Gem Stones

By Robert G. Clarke [1]

Domestic gem stone production was estimated at $2.4 million in 1970, unchanged from that of 1969. Gem stone collection continued to be principally a recreational activity of individual collectors and hobbyists at free or fee sites. Only a few deposits were operated to produce rough material for direct sale to wholesale or retail outlets or for raw material to manufacture finished jewelry by the deposit operators.

DOMESTIC PRODUCTION

Gem stone production was reported from 38 States. The following States led in production and accounted for 78 percent of the total: Oregon, $750,000; California, $200,000; Arizona, $155,000; Texas, $150,000; Washington, $150,000; Wyoming, $130,000; Colorado, $120,000; Montana, $109,000; and Nevada, $100,000.

Many States publish brochures describing their major occurrences of gem stones and minerals, including maps and instructions on how to reach the deposits. The brochures are free and usually may be obtained from the individual State Department of Economic Development, or from the State Geologist.

Reports of activities in gem collecting included all varieties of precious and semiprecious stones. In Louisiana, an 18.20 carat diamond was found in Princeton, in a yard, by a little girl at play.[2] It was named the LaMounce diamond for Louisiana (La), and Mr. Mounce, the jeweler who purchased it. It has since been cut into three fine gems by Lazare Kaplan and Sons of New York City; an oval, a marquise, and a heart shape.

In South Dakota, the Cheyenne River Agency of the South Dakota Sioux operated a quarry near Rapid City for alabaster which was handcrafted at the Sioux Stone Craft Co.[3] Third year sales exceeded the total of the first 2 years combined. Many accounts of interesting field trips resulting in mineral and gem stone finds were related in journals for enthusiasts.[4 5] Many clubs and societies reported on the activities of their members.

CONSUMPTION

The output of domestic gem stones generally went to rock, mineral, and gem stone collections, objects of art, and jewelry. Apparent consumption of gem stones (domestic production plus imports minus exports and reexports) declined to $292 million, compared with $343 million in 1969 because of greater exports and reexports of diamonds.

PRICES

During the year, price ranges for cut and polished, unmounted gem diamond were as follows: 0.25 carat, $100 to $425; 0.50 carat, $275 to $900; 1 carat, $700 to $2,800; 2 carats, $2,000 to $9,500; and 3 carats, $4,000 to $20,000. The median price for each range was 0.25 carat, $200; 0.5 carat, $500; 1 carat, $1,550; 2 carats, $4,100; and 3 carats, $8,500.

[1] Physical scientist, Division of Nonmetallic Minerals.

[2] Lapidary Journal. Diamond Found in Louisiana. V. 24, No. 8, November 1970, p. 1122.

[3] Lapidary Journal. Stone Age Provides New Business for Sioux. V. 24, No. 7, October 1970, p. 925.

[4] Gems and Minerals. News Notes of Collecting Areas. No. 388, January 1970–No. 399, December 1970.

[5] Rocks and Minerals. Mineral Localities Information Department. V. 45, No. 1, January 1970–V. 45, No. 12, December 1970.

FOREIGN TRADE

United States exports of diamond in 1970, on which some work was done prior to reexport, amounted to 391,599 carats valued at $116.6 million. Of this total, diamonds, cut but unset, suitable for gem stones, not classified by weight, were 93,937 carats valued at $5.3 million; cut but unset, suitable for gem stones, not over ½ carat, were 49,297 carats valued at $5.4 million; and, cut but unset, suitable for gem stones, over ½ carat, were 248,365 carats valued at $105.9 million.

Reexports of diamond in 1970, on which no work was done, amounted to 1,258,146 carats valued at $67.8 million in the following categories: Cut but unset, suitable for gem stones, not classified by weight, 1,213,958 carats valued at $58.5 million; cut but unset, suitable for gem stones, not over ½ carat, 28,704 carats valued at $4.4 million; cut but unset, suitable for gem stones, over ½ carat, 15,484 carats valued at $4,920,588.

Exports and reexports of all other gem materials amounted to $12.4 million. Of this total, natural precious and semiprecious stones, worked or unworked, not set or strung, were valued at $11.1 million. Exports and reexports of pearls, natural and cultured, not set or strung, were valued at $0.9 million. Synthetic or reconstructed precious or semiprecious stones, not set or strung, exports and reexports, were valued at $0.4 million.

Imports of gem material decreased 14 percent in value compared with that of 1969. Gem diamonds accounted for 87 percent of the total value of imports.

Imports of emeralds decreased 16 percent in value, but increased 6 percent in quantity. Of 24 countries supplying emeralds to the United States, India furnished 215,664 carats valued at $2.8 million; Brazil, 33,565 carats valued at $0.6 million; and Colombia, 17,419 carats valued at $1.5 million. These three countries furnished 82 percent of the quantity (in carats) and 64 percent of the value of emeralds. Imports of emeralds from Switzerland amounted to 14,224 carats valued at $1.2 million, but the actual country of origin is unknown.

Imports of rubies and sapphires decreased 37 percent in value from 29 countries. Four countries accounted for 76 percent of the value of rubies and sapphires as follows: Thailand, $2.3 million; India, $0.9 million; Ceylon, $0.7 million; and Hong Kong, $0.5 million. The value of imported natural and cultured pearls decreased 22 and 17 percent, respectively; the value of imported imitation pearls increased 122 percent.

Table 1.—U.S. imports for consumption of precious and semiprecious gem stones

(Thousand carats and thousand dollars)

Stones	1969		1970	
	Quantity	Value	Quantity	Value
Diamonds:				
Rough or uncut—carats	2,932	$287,566	2,633	$234,164
Cut but unset—do	1,758	217,081	1,642	190,733
Emeralds: Cut but unset—do	309	9,175	326	7,715
Rubies and sapphires: Cut but unset	NA	9,201	NA	5,769
Marcasites	NA	6	NA	4
Pearls:				
Natural	NA	475	NA	371
Cultured	NA	12,238	NA	10,184
Imitation	NA	672	NA	1,493
Other precious and semiprecious stones:				
Rough and uncut	NA	4,847	NA	10,001
Cut but unset	NA	12,799	NA	12,034
Other, n.s.p.f	NA	559	NA	590
Synthetic:				
Cut but unset—number	4,886	2,793	7,333	4,363
Other	NA	282	NA	526
Imitation gem stones	NA	8,999	NA	8,096
Total	NA	566,693	NA	486,043

NA Not available.

Table 2.—U.S. imports for consumption of diamond (exclusive of industrial diamond), by countries

(Thousand carats and thousand dollars)

Country	1968				1969				1970			
	Rough or uncut		Cut but unset		Rough or uncut		Cut but unset		Rough or uncut		Cut but unset	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Belgium-Luxembourg	46	$7,455	954	$119,396	59	$6,729	916	$113,114	64	$6,572	863	$103,705
Brazil	10	594	(1)	8	29	1,033	1	58	31	1,184	1	80
Canada	9	1,256	5	205	8	1,307	(1)	54	2	462	1	60
Central African Republic	218	11,818	1	61	232	9,806			165	5,826		
France	22	1,004	22	2,514	10	379	20	2,484	4	195	27	2,550
Germany, West	(1)	2	5	556	1	13	5	507	2	117	4	516
Guyana	14	830	(1)	5	20	1,020			26	1,074	(1)	19
India			30	2,714			30	2,663			40	3,475
Israel	50	5,245	666	70,217	36	4,155	658	73,777	52	6,723	604	61,753
Japan	(1)	52	1	100	(1)	5	1	71	(1)	20	(1)	18
Liberia	7	1,898			13	2,976			6	1,893		
Netherlands	46	9,953	19	3,073	48	12,810	27	3,561	23	7,886	13	1,899
Sierra Leone	61	1,892	9	1,310	224	8,331	10	1,447			6	814
South Africa, Republic of	434	46,380	35	9,076	361	41,585	28	8,713	593	54,571	26	6,868
Switzerland	20	2,039	4	785	6	1,043	3	919	4	354	1	262
U.S.S.R.			63	9,588			43	6,629			44	6,826
United Kingdom	1,439	152,881	17	2,239	1,697	185,278	9	1,496	1,432	140,243	6	970
Venezuela	95	3,468			157	5,439			223	6,333		
Western Africa, n.e.c.	36	5,614	(1)	5	27	5,210			1	366		
Other countries	7	272	3	626	4	447	7	1,588	5	345	6	918
Total	2,514	252,653	1,834	222,478	2,932	287,566	1,758	217,081	2,633	234,164	1,642	190,733

[1] Less than ½ unit.

WORLD REVIEW

Angola.—Diamond exports amounted to 2,239,912 carats, compared with 1,980,394 carats in 1969. The number of exploration projects increased tremendously because most of the area previously held exclusively for Companhia de Diamantes de Angola (DIAMANG) has been released, particularly at sites near Luanda and Gabela.

Australia.—A large kimberlite intrusion was located by a team working for Stellar Mining Co. in the Kimberley district of Western Australia, where gems have been discovered in prior years.[6]

Botswana.—Work at the Orapa pipe, covering 276 acres, claimed to be the world's second largest, proceeded on schedule.[7] The indicated recovery ratio of industrial diamond to gem diamond was 90 to 10. First stage development was forecast for July 1971 at 7,250 metric tons per day to yield 2 million carats per year.

Brazil.—Dredging activity for diamond in the Rio Jequitinhonha was increased 50 percent by the transfer of a dredge formerly used for gold recovery in the Rio das Belhas by Mineração Tejucana S.A., of Minas Gerais. Geologists reportedly found diamond pipe or kimberley-like deposits of diamonds in Piauí State.[8] Opals in large quantities were also reported from Piauí State. Exact weight and value of gem production were unavailable, but the Federal Government of Brazil has set up a Gem Bank in Minas Gerais State to control the gem industry.

Central African Republic.—Diamond production fell 18 percent in value and 10 percent in volume from 1969. Most of the decrease was due to disagreements between mining companies and the Government. Also, in 1970 the Government passed a law forbidding anyone but native-born citizens from prospecting for diamonds or other precious stones.

Congo, Kinshasa.—In 1970 the total output of diamonds, both gem and industrial, was almost equal to that of 1969. However, the amount of gem diamonds (in carats) increased 256 percent. The increase in gem diamonds reflected a decrease in industrial diamonds, which alleviated slightly the Government's distress in light of the planned sales of U.S. surplus industrial diamond holdings. The Congo retained its world rank of number one for total natural diamonds produced.

India.—The National Mineral Development Corp. operated the nationalized diamond industry in the Panna district more vigorously, and also conducted prospecting operations at Angore, in the Chhatarpur district, and at Andhra Pradesh, in the Anantpur district.[9] India aimed to satisfy domestic diamond demand through domestic production. India imported rough diamonds purchased through the Central Selling Organization (CSO) and reexported finished gems.

Israel.—The decrease in general business activity in the United States in 1970 affected the two countries that import the greatest amount of rough diamonds and export the greatest amount of polished diamonds. Belgium ranked first and Israel ranked second, and both countries procured most of their rough diamonds through the CSO. At Tel Aviv, in the world's largest diamond exchange, daily transactions in 1970 were estimated at $60 million.[10]

Ivory Coast.—Diamond production in 1970 increased 5 percent over that of 1969. A new plant at Tortiya (south of Korogho) was started to treat low-grade ore. Improvements were also made at older plants at Seguela. The increase in production from all plants was estimated at 30 percent, and will be reflected in future reports. Output of diamonds from Ivory Coast is estimated to be 40 percent gem stones.

Kenya.—Gem stone production included amethyst, sapphire, ruby, garnet, tourmaline, aquamarine, and zircon. Indicated quantities and value were greater than in 1969.

Liberia.—Exports of rough diamonds were reported as 775,500 carats valued at $5.5 million. No distinction was made between gem diamonds and industrial diamonds, but according to a report by the Director of the Bureau of Natural Resources and Surveys of Liberia, most of the diamond output was not high quality.

[6] Mining & Mineral Engineering (London). V. 6, No. 12, December 1970, p. 53.
[7] Mining Magazine. Botswana Diamonds. V. 123, No. 6, December 1970, p. 473.
[8] Rolff, Almeida. Gem News From Brazil. Lapidary J., v. 24, No. 3, June 1970, pp. 514–516.
[9] Singh, D. V. A Review on Diamond and Its Beneficiation. J. Mines, Metals and Fuels, v. 18, No. 11, November 1970, pp. 399–406.
[10] Time. Israel, the Kindest Cut of All. V. 96, No. 7, Aug. 17, 1970, p. 62.

Table 3.—Diamond: World production, by countries [1]

(Thousand carats)

Country [2]	1968			1969			1970 [p]		
	Gem	Industrial	Total	Gem	Industrial	Total	Gem	Industrial	Total
Africa:									
Angola	1,316	351	1,667	1,617	404	2,021	1,917	479	2,396
Central African Republic	305	304	609	268	267	535	241	241	482
Congo (Kinshasa)	551	11,353	11,904	491	13,625	14,116	1,750	12,336	14,086
Ghana	245	2,202	2,447	239	2,152	2,391	252	2,271	2,523
Guinea [e]	21	49	70	22	50	72	22	52	[3] 74
Ivory Coast	77	110	187	81	121	202	85	128	213
Lesotho	2	10	12	5	24	29	4	13	17
Liberia [4]	537	212	749	562	184	746	[5] 620	[5] 206	[5] 826
Sierra Leone	560	962	1,522	736	1,253	1,989	[5] 723	[5] 1,232	[5] 1,955
South Africa, Republic of:									
Premier mine	[r] 608	1,824	2,432	631	1,891	2,522	669	2,008	[6] 2,677
Other De Beers Company [7]	[r] 2,313	1,892	4,205	2,457	2,010	4,467	[e] 2,511	[e] 2,054	[e] 4,565
Other	[r] 478	318	796	524	350	874	[e] 522	[e] 348	[e] 870
Total, South Africa, Republic of	[r] 3,399	4,034	7,433	3,612	4,251	7,863	3,702	4,410	8,112
South-West Africa, Territory of	1,636	86	1,722	1,923	101	2,024	[e] 2,100	[e] 100	[e] 2,200
Tanzania	356	346	702	394	383	777	359	349	708
Other areas:									
Brazil [e]	160	160	320	160	160	320	160	160	320
Guyana	28	38	66	21	31	52	24	37	61
India	7	2	9	10	2	12	[e] 10	[e] 2	[e] 12
Indonesia [e]	14	6	20	14	6	20	14	6	20
U.S.S.R. [e]	1,400	5,600	7,000	1,500	6,000	7,500	1,600	6,250	7,850
Venezuela	60	54	114	118	76	194	129	371	500
World total	[r] 10,674	25,879	36,553	11,773	29,090	40,863	13,712	28,643	42,355

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

[1] Total (gem plus industrial) diamond output of each country is actually reported except where indicated to be an estimate by footnote. In contrast, the detailed separate reporting of gem diamond and industrial diamond represents Bureau of Mines estimates in the case of all countries except Angola, Congo (Kinshasa), Lesotho (1969 only), Liberia, and Venezuela, where sources list both total output and the detail. The estimated distribution of the total in the case of several countries is conjectural, based on unofficial sources of varying reliability.

[2] In addition to the countries listed, Botswana also produces diamond, but output statistics are regarded as confidential by the producer, and there is insufficient general information to prepare reliable estimates.

[3] Government of Guinea estimate.

[4] Exports for year ending August 31 of that stated.

[5] Exports.

[6] Officially reported production of nonalluvial stones from Transvaal; the Premier mine is the only major source of such stones in the Transvaal.

[7] All company output from the Republic of South Africa except for that from the Premier mine; excludes company output from the Territory of South-West Africa.

Sierra Leone.—Diamonds are the country's most important mineral resource. To derive maximum benefit from its diamond resources, the Government acquired majority control (51 percent) of Sierra Leone Selection Trust Ltd. (SLST), which had the concession to about 450 square miles of the best diamond area. A new company, the National Diamond Mining Co., Ltd. (DIMINCO) was formed. Diamond exports dropped owing to the depressed world diamond market.[11]

South Africa, Republica of.—From the best information available, South Africa ranked second in total diamond production and first in gem diamonds in 1970. The Department of Mines also reported production of 7,500,000 carats of emerald, of which 4,975,000 carats was exported; and 1,150 short tons of Tiger's-Eye, of which 139 short tons was exported. In the annual report of De Beers Consolidated Mines Ltd., sales by the CSO were 23 percent less than sales in 1969, and the book value of diamonds-on-hand increased 92 percent.[12]

Southern Rhodesia.—A large emerald crystal, 2 inches high by 3 inches across, weighing 1,160 carats, was found at the Chikwanda mine of Rhodesia Star mines, Fort Victoria, Rhodesia, in late December 1969. If a cut gem stone was produced from it, one appraiser estimated the gem could be worth $2 million. The collector, who has acquired it, intends to keep it uncut.[13]

Tanzania.—Diamonds were the principal mineral mined and almost the entire output came from Williamson Diamonds Ltd., which is 50 percent Government owned. Prospecting for colored gem stones attracted numerous small miners in the northern sections for minerals such as tanzanite.[14]

U.S.S.R.—Diamond production increased in 1970 and was claimed by the U.S.S.R. to rank second in the world. However, most of the output was industrial diamond, and was from the pipes in Yakutia near Mirny. Gem deposits were reported to have been discovered in the Turkestan mountain range in Uzbekistan and included turquoise, amethyst, chalcedony, jasper, and selenite.[15]

TECHNOLOGY

The practical aspects of the diamond cutter's art, from cleaving and sawing to the final facetting operations were described; and the assistance of science was explained as an aid to the cutter in understanding the structure and properties of the diamond crystal.[16]

Pigmented synthetic quartz crystals of large size (up to 2 pounds) in citrine, peridine, and cobalt blue colors, developed by Soviet scientists, and believed to be intended for less expensive jewelry items, were displayed at gem shows as crystals and in cut form in jewelry.[17]

On May 28, 1970, General Electric Corp. made public its progress in developing man-made, gem-quality diamonds up to 1 carat in size, but the cost of their production exceeded that of natural stones.[18]

The defects of the crystalline structure of a natural emerald from Muzo, Colombia, and of an artificial emerald synthesized by Gilson, were studied by X-ray. The study revealed zoning of strong misorientations in the natural crystals and a high number of irregularities of curved grains in the synthetic.[19]

Polarized absorption spectra of natural yellow, green, and blue sapphires, and of synthetic blue sapphires grown by the Verneuil process were studied and interpreted for the roles of titanium and iron in the resulting colors.[20]

---

[11] Bureau of Mines. Mineral Trade Notes. Diamonds. V. 68, No. 2, pp. 8, 9.

[12] Mining Journal. De Beers Consolidated Mines Ltd. Annual Report. V. 276, No. 7082, May 14, 1971, pp. 389–395.

[13] Lapidary Journal. Giant Emerald Crystal Found at Ft. Victoria, Rhodesia. V. 24, No. 4, July 1970, p. 646.

[14] Skilling's Mining Review. Diamonds and Gold Are Leading Exports of Tanzania. V. 59, No. 48, Nov. 28, 1970, pp. 14, 15.

[15] Mining Journal. V. 276, No. 7082, May 14, 1971, p. 391.

[16] Rainier, D. M. How Gem Diamonds are Fashioned. Ind. Diamond Rev., v. 30, No. 358, September 1970, pp. 350–357.

[17] Pough, F. H. Colored Synthetic Quartz From Russia. Lapidary J., v. 24, No. 3, June 1970, pp. 444–446.

[18] Lapidary Journal. G. E. Announces First Man-Made Gem-Quality Diamonds. V. 24, No. 4, July 1970, pp. 540–548.

[19] Schubnel, H. J., and A. Zarka. Topographie Aux Rayons X D'une Émeraude Naturelle et D'une Émeraude Artificielle. Association Francoise de Gemmologie. Bull. No. 25, December 1970, pp. 7–10.

[20] Lehmann, G. and H. Harder. Optical Spectra of Di- and Trivalent Iron in Corundum. The Am. Miner., v. 55, Nos. 1 and 2, January–February 1970, pp. 98–105.