with that of 1981.

The U.S. price of 1.0-carat, D-flawless, investment-grade diamond fluctuated during 1982 between $12,000 and $25,000 per carat, and at yearend 1982 was $19,750 per

carat, a 12% decrease compared with that of 1981. However, investment diamond sales are only a very small percentage of the total diamond market, estimated at $100 million for the world, compared with total world diamond jewelry sales of $18.5 billion.

A sampling of prices that colored-stone dealers in various U.S. cities charged their customers during January 1983 is shown in table 2.

Colored stones languished during the year. Commercial gem materials were more popular although expensive, and fine-quality stones experienced poor sales. Average prices of some medium-quality stones—sapphire, Colombian emerald, and ruby—decreased 20% to 56%. The average price for medium-quality tsavorite garnet increased 27% because of its rarity and beauty.

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

Gem stone	Carat weight	Price range per carat 1982	Median price per carat[1 2]	
			January 1982	Early January 1983
Amethyst	10	$10- $35	$18	$17
Aquamarine	5	40- 300	187	150
Citrine	10	6- 45	16	10
Emerald:				
Colombian	1	1,200-4,000	2,500	1,500
Zambian	1	NA	NA	1,400
Garnet, tsavorite	1	300-1,200	625	725
Opal, black	3	200- 900	250	NA
Opal, white	5	40- 130	80	NA
Peridot	5	40- 200	65	NA
Ruby:				
Medium to better	1	1,000-5,000	1,650	1,200
Commercial	1	500-3,000	700	NA
Sapphire:				
Medium to better	1	450-2,500	1,500	700
Commercial	1	225-1,000	750	NA
Star sapphire:				
Sky-blue	5	200-1,000	450	NA
Gray	5	30- 200	102	NA
Tanzanite	5	300-1,200	850	762
Topaz	5	75- 500	237	210
Tourmaline, green	5	40- 200	125	132
Tourmaline, pink	5	40- 250	125	137

NA Not available.
[1]Medium to better quality.
[2]Jewelers' Circular-Keystone, v. 153, No. 2, February 1982, p. 152; v. 154, No. 2, February 1983, p. 87. These figures represent a sampling of net prices that colored stone dealers in various U.S. cities charged their cash customers during the month.

FOREIGN TRADE

The declared customs value of U.S. imports of rough and polished natural diamonds, excluding industrial diamonds, was $1.9 billion in 1982, a 14% decrease compared with that of 1981. Total polished diamond imports, principally from Belgium (35%) and Israel (25%), were valued at $1.6 billion. Imports in the over-0.5-carat category, mostly from Belgium (40%), Israel (15%), and Switzerland (15%), decreased 17% in value to $633 million. Imports in the less-than-0.5-carat group, mostly from Belgium (32%), Israel (31%), and India (27%), decreased 3% in value to $1.01 billion. Imports of rough natural diamond, principally from the Republic of South Africa (65%), the United Kingdom (9%), and Belgium, (9%), decreased 5% in caratage and 32% in value in 1982 compared with that of 1981. The decrease in carat value from $430 in 1981 to $345 in 1982 for South African imports again indicated that De Beers Consolidated Mines Ltd. was withholding the better quality rough stones from the market.

The total value of emerald imports decreased 8% to $121 million in 1982. The total value of rubies and sapphires imported in 1982 decreased 27% to $129 million, compared with $177 million in 1981. Import caratage of ruby and sapphire were reported for the first time in 1982, and indicated an average carat value of $34 for ruby and $24.50 for sapphire.

Export value of all gem materials, other than diamond, amounted to $67.3 million.

Of this total, other precious and semiprecious stones, cut but unset, were valued at $29.6 million; other natural precious and semiprecious stones, not set or cut, $17.2 million; synthetic gem stones and materials for jewelry, cut, $7.7 million; pearls, natural, cultured, or synthetic, not strung or set, $1.3 million; and other, $11.5 million. Reexports of all gem materials, other than diamond, amounted to $43.1 million in value in categories as follows: pearls, $3.0 million; precious and semiprecious stones, cut but unset, $32.5 million; and other, $7.6 million.

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

Country	1981		1982	
	Quantity (carats)	Value (millions)	Quantity (carats)	Value (millions)
Exports:				
Belgium-Luxembourg	47,781	$49.4	40,655	$33.6
Canada	9,020	7.1	10,193	5.8
France	5,909	23.0	4,990	9.8
Germany, Federal Republic of	3,037	6.8	1,961	3.5
Hong Kong	47,802	134.8	47,395	100.0
Israel	16,253	11.8	20,353	5.6
Japan	31,415	66.8	27,411	52.0
Netherlands	371	4.3	1,052	2.5
Singapore	6,585	12.3	8,528	17.0
Switzerland	16,930	98.4	13,649	48.4
United Kingdom	5,278	18.3	4,180	9.1
Other	6,729	8.3	4,504	5.5
Total	197,110	441.3	184,871	292.8
Reexports:				
Belgium-Luxembourg	[1]1,973,297	142.0	[1]1,368,040	108.0
France	4,315	5.2	4,537	3.3
Hong Kong	55,118	44.9	112,431	54.8
India	323,785	7.2	370,863	7.2
Israel	386,840	79.3	338,034	66.7
Japan	79,813	19.5	77,687	26.8
Netherlands	41,324	3.2	27,824	4.6
Switzerland	28,182	58.5	43,727	39.3
United Kingdom	43,719	39.1	69,113	25.2
Other	81,484	13.9	85,922	9.8
Total	3,017,877	412.8	2,498,178	345.7

[1]Artificially inflated in 1981 by auction of 1,477,365 carats of U.S. Government stockpile industrial diamond stones with subsequent reexport as gem stones to Belgium-Luxembourg. In 1982, approximately 1.2 million carats were similarly auctioned and reexported to Belgium-Luxembourg.

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

Kind and country	1981		1982	
	Quantity (carats)	Value (millions)	Quantity (carats)	Value (millions)
Rough or uncut, natural:[1]				
Belgium-Luxembourg	r28,237	$12.2	77,117	$25.3
Central African Republic	19,869	2.2	7,860	.5
Guinea	--	--	37,168	4.0
Israel	21,609	6.7	25,123	4.9
Liberia	r3,798	r3.2	4,407	4.7
Netherlands	--	--	6,581	4.4
Sierra Leone	37,872	23.3	1,953	.6
South Africa, Republic of	r656,444	282.5	579,815	199.8
Switzerland	r7,966	r4.2	6,955	6.8
United Kingdom	r80,236	56.9	77,818	19.3
Venezuela	67,351	6.0	38,156	2.8
Other	r11,726	r7.2	27,767	3.5
Total	r935,108	r404.4	890,720	276.6

See footnotes at end of table.

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

Kind and country	1981 Quantity (carats)	1981 Value (millions)	1982 Quantity (carats)	1982 Value (millions)
Cut but unset, not over 0.5 carat:				
Belgium-Luxembourg	777,054	$319.9	954,156	$323.6
Hong Kong	19,370	10.0	27,196	11.0
India	1,120,122	246.0	1,229,187	271.4
Israel	958,153	383.3	832,168	315.4
South Africa, Republic of	45,150	27.9	49,611	24.2
Switzerland	29,660	13.8	44,734	15.4
United Kingdom	17,571	10.8	39,080	16.5
Other	68,851	25.5	87,427	30.4
Total	3,035,931	1,037.2	3,263,559	1,007.9
Cut but unset, over 0.5 carat:				
Belgium-Luxembourg	206,171	319.3	232,263	250.7
Hong Kong	5,899	26.2	9,177	28.4
India	11,409	6.3	27,299	7.6
Israel	138,107	146.7	111,084	95.7
Netherlands	8,288	16.0	12,322	16.5
South Africa, Republic of	26,463	48.2	36,045	51.7
Switzerland	18,688	125.6	14,539	91.8
United Kingdom	11,112	40.1	22,089	46.4
Other	11,927	31.4	15,717	44.3
Total	438,064	759.8	480,535	633.1

rRevised.
[1]Includes some natural advanced diamond.

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

Kind and country	1981 Quantity (carats)	1981 Value (millions)	1982 Quantity (carats)	1982 Value (millions)
Emerald:				
Belgium-Luxembourg	6,645	$3.2	5,392	$1.5
Brazil	48,977	5.8	328,976	5.7
Canada	18,788	1.2	10,351	.7
Colombia	121,708	40.2	116,272	37.6
France	9,759	2.2	12,963	2.9
Germany, Federal Republic of	41,795	4.6	19,167	2.2
Hong Kong	120,313	12.2	100,955	15.5
India	1,572,510	15.8	1,136,247	11.5
Israel	96,870	22.8	238,543	17.1
Pakistan	4,651	1.2	4,813	1.0
South Africa, Republic of	14,787	1.4	15,702	.4
Switzerland	49,721	1.1	76,377	14.5
Thailand	31,940	2.6	43,246	1.9
United Kingdom	7,097	4.6	18,442	3.9
Other	152,098	12.7	39,404	4.4
Total	2,297,659	131.6	2,166,850	120.8
Ruby:				
Austria	NA	.1	14,267	.2
Germany, Federal Republic of		3.1	35,994	1.3
Hong Kong		r9.1	203,379	9.1
India		4.7	303,205	4.7
Israel		.7	25,258	.7
Italy		.1	40,722	.1
Switzerland		12.0	45,876	16.4
Thailand		47.6	1,175,698	25.2
United Kingdom		4.7	47,395	3.6
Other		11.7	41,489	4.5
Total	NA	93.8	1,933,283	65.8

See footnotes at end of table.

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

Kind and country	1981 Quantity (carats)	1981 Value (millions)	1982 Quantity (carats)	1982 Value (millions)
Sapphire:				
Austria	NA	$.1	14,521	$0.2
Belgium		1.4	10,922	1.4
Canada		1.1	12,919	.4
France		2.2	11,036	1.8
Germany, Federal Republic of		2.4	40,381	1.6
Hong Kong		8.4	179,616	8.0
India		3.3	360,810	2.4
Israel		.6	41,597	.6
Sri Lanka		7.5	41,938	4.0
Switzerland		11.1	66,575	13.4
Thailand		34.8	1,749,651	22.3
United Kingdom		5.1	25,800	3.0
Other		5.0	25,184	4.2
Total	NA	83.0	2,580,950	63.3
Other:				
Rough, uncut:				
Australia	NA	1.2	NA	.9
Brazil		3.2		4.4
Colombia		2.2		3.4
South Africa, Republic of		1.6		.9
Switzerland		.7		2.9
Zambia		2.5		.9
Other		6.3		6.3
Total	NA	17.7	NA	19.7
Cut, set and unset:				
Brazil	NA	r37.1	NA	15.7
China		3.6		1.6
Germany, Federal Republic of		r11.6		10.0
Hong Kong		r22.8		19.7
India		r4.0		3.7
Japan		96.6		84.7
Switzerland		r3.7		3.4
Taiwan		r3.5		1.1
Thailand		r2.9		2.2
Other		14.3		16.8
Total	NA	r200.1	NA	158.9

rRevised. NA Not available.

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

(Million dollars)

Country	1981	1982
Synthetic, cut but unset:		
Austria	r1.8	1.0
France	1.2	1.3
Germany, Federal Republic of	r5.9	5.9
Korea, Republic of	8.2	11.1
Switzerland	r3.2	3.0
Other	r3.3	1.9
Total	r23.6	24.2
Imitation:		
Austria	7.7	7.2
Czechoslovakia	r.9	.8
Germany, Federal Republic of	r3.9	3.0
Other	r2.8	2.4
Total	r15.3	13.4

rRevised.

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

(Thousand carats and thousand dollars)

Stones	1981		1982	
	Quantity	Value	Quantity	Value
Diamonds:				
Rough or uncut[1]	935	404,354	891	276,577
Cut but unset	3,474	1,796,908	3,745	1,641,035
Emeralds: Cut but unset	2,298	131,560	2,167	120,809
Coral: Cut but unset, and cameos suitable for use in jewelry	NA	3,630	NA	2,804
Rubies and sapphires: Cut but unset	NA	176,758	4,514	129,794
Marcasites	NA	498	NA	38
Pearls:				
Natural	NA	2,008	NA	3,003
Cultured	NA	105,942	NA	92,741
Imitation	NA	1,966	NA	1,458
Other precious and semiprecious stones:				
Rough, uncut	NA	17,697	NA	19,769
Cut, set and unset	NA	r87,990	NA	58,842
Synthetic:				
Cut but unset[2]	28,846	22,646	26,703	23,238
Other	NA	961	NA	896
Imitation gem stones	NA	13,332	NA	13,448
Total	XX	2,766,250	XX	2,384,452

rRevised. NA Not available. XX Not applicable.

[1]Includes 1,823 carats of other natural diamond, advanced, valued at $1.26 million in 1981, and 4,985 carats valued at $837,000 in 1982.

[2]Quantity in thousands of stones.

WORLD REVIEW

Angola.—In Angola, Companhia de Diamantes de Angola (Diamang) became the operating arm of the state-owned National Diamond Enterprise (Endiama). Endiama has the exclusive right to prospect, explore, and trade in Angolan diamonds. The Diamond Trading Co., owned by Anglo American Corp. of South Africa Ltd. and De Beers of the Republic of South Africa, provided essential managerial, technical, and marketing services, and owned a 2% interest in Diamang. Diamang was making significant progress in revitalizing Angola's diamond industry, the second most important mineral industry, following petroleum.[2]

Australia.—On November 1, 1982, Ashton Joint Venture (AJV) was restructured into two new joint ventures—Argyle Diamond Mines Joint Venture, with responsibility for the development, mining, and management of AJV's diamond interest in the Argyle and Ellendale areas of Western Australia, and Ashton Exploration Joint Venture, covering all exploration and evaluation activities in the remainder of the existing AJV area of diamond exploration in the Kimberley region.

Six small shafts on the kimberlite pipe AK-1 were completed in late 1982 to an average depth of 51 meters. Diamond recovery of 16 carats per metric ton from these shaft samples was much higher than cumulative averages to date. Total cumulative totals of bulk testing of the kimberlite pipe AK-1 gave a recovery of 408,392 carats from 62,846 tons, an average of 6.5 carats per ton. Testing of 120,650 tons of alluvial ore resulted in the recovery of 401,985 carats, an average of 3.33 carats per ton. Based on this information, diamond reserves were estimated to be about 500 million carats.[3]

AJV estimated that the average diamond quality from the AK-1 pipe comprised 5% gem, 25% cheap gem, and 70% industrial, with a total average value of $6.50 per carat. Average diamond quality for the alluvials comprised 10% gem, 35% cheap gem, and 55% industrial, with a total average value of $11.00 per carat.[4]

A 34.5-kilometer water supply pipeline from Lake Argyle was completed in November 1982 for the commercial alluvial operation and the large-scale kimberlite treatment plant. Work was continuing to double the capacity of the Argyle alluvial treatment plant to 4,000 tons per day by early 1983. This project will expand Argyle's diamond production capability to about 5 million carats per year. After the State government of Western Australia approved the

mining and marketing proposals on December 21, 1982, commercial production of diamonds from the Upper Smoke Creek alluvial deposit was initiated at yearend.[5]

In the last 15 years, Australian production of opals and sapphires increased to over $66 million in value in 1982, with the principal production coming from small syndicate operations and individual producers. Precious opal mining came from long-established fields at Coober Pedy and Andamooka in South Australia, at Lightning Ridge and White Cliffs in New South Wales, and from smaller fields in Queensland.

Australia has become the major world supplier of rough gem-quality sapphires. The industry is centered in the placer gravels of the Glen Innes-Inverell district and in Queensland in the Anakie district.[6]

Belgium.—Antwerp's diamond industry had increased exports despite major price instability in the last few years, but local employment in diamond cutting had decreased sharply, principally because of increased competition from India and the U.S.S.R. The U.S.S.R. had become the largest source of imports of polished goods for Antwerp dealers, some of which were reexported to the United States. Antwerp was expected to remain a world center for trading, grading, and cutting by virtue of its skilled labor force and favorable business climate. Diamond exports in 1982 increased in value 0.7% to $3.1 billion, with the United States receiving $832 million, or 35%, of the total value.[7]

Botswana.—Botswana's diamond production was rapidly approaching that of the Republic of South Africa, with 7.8 million carats in 1982 compared with South African production of 9.2 million carats, and showed possibilities of becoming the leading producer of gem diamonds in the world. Botswana started its Jwaneng Mine in June, the third major diamond mine developed in recent years. Jwaneng produced about 2.6 million carats of medium-quality diamonds in 1982, and the yield was expected to reach 4.5 million carats by 1985. The other two mines, Orapa with a production of 4.5 million carats per year and Letlhakane with a production of 0.5 million carats per year, were operated by Debswana, a joint venture by De Beers and the Botswana Government. All diamond production was sold to the Central Selling Organization (CSO).[8]

Brazil.—Société d'Enterprise et d'Investissements S.A. (Sibeka), the Belgium-based diamond producer, was prospecting for diamonds in Brazil through its subsidiary, Sibinter, which had an 8.5% interest in Dinamin CA. Dinamin was carrying out an extensive drilling and dredging program over an area south of the Orinoco River.[9]

Central African Republic.—The Central African Republic's only active mining industry was gem diamond. In 1981, the International Development Association approved a $4 million technical assistance project for the Central African Republic, part of which included a study of the diamond sector. Central African diamond production decreased 10% in 1982 to about 277,000 carats, and remained far below the 1972 high of 524,000 carats.[10]

China.—A diamond weighing 96.94 carats was found in 1982 at the Chenjiafu diamond placer mine near Tancheng in Shandong Province. It was the third largest diamond found in the mining area, and followed finds of 159 carats in 1979 and 124 carats in 1981. The diamonds may come from deposits in the nearby Yi-Meg Mountain Range.[11]

Although several diamond mining areas have been reported in China, Changte in north Hunan Province is the only one confirmed. Changte has been known since 1955, and the recovery grade of the mine is about 0.25 carat per ton. Provinces where diamond deposits, individual stones, or kimberlite pipes have been discovered include Liaoning, Shandong, Guangxi, Guizhou, and Xizang. The Changte Mine produced principally industrial stones; production had been initiated in the early 1970's. China's diamond production was estimated to have been 15,000 carats in 1976, and by 1980, output had increased to 1.8 to 2.8 million carats, with about 20% gem-quality.

A diamond cutting industry has operated in Shanghai for about 50 years. A new diamond cutting plant was established in Beijing in 1981, financed by a Federal Republic of Germany company that previously had a marketing outlet for Chinese gold and silver jewelry. The new plant capacity was estimated at 60,000 carats per year of principally small stones. The first Chinese cut gem diamonds were introduced to the London market in 1980, and were pronounced of high-quality cut.[12]

Colombia.—Colombia, previous supplier of 90% of the world's high-quality emeralds, was facing strong competition from stones from Brazil, Zimbabwe, Mozambique, Tanzania, and especially Zambia. At yearend 1982, the median price of Zambian emeralds

was almost the same as Colombian emeralds. However, the Bogota prices remained high, and because of their exceptional color and reputation, Colombian emeralds continued to dominate the market for investment gems.[13]

Ghana.—India contracted in 1982 to market Ghana's diamond production of over 800,000 carats per year. The Ghanaian Government had also asked the Indian Government to participate in a joint venture for diamond mining in Ghana.[14]

Guinea.—The Guinean $85 million joint venture, Société Mixte Aredor-Guinea, received at yearend 1982 a 7-year bank credit of $43 million as part of a $60 million financing package to develop and exploit diamond and gold deposits in the Baule Basin. Aredor-Guinea was a joint venture of Guinea, 50%; Bridge Oil Ltd. of Australia, 45%; Industrial Diamond Co., of London, 2.5%; and Simonius Vischer of Basel, Switzerland, 2.5%. The alluvial project was scheduled to come onstream in 1984 and was to mine 400,000 cubic meters of diamond-bearing gravels annually, with reserves sufficient for 15 years of operation. Exploration testing had indicated recovery of 20 carats per 100 tons, 80% gem quality, and average diamond value of $170 per carat. Guinea was the only African nation to sell its diamonds independently of the CSO.[15]

India.—The Geological Survey of India (GSI) explored the Ramkheria alluvial deposit adjacent to the famous Panna diamond district of India, and estimated the diamond reserves to be over 200,000 carats with a grade of 10 carats per 100 tons. GSI was also exploring many other diamond prospects including the famous Golconda Mines in Andhra Pradesh.

Emerald production in India's Rajasthan State was on the decline with only 6,600 carats produced in 1980 compared with 38,000 carats in 1975. Gem-quality garnet, agate, and jasper were also produced in Rajasthan, while Maharashtra State produced 80% of India's corundum and sapphire.[16]

The Indian Government continued to promote its diamond cutting and polishing industry to improve its export earnings, with over 200,000 artisans specializing in cutting small, inexpensive stones. Exports for the 1981-82 year were about $800 million, only a slight improvement over 1978-79. To ensure a long-term source of small gem diamond, India's Metals and Minerals Trading Corp. had offered to play a major role in the marketing of Ashton Joint Venture diamond production from Western Australia.[17]

Israel.—In September and October 1982, Israel's diamond imports increased considerably over the corresponding months in 1981, indicating that dealers were beginning to replenish their inventories that had depleted over the previous 2 years. For January and February 1983, exports of finished goods were $181 million, an 8% increase compared with that of the corresponding period of 1982.[18]

Ivory Coast.—Diamond mining in the Tortiya area had ceased in 1980, and prospecting programs were the major mining activity in the Ivory Coast. A diamond deposit was discovered in 1982 in the Tortiya area, 440 kilometers northwest of Abidjan. A Canadian company was contracted to follow up this initial discovery under the supervision of the state company, Société pour le Development Minier de la Cote d'Ivoire.[19]

Lesotho.—During May 1982, the Lesotho Government and De Beers agreed that the Letseng-la-Terai diamond mine was no longer economic, and the mine was closed. Stockpiled ore was treated through October 1982, and final cleanup operations were finished by yearend. Average recovery for 1982 was 2.95 carats per 100 tons.[20]

Liberia.—Exports of Liberian diamonds were valued at $23 million in 1981. About 75% of these exports were believed to originate from Guinea and Sierra Leone. Liberia exported diamonds to four countries in 1981: The United Kingdom (48%), Belgium (29%), the United States (21%), and Israel (2%).[21]

Namibia.—Production at De Beer's Consolidated Diamond Mines (Pty.) Ltd. beach-placer diamond mine at Oranjemund was reduced early in 1982 to achieve further economies because of the soft diamond market. This resulted in 19% less diamond production for 1982. Ten million tons of ore was treated during the year, with an average recovery of 10.13 carats per 100 tons. Ninety-five percent of the production was of gem quality.[22]

Pakistan.—The Pakistan Investment Promotion Bureau project for cutting, processing, finishing, and polishing diamond and precious stones, to be established in Karachi, was delayed for lack of approval and financing. This plan was reportedly similar to the plan of the Government of

India, which has been so successful.[23]

Three new emerald deposits were discovered by the country's Gemstone Corp., at Charbagh, Makad, and Gujar Killi in Swat.[24]

Sierra Leone.—Diamond production in Sierra Leone had consistently accounted for over one-half of its export earnings in recent years. The National Diamond Mining Co. (DIMINCO) was forced to layoff over 1,800 employees in 1982. The country's diamond production in 1982 was less than 300,000 carats, a decrease of about 5% from 1981 totals. Production had previously peaked at nearly 2 million carats in 1969. Production from the Alluvial Diamond Mining Scheme accounted for most of the shortfall and is expected to diminish further as alluvial deposits are depleted.[25]

DIMINCO had developed a $100 million project for the underground mining of a kimberlite pipe at Kono and negotiated during 1982 for international funding.[26]

South Africa, Republic of.—De Beer's CSO reported that diamond sales were higher in the second half of 1982 compared with the previous two half-years, reflecting a significant improvement in the demand for small sizes and cheaper qualities. Retail sales of diamond jewelry in 1982 was only 3% lower than in 1981, a record year. Despite all of De Beer's economy measures and cutbacks during 1982, its diamond stocks remained high at a value of $1.7 billion.

Operations at the De Beer's Koffiefontein Mine, a producer of high-quality diamonds, was suspended in June 1982, but its Finsch Mine, which produced smaller and lower quality stones, was restored to full capacity. Production at the Premier Mine increased 21% as a result of improved grade and recovery brought about by better mining and metallurgical controls. In Namaqualand, the Tweepad plant closed in mid-1981 and was reopened in September 1982; and the Annex Kleinzee plant was temporarily closed, resulting in an overall reduction of 22% in the Namaqualand Div. output. Active exploration continued during the year, with the sampling of the kimberlite pipes on the farm Venetia, and the testing of gravel along the north bank of the Orange River.[27]

Tanzania.—Diamond production in Tanzania comprised 99% of the country's value of mineral production, and 88% of mineral export revenues. Diamond production came from kimberlite and its associated alluvial deposits in the Shinyanga region. Williamson Diamonds Ltd. and Alamasi Ltd. operated two mines in the area.[28]

Thailand.—Thailand customs estimated that total gem export value in 1981 was over $220 million, principally sapphires and rubies. Over 200,000 miners, cutters, and polishers were employed in the country.[29]

U.S.S.R.—Diamond, after fossil fuels and precious metals, was one of the significant foreign-exchange-earning exports of the Soviet Union. Diamonds were cut in centers at Leningrad, Sverdlovsk, and Smolensk. A principal market was Antwerp, through a Soviet-Belgium diamond export organization, Almazyuvelierexport. Operating mines in Yakutia included the Mirnyy open pit with five concentrators, the Aykhal open pit and concentrator, the Udachnaya placer mine and concentrator, and the Irelyakh placer mine with two dredges. A small production came from the Vishera River region in Perm Oblast', where four dredges and two separation plants were operated at two deposits.[30]

Venezuela.—The Venezuelan Ministry of Energy and Mines enacted a new law during 1982 to improve mining techniques of small miners because an estimated 65% of their diamond production was smuggled out of the country.[31]

Sibeka, through its subsidiary, Sibinter, continued to prospect by drilling and dredging during the year in the large area south of the Orinoco.[32]

Zaire.—Zaire's state-owned Société Minière de Bakwanga (Miba) diamond mine produced about 6 million carats in 1982, valued at about $45 million. About 70% of this output was industrial-quality crushing bort, 25% was for cheap gem or high-quality industrial use such as setting stones, and the remaining 5% was gem stones. An estimated additional 6 million carats was produced by numerous small alluvial operators and illicit miners in the Tshikapa area. This artisanal production was supposed to have been sold to authorized buyers in Kinshasa. Instead, most of it was smuggled into the neighboring Congo and sold in Bujumbura, Brazzaville, and Europe. Congo has no diamond production of its own, but is a sizable exporter of gem-quality goods. Despite efforts of the Zairean Government to set up purchasing offices in several parts of the country in 1982 and to pay for the diamonds at black market exchange rates, the project was only marginally successful and may not continue. At yearend, the Zairean Depart-

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

(Thousand carats)

Country	1978			1979			1980			1981[p]			1982[e]		
	Gem	Industrial	Total	Gem	Industrial	Total	Gem	Industrial	Total	Gem	Industrial	Total	Gem	Industrial	Total
Angola	488	162	650	630	211	841	1,110	370	1,480	1,050	350	1,400	1,000	400	1,400
Australia	--	--	--	--	--	--	--	48	48	21	184	205	70	487	[2]557
Botswana	420	2,379	2,799	659	3,735	4,394	765	4,336	5,101	744	4,217	4,961	1,165	6,604	[2]7,769
Brazil[3]	236	384	620	236	384	620	253	414	667	163	926	1,089	175	975	1,150
Central African Republic	199	85	284	205	110	315	227	115	342	209	103	312	186	91	[2]277
China[e]	NA	NA	NA	NA	NA	NA	360	1,440	1,800	380	1,520	1,900	400	1,600	2,000
Ghana	142	1,281	1,423	125	1,128	1,253	126	1,132	1,258	85	751	836	68	612	[2]680
Guinea[e]	25	55	80	27	58	85	12	26	38	12	26	38	13	27	40
Guyana	7	10	17	6	10	16	4	6	10	4	6	10	5	6	[2]11
India	14	2	16	14	2	16	12	2	14	14	2	16	12	2	14
Indonesia[e]	3	12	15	3	12	15	3	12	15	3	12	15	3	12	15
Ivory Coast	22	23	45	24	24	48	--	--	--	--	--	--	--	--	--
Lesotho	62	5	67	48	4	52	50	4	54	49	4	53	39	3	[2]42
Liberia	128	180	308	170	132	302	123	175	298	132	204	336	170	263	[2]433
Namibia	1,803	95	1,898	1,570	83	1,653	1,482	78	1,560	1,186	62	1,248	963	51	[2]1,014
Sierra Leone	353	426	779	[r]434	[r]451	[r]885	317	275	592	208	97	305	[2]203	[2]87	[2]290
South Africa, Republic of:															
Finsch Mine	403	2,227	2,630	465	2,120	2,585	465	2,442	2,907	1,002	3,463	4,465	847	3,003	3,850
Premier Mine	380	1,603	1,983	468	1,613	2,081	407	1,632	2,039	510	1,530	2,040	615	1,845	2,460
Other De Beers properties[4]	1,254	1,395	2,649	1,850	1,370	3,220	1,550	1,489	3,039	1,603	1,069	2,672	1,359	906	2,265
Other	320	145	465	403	95	498	390	145	535	314	35	349	521	58	579
Total	2,357	5,370	7,727	3,186	5,198	8,384	2,812	5,708	8,520	3,429	6,097	9,526	3,342	5,812	[2]9,154
Tanzania	141	141	282	157	157	314	137	137	274	110	107	217	100	120	220
U.S.S.R.[e]	2,150	8,400	10,550	2,200	8,500	10,700	2,250	8,600	10,850	2,100	8,500	10,600	2,100	8,500	10,600
Venezuela	271	549	820	247	556	803	238	483	721	102	388	490	100	400	500
Zaire	640	10,603	11,243	294	8,440	8,734	345	9,890	10,235	450	8,550	9,000	450	8,550	9,000
World total	9,461	30,162	39,623	[r]10,235	[r]29,195	[r]39,430	10,626	33,251	43,877	10,451	32,106	42,557	10,564	34,602	45,166

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through June 3, 1983. 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 diamond and industrial diamond are Bureau of Mines estimates in the case of every country except Australia (1980-82), Central African Republic (1978-81), Liberia (1978-82), Sierra Leone (1978-82), the Republic of South Africa (1978-79), and Venezuela (1978-81), 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]Reported figure.

[3]Figures represent officially reported output plus official Brazilian estimates of output by nonreporting mines; officially reported output was as follows, in thousand carats: 1978—86, 1979—83, 1980—158, 1981-136.

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

ment of Mines and Energy had established a list of approved private buyers of artisanally mined diamonds. These buyers will compete legally with the state marketing agency, Sozacom, which also has a diamond buying and marketing operation.[33] Miba had suffered declining grade and production of its alluvial deposits since 1961 and had been seeking a $40 million loan from the International Finance Corp. for the mining of its Massif I kimberlite pipe near Mbuji Mayi, with no progress at yearend 1982. Despite this, preparations continued for development of the new mine with increased capacity and modernization of its treatment plant.[34] Of the world's 15 largest diamond pipes, Zaire has two: Talala, covering 40 hectares, and Massif I, 18.6 hectares.

Zairean announcements during 1982 indicated satisfaction with its break in 1981 with CSO for the marketing of its Miba diamond production. Five-year contracts were signed with three buying concerns, Caddi Sprl and Glasol NV of Antwerp, Belgium, and Industrial Diamond Co. of London, England. Despite this apparent success, the Zairean Government announced on March 7, 1983, that it was once again returning to the CSO, and gave CSO exclusive purchase rights for Miba's diamond production with a floor price of $8.55 per carat. The prior system of three designated buyers was determined not to be as profitable to the Government as the new CSO arrangement was expected to be with a guaranteed minimum price.[35]

Zambia.—Extensive illegal mining of emerald occurred in Zambia during 1982. Estimated total value of emerald production for the year was $100 million. International Development and Construction Co. of Saudi Arabia and the Reserved Minerals Corp. of Zambia formed a joint venture for mining of emeralds in Zambia.[36]

TECHNOLOGY

Two methods were announced during 1982 to mark valuable gem diamonds with invisible identification marks. General Electric Co. developed an ion implanter to bombard the surface of a stone with a brand or secret pattern for use in positive identification.[37]

The Gemological Institute of America announced the development of a machine to inscribe an identification on the girdle of a stone using a laser device. The inscription will only be visible under 10-power magnification or better.[38]

---

[1]Physical scientist, Division of Industrial Minerals.

[2]Mining Journal (London). Mining Annual Review—1982. June 1982, p. 428.

———. Company News/Comment. Sibeka Annual Report, 1981. V. 299, No. 7665, July 16, 1982, p. 53.

[3]CRA Ltd. Third Quarter 1982 Press Release. Melbourne, Victoria, Australia, Oct. 29, 1983.

———. Fourth Quarter 1982 Press Release. Melbourne, Victoria, Australia, Jan. 27, 1983.

[4]Mining Journal (London). Ashton Evaluation Nears Completion. V. 299, No. 7683, Nov. 19, 1982, p. 257.

[5]Second work cited in footnote 3.

[6]Page 370 of first work cited in footnote 2.

[7]U.S. Embassy, Antwerp, Belgium. State Department Telegram 3, Jan. 5, 1983.

[8]Industrial Minerals (London). World of Minerals. Botswana. A Third Diamond Mine Is Opened. No. 181, October 1982, p. 9.

[9]Second work cited in footnote 2.

[10]Page 447 of first work cited in footnote 2.

[11]Industrial Minerals (London). Company News and Mineral Notes. No. 186, March 1983, p. 64.

[12]Hawkins, B. Diamonds in the People's Republic of China. Minerals Bureau, Department of Mineral and Energy Affairs, Republic of South Africa. Rept. No. 1/82, Project No. 820202, July 1982, 17 pp.

[13]Engineering and Mining Journal. V. 183, No. 9, September 1982, p. 234.

[14]Industrial Minerals (London). Company News and Mineral Notes, No. 181, October 1982, p. 62.

[15]Mining Journal (London). Guinea Diamond Venture Underway. V. 299, No. 7669, Aug. 13, 1982, p. 108.

Industrial Minerals (London). Diamonds in Guinea—First Stage Finances Take Shape. V. 187, April 1983, p. 53.

[16]Eswar, N. V. The Indian Mining Industry. World Min., v. 35, No. 6, June 1982, p. 62.

[17]Industrial Minerals (London). World of Minerals. No. 177, June 1982, p. 9.

Mining Journal (London). V. 299, No. 7663, July 2, 1982, p. 13.

[18]U.S. Embassy, Tel Aviv, Israel. State Department Telegram 3768, Mar. 18, 1983.

[19]Engineering and Mining Journal. V. 183, No. 10, October 1982, p. 235.

[20]De Beers Consolidated Mines Ltd. Annual Report 1982. P. 27.

[21]U.S. Embassy, Monrovia, Liberia. State Department Airgram A-03, Jan. 28, 1983.

[22]Pages 24-26 of work cited in footnote 20.

[23]Industrial Minerals (London). Company News and Mineral Notes. No. 178, July 1982, p. 55.

[24]———. Company News and Mineral Notes. No. 184, January 1983, p. 44.

[25]U.S. Embassy, Freetown, Sierra Leone. State Department Airgram A-01, Jan. 28, 1983. pp. 4-5.

[26]Industrial Minerals (London). Company News and Mineral Notes. No. 179, August 1982, p. 65.

[27]Pages 3 and 5 of work cited in footnote 20.

[28]U.S. Embassy, Dar Es Salaam, Tanzania. State Department Telegram 6556, Oct. 19, 1982, p. 1.

[29]World Mining. V. 35, No. 10, October 1982, p. 168.

[30]Page 500 of first work cited in footnote 2.

[31]World Mining. V. 35., No. 12, December 1982, p. 82.

[32]Second work cited in footnote 2.

[33]Mining Journal (London). V. 300, No. 7699, March 11, 1983, pp. 157-158.

U.S. Embassy, Kinshasa, Zaire. State Department Telegram 14615, Dec. 23, 1982, Sec. 1, p. 1.

[34]Second work cited in footnote 2.

[35]U.S. Embassy, Kinshasa, Zaire. State Department Telegram 2915, Mar. 9, 1983, pp. 1-2.

[36]U.S. Embassy, Lusaka, Zambia. State Department Airgram A-002, Aug. 15, 1982.

Industrial Mineral (London). Company News and Mineral Notes. No. 183, December 1982, p. 83.

[37]Wall Street Journal. V. 199, No. 34, Feb. 19, 1982, p. 12.

[38]Jewelers' Circular-Keystone. V. 153, No. 11, October 1982, p. 45.