Gem Stones

By John W. Hartwell [1] and Betty Ann Brett [2]

GEM materials and mineral specimens produced in the United States during 1960 were estimated at $1,188,000—a $3,000 increase over 1959.

During the year the U.S. Customs Bureau auctioned 8,014 carats of confiscated diamonds, realizing over $1 million for the Government.

The Federal Trade Commission approved the use of the term "Chatham-created emerald" to describe the gem stone produced by the Chatham Research Laboratories, San Francisco, Calif. This term was developed to replace the word "cultured" formerly used. The Commission emphasized that this phrase was to be used only in describing the gems and not the jewelry in which the stones were mounted.

DOMESTIC PRODUCTION

Production information was collected by the Bureau of Mines by canvassing amateur and professional producers of gem stones, but it was not possible to contact all operations. Therefore, facts are based on only a partial survey.

Forty-four States reported production of gem stones, compared with 45 in 1959. Oregon again was the leading State. Thirteen States—Oregon, California, Arizona, Nevada, Texas, Washington, Utah, Wyoming, Colorado, New Mexico, Arkansas, Montana, and South Dakota—produced 89 percent of the total value.

Agate.—About 200 tons of agate, valued at $175,000, was produced in 29 States in 1960. This was a large increase in value and quantity over 1959. Principal States, in decreasing order of production, were Oregon, Utah, New Mexico, Arizona, California, Wyoming, Colorado, and Texas.

A large agate weighing 237 pounds was discovered in Idaho. It was 14 inches in diameter, contained alternate bands of blue and white quartz, and had a small portion in the center containing quartz crystals.

Fire agate production was valued at $5,000; moss, plume, and Turritella agate production was valued at more than $33,000.

Diamond.—Diamonds were still being found at the "Crater of Diamonds" near Murfreesboro, Ark. Production in 1960 was 141 carats

[1] Commodity specialist, Division of Minerals.
[2] Statistical clerk, Division of Minerals.

valued at about $9,000. Kimberlite, valued at $7,500 and weighing 15,000 pounds also was sold.

Jade.—Production of jade from Alaska, California, Colorado, and Wyoming was 22,000 pounds, valued at $51,000. Wyoming was the leading State with 7,000 pounds, valued at $24,000. Some Alaskan jade was sent to West Germany for cutting and polishing; other jade was cut and polished locally by native craftsmen.

Petrified Wood.—Almost 150 tons of petrified wood valued at $90,000 was produced in 16 States during 1960. This was considerably less than in 1959. Arizona led with nearly 45 tons, followed by Utah, Oregon, Wyoming, and New Mexico. Twenty-five thousand pounds of petrified palm wood and petrified bone, valued at $20,000, was produced in 8 States. A large deposit of petrified wood, apparently buried under volcanic ash, was discovered in Crook County, Oreg.

Quartz Crystal.—An estimated 18 tons of quartz crystal, valued at $15,000, was produced in 15 States. Arkansas, with over 11 tons valued at nearly $7,000, was the principal producing State. Thirty-eight tons of rose quartz, valued at $5,000, was produced in 5 States. Arizona, with 35 tons, was the leading State. A small quantity of smoky quartz, valued at $1,500, also was produced.

Turquoise.—Production of turquoise from Arizona, Colorado, and Nevada was 16,000 pounds, valued at $60,000. The Villa Grove Turquois Lode, Saguache County, Colo., reported production of over 400 pounds, valued at $16,400. The American Gem Co. reported production from its Lone Mountain Turquois Mine, Esmeralda County, Nev., of 332 pounds, valued at $6,640.

Miscellaneous Gem Material.—Mineral specimens produced in the United States were estimated at nearly 300,000 pounds, valued at $125,000. Principal producing States were Arizona, Utah, California, Oregon, and Wyoming.

TABLE 1.—Estimated value of gem stone production in the United States

(Thousand dollars)

State	1959	1960	State	1959	1960
Alaska	$18	(1)	New Jersey	$6	$7
Arizona	88	$120	New Mexico	39	40
Arkansas	18	38	New York	8	9
California	150	150	North Carolina	9	4
Colorado	43	45	North Dakota	1	1
Connecticut	5	7	Ohio	2	3
Florida	3		Oklahoma	(1)	1
Hawaii	(1)	(1)	Oregon	(1)	(1)
Idaho	5	5	Pennsylvania	3	4
Illinois	1	1	South Dakota	20	20
Kansas	1		Tennessee		1
Maine	10	15	Texas	100	100
Maryland	2	2	Utah	134	72
Massachusetts	(1)	1	Vermont	1	1
Michigan	1	1	Virginia	4	5
Minnesota		2	Washington	75	75
Missouri	3		West Virginia	1	1
Montana	35	35	Wyoming	76	68
Nebraska	3	4	Other States	209	235
Nevada	100	100			
New Hampshire	10	15	Total	1,184	1,188

[1] Included with "Other States."

Rough garnet production was 4,500 pounds, valued at $5,000. The garnet mine, North Creek, N.Y., reported sales of 1,440 carats of cut and polished stones valued at $3,600.

Fire opal from Nevada was valued at over $5,000; quantity was not reported, but one producer at Virgin Valley, Nev., reported 20 pounds valued at $800.

Lapis lazuli production from the Caseade Mine, San Bernardino County, Calif., was 250 pounds. The value depended upon the quality and was priced from $3.50 to $200 per pound.

The quantity and value of some other gem stones and mineral specimens produced were: Amethyst, 1,600 pounds, $2,200; beryl specimens, 1,000 pounds, $500; copper minerals, 8,000 pounds, $5,000; fluorite, 5,000 pounds, $8,000; geodes, 50,000 pounds, $10,000; howlite, 3,000 pounds, $1,500; jasper, 100,000 pounds, $30,000; kunzite, 50 pounds, $1,500; lepidolite, 1,500 pounds, $1,000; marcasite, 1,500 pounds, $1,500; onyx, 16,000 pounds, $4,500; peridot, 440 pounds, $1,000; rhodonite, 20,000 pounds, $6,000; rhyolite, 21,000 pounds, $3,000; and vesuvianite, 2,500 pounds, $1,500.

CONSUMPTION

Consumption of diamond ($166 million) was 8 percent lower than in 1959; sales of synthetic and imitation stones ($6 million) were 40 percent lower; and sales of natural and cultured pearls ($14.6 million) were 6 percent higher.

Apparent consumption (domestic production plus imports minus exports) of gem stones in the United States in 1960 was over $164 million, compared with $189 million in 1959.

PRICES

Prices of colored precious stones and some semiprecious stones have increased in the past few years. Some gem stones were difficult to find in wholesale and retail stores in the United States because of a greater demand from European countries.

Emeralds were in demand everywhere, but especially in Italy where the green stones are highly esteemed. Most natural emeralds sold originated in Colombia and Africa (good quality stone but small or dark), Brazil (pale), and India, where the mines were nearly exhausted.

Deep blue aquamarines, produced in Brazil, were scarce and priced higher than wholesalers in New York were willing to pay.

Large rubies, always high-priced, were rare, whereas the prices of small cheap stones rapidly increased. The large flawed crystals, usually sold as mineral specimens, were cut and polished for the jewelry trade. Large quantities of dull, dark, and flawed star rubies from India were sold.

Sapphires also gained in popularity, and prices increased considerably above the unusual low prices of former years. Production of fancy sapphires from Ceylon continued to decrease.

Prices of Ceylon cat's eye and alexandrite increased, but these gems were almost nonexistent in the markets. No alexandrites were avail-

able in European markets in late 1960, but a few small Russian stones at prices higher than diamonds of the same size were offered.

Wholesale prices of black opal increased 50 percent or more. Red tourmaline, in short supply, and green and blue tourmaline, in good supply, increased only slightly in price. Most quartz gems were abundant, but fine amethysts were rare, and even average-quality stones were hard to find.

Most other semiprecious and synthetic gem stones increased in price only slightly despite the increased labor costs of cutting and polishing.

Zircon was the only gem whose price decreased.[3]

FOREIGN TRADE[4]

Imports.—Imports of gem stones decreased nearly 10 percent in value from 1959. Gem diamonds accounted for 86 percent of the total imports but decreased about $6.8 million in value from 1959.

The value of natural and cultivated pearls imported increased $900,000 over 1959.

Emerald imports, cut but not set, decreased $1 million. Imports from Switzerland increased nearly 400 carats, but the unit value per carat dropped from $725 in 1959 to $134 in 1960, resulting in an $861,000 drop in value. Imports from Colombia and Ceylon dropped 12 percent and 83 percent, respectively, in quantity. There were

TABLE 2.—U.S. imports for consumption of precious and semiprecious stones (exclusive of industrial diamonds)

Item	1959		1960	
	Carats	Value (thousands)	Carats	Value (thousands)
Diamonds:				
Rough or uncut (suitable for cutting into gem stones), duty free	[1] 1,578,170	[1] $94,283	1,365,529	$87,510
Cut, but unset, suitable for jewelry, dutiable	[1] 916,824	86,366	801,945	78,037
Emeralds: Cut but not set, dutiable	88,875	2,450	81,207	1,463
Pearls and parts, not strung or set, dutiable:				
Natural	----------	595	----------	629
Cultured or cultivated	----------	13,083	----------	13,934
Other precious and semiprecious stones:				
Rough or uncut, duty free	----------	678	----------	620
Cut but not set, dutiable	----------	3,990	----------	3,967
Imitation, except opaque, dutiable:				
Not cut or faceted	----------	64	----------	74
Cut or faceted:				
Synthetic	----------	243	----------	334
Other	----------	10,746	----------	5,897
Imitation, opaque, including imitation pearls, dutiable	----------	14	----------	8
Marcasites: Real and imitation, dutiable	----------	8	----------	7
Total	----------	[1] 212,520	----------	192,480

[1] Revised figure.

SOURCE: Bureau of the Census

[3] Pough, Frederick H., Precious Stones: Scarcer, Costlier: Jewelers' Circ.-Keystone, vol. 131, No. 6, March 1961, pp. 76, 93–94.

[4] Figures on imports and exports compiled by Mae B. Price and Elsie D. Jackson, Division of Foreign Activities, Bureau of Mines, from records of the U.S. Department of Commerce, Bureau of the Census.

almost no imports from Thailand, whereas in 1959 nearly 2,500 carats were imported.

Imports of imitation gems, cut or faceted were nearly 55 percent under 1959.

TABLE 3.—U.S. imports for consumption of diamonds (exclusive of industrial diamonds), by countries

Country	1959				1960			
	Rough or uncut		Cut but unset		Rough or uncut		Cut but unset	
	Carats	Value (thousands)	Carats	Value (thousands)	Carats	Value (thousands)	Carats	Value (thousands)
North America:								
Canada	13,322	$1,259	817	$61	13,751	$1,004	936	$74
Mexico			15	1			173	16
Total	13,322	1,259	832	62	13,751	1,004	1,109	90
South America:								
Argentina	508	11						
Brazil	22,032	725	213	18	26,811	907	34	8
British Guiana	7,461	241	67	8	22,102	743	23	1
Colombia	216	5						
Surinam			25	3				
Venezuela	47,518	1,411	19	2	41,220	1,161		
Total	77,735	2,393	324	31	90,133	2,811	57	9
Europe:								
Austria			220	28			753	47
Belgium-Luxembourg	398,790	20,003	538,811	50,786	207,225	14,354	435,284	44,462
France	24,373	1,257	13,981	1,461	45,965	1,803	13,337	1,181
Germany, West	2,418	57	49,400	3,438	553	13	59,703	3,974
Italy	1,152	28	58	14			66	15
Netherlands	6,900	546	35,782	3,987	22,512	1,432	33,869	3,762
Switzerland	3,134	91	918	433	2,501	138	99	10
United Kingdom	877,236	[1] 63,749	7,398	1,016	829,523	59,547	7,133	1,094
Total	1,314,002	[1] 85,731	646,568	61,163	1,108,279	77,287	550,244	54,545
Asia:								
India			1,970	331			86	15
Israel	6,625	158	[1] 228,677	17,497	54,894	1,801	213,013	17,453
Japan			1,828	159			6,398	81
Lebanon			3	1				
Singapore, Colony of			32	13				
Total	6,625	158	[1] 232,510	18,001	54,894	1,801	219,497	17,549
Africa:								
Congo, Republic of the, and Ruanda-Urundi[2]					22	1		
Western Africa, n.e.c.[3]	5,546	224			7,180	259		
Western Equatorial Africa, n.e.c.[4]	1,796	85			3,494	105		
Ghana	43,508	404			7,104	47		
Liberia	30,384	905			23,567	879		
Union of South Africa	[1] 85,251	[1] 3,124	36,590	7,109	56,185	3,198	30,955	5,843
Total	[1] 166,485	[1] 4,742	36,590	7,109	97,552	4,489	30,955	5,843
Oceania: Australia					920	118	83	1
Grand total	[1] 1,578,170	[1] 94,283	[1] 916,824	86,366	1,365,529	87,510	801,945	78,037

[1] Revised figure.
[2] Effective July 1960; formerly Belgian Congo.
[3] Effective July 1960; formerly French West Africa and Republic of Togo.
[4] Effective July 1960; formerly French Equatorial Africa.

SOURCE: Bureau of the Census.

Exports.—Exports of gem stones, precious and semiprecious, were $7.6 million in 1960, compared with $5.3 million (revised) in 1959; and reexports were $21.7, compared with $19.7 million (revised) in 1959.

WORLD REVIEW

World diamond production decreased 700,000 carats below 1959. This decrease was due to the political unrest in the Republic of the Congo where loss in production was 1.8 million carats. Increases in other countries brought the total production to 26.1 million carats.

Gem-diamond production increased 300,000 carats, principally because of increased production from Angola, Sierra Leone, and the Union of South Africa (De Beers' Group).

Sales of gem diamonds, reported by the Central Selling Organization, London, which sold about 90 percent of the world total, were a record $178 million, compared with $177 million in 1959.

TABLE 4.—World production of diamonds, by countries

(Thousand carats)

Country	1959		1960	
	Gem	Industrial	Gem	Industrial
Africa:				
Angola	516	500	658	400
Central African Republic [2]	40	60	30	45
Congo, Republic of the	655	14,200	413	13,040
Ghana	876	2,200	873	2,400
Guinea [1 2]	200	400	447	670
Ivory Coast [3]			80	120
Liberia [3]	470	500	577	400
Sierra Leone	644	650	912	1,050
South-West Africa	841	90	866	70
Tanganyika	274	350	287	250
Union of South Africa:				
Premier	323	950	309	1,000
De Beers Groupe	562	500	717	580
Other "pipe" Mines [2]	30	70	30	70
Alluvial [2 4]	250	150	240	160
Other regions:				
Brazil [2]	180	170	150	150
British Guiana	22	40	41	60
Venezuela	15	80	14	57
India, Borneo, Australia, U.S.S.R., and Others [2]	5	10	10	20
World total	5,903	20,920	6,700	20,500

[1] Formerly French Guinea.
[2] Estimate.
[3] Exports only.
[4] Including State-owned mines.

NORTH AMERICA

Dominican Republic.—Amber, containing numerous insect and plant inclusions, from deposits in Dominican Republic was described. Some references to other world deposits known to contain animal and vegetable inclusions were made.[5]

[5] Science, Amber With Insects and Plant Inclusions from the Dominican Republic: Vol. 131, No. 3409, Apr. 29, 1960, p. 1313.

SOUTH AMERICA

Brazil.—Exploracao de Mineros Brasilia Ltd., a partnership of two Canadian corporations, prospected for diamonds and gold in several areas in the State of Minas Gerais during 1960. An alluvial deposit was found in central Brazil, but the quantity of gold was considered too low to risk the development of the property solely for diamonds.[6]

British Guiana.—A new diamond deposit was reported found near Ekereku.[7]

EUROPE

Spain.—The history and present production of "Spanish Topaz" mines near Velas Buenas, Spain, were given. These "topaz" crystals (brown quartz crystals or citrine) were valued in 1958 at US$35 per kilogram.[8]

U.S.S.R.—Gem diamond produced by the U.S.S.R. was to be sold exclusively by the Central Selling Organization of the Diamond Corp., London, under an agreement whereby the diamonds produced from Siberian deposits would be marketed for the first time in the free world.

The diamond mines in Yakut ASSR and their industrial development were described.[9]

ASIA

Fine precious gems of Burma, Ceylon, and Thailand became scarce because mining almost ceased. Sapphires were still found in these countries, but the Ceylon stones were less valuable than those of Burma or Thailand. The Thailand sapphires were easier to cut and polish than Burma stones but had less value.

Ceylon.—Gem stone mines in Ceylon produced alexandrite, amethyst, aquamarine, cat's eye, garnet, moonstone, ruby, sapphire, spinel, topaz, tourmaline, and zircon. The average annual output was estimated at US$420,000.[10]

India.—The Geological Survey of India reported discovery of a rare variety of diamond in the Majhagawan diamond mines in the Panna district. Diamond also was reported to occur in a conglommerate bed near Banganapalle in Andhra Pradesh.[11]

Indonesia.—A new diamond field was discovered in South Kalimantan near the Ulin airport at Bandjarmas. One diamond that was found weighed 12 carats.

Israel.—The history and status of the diamond industry were reported.[12] Israel, with nearly 150 small factories employing 4,000 people, cutting and polishing gem diamonds ranging from 1/15 carat

---

[6] Mining World, Latin America: Vol. 13, No. 12, November 1960, p. 70.
[7] Diamond News, Diamond Rush in British Guiana: Vol. 24, No. 3, December 1960, p. 13.
[8] Pough, Frederick H., The "Spanish Topaz" Mines: Jewelers' Circ.-Keystone, vol. 130, No. 4, January 1960, pp. 62, 64.
[9] Bureau of Mines, Mineral Trade Notes: Vol. 50, No. 5, May 1960, pp. 7–12.
[10] Mining Journal (London), Diamonds, Gemstones, and Abrasives: Annual Review, May 1960, pp. 71, 73, 75, 77.
[11] Mining World, India: Vol 22, No. 12, November 1960, pp. 78–79.
Mining Journal (London), Mineral Discoveries in India: Vol. 255, No. 6530, Oct. 14, 1960, p. 413.
[12] Bureau of Mines, Mineral Trade Notes: Vol. 51, No. 5, November 1960, pp. 18–24.

to ½ carat, was the third largest diamond center in the world. Diamond exports in 1959 were valued at nearly US$47 million, and 42 percent of the total was exported to the United States.

AFRICA

Congo, Republic of the.—Most diamond mining in the Congo was suspended for about 2 months during 1960 because of political conditions. The Bakwanga mine produced about 95 percent of the total output. It was closed on August 28, resumed operations late in October, and production was expected to become normal early in 1961. Most other smaller mines of the Forminiere were partially shut down during the last half of the year.[13]

Guinea, Republic of.—In the first part of 1960, Soguinex, a subsidiary of De Beers, and another French company, produced two-thirds of the Guinean diamonds; the other third was produced by a large number of individual miners. In November 1960 a Government resolution decreed that all private exploitation should be nationalized. Diamond exploitation was placed under the control of a new organization, Societe Nationale d'Exploitation de Diamonts, which was run for the Government by Russian mining engineers. In 1960, 1,116,500 carats of diamond was exported compared with 643,000 carats in 1959.[14]

Alluvial diamond mining deposits near the Sierra Leone border were described.[15]

Ivory Coast.—The output of diamond in 1959 by the two principal producers was about 188,000 carats, a 13-percent increase over 1958. One producer erected a plant to treat the 1960 production by a new process tried in a pilot plant during 1959. This new plant will recover about 250,000 carats from old tailings.[16]

Malagasy Republic.—During 1959, 24,740 pounds of precious and semiprecious stones, valued at nearly US$9,000, was exported. In the first half of 1960, exports were 21,800 pounds valued at US$19,000. Most valuable gems exported were citrine and labradorite.[17]

Rhodesia and Nyasaland, Federation of.—Rhodesia Chrome Mines, Ltd., discovered a deposit of nephrite jade in the midlands of Southern Rhodesia during 1960. This was the first discovery of this mineral in Southern Africa.[18]

Sierra Leone.—A program, called the Sierra Leone Revolving Loan Scheme, was instituted by the Department of Information, Ministry of Mines and Labor, to help native diamond miners improve mining methods and secure equipment. This program, financed by a free grant from American Aid released to the British Territories in Africa, allocated Sierra Leone $140,000.[19]

---

[13] Foreign Commerce Weekly, Strife-Torn Congo Struggles To Keep Mineral Output at Normal Rate: Vol. 64, No. 22, Nov. 28, 1960, pp. 32, 34.
U.S. Embassy, Leopoldville, Republic of the Congo, State Department Dispatch 226: Jan. 23, 1961, p. 1.
[14] U.S. Embassy, Conakry, Republic of Guinea, State Department Dispatch 225: Mar. 13, 1961, p. 15.
[15] Bruton, M. E., Diamond Mining in Guinea: Gemmologist, vol. 29, No. 348, July 1960, pp. 121–131.
[16] Bureau of Mines, Mineral Trade Notes: Vol. 50, No. 6, June 1960, p. 10.
[17] Bureau of Mines, Mineral Trade Notes: Vol. 52, No. 2, February 1961, pp. 10–11.
[18] Industrial Diamond Review (London), News in Brief: Vol. 20, No. 238, September 1960, p. 175.
[19] Bureau of Mines, Mineral Trade Notes: Vol. 52, No. 2, February 1961, p. 10.

South-West Africa.—Most of the 18 varieties of gem stones produced in South Africa come from an area near Namaland, and include agate, amazonite, amethyst, aquamarine, emerald, garnet, jade, topaz, and tourmaline.

Production of gem diamond in 1959 was nearly 875,000 carats, compared with 834,000 in 1958. Output in 1960 was estimated at 4 percent more than in 1959.

The Central Selling Organization reported that South-West Africa contributed about 24 percent of the total value of gem diamonds sold on the world market in 1959.

Consolidated Diamond Mines, a subsidiary of De Beers Consolidated Mines, Ltd., accounted for about 99 percent of the diamonds produced in this country.[20]

Tanganyika.—Tanganyika Corundum Corp, Ltd., continued to develop a ruby-corundum deposit near Longido, but no significant production or sale of gem material was reported.

Ruby and Sapphire were reported discovered in deposits in the Lushoto district, Tanganyika.[21]

Union of South Africa.—Income from the sale of gem diamond during 1960 decreased 7 percent from 1959 owing to a decrease in the quantity of diamonds sold. Production of semiprecious gems was amethyst, 2,000 pounds, and tourmaline, 5,700 pounds. Tiger eye continued to be exported (2,000 pounds), but production figures were not available.[22]

OCEANIA

Australia.—Nullamanna Sapphires Pty., Ltd., about 10 miles north of Inverell, New South Wales, began producing sapphire during 1959. In 2 months, 221 ounces of material was produced.

Opal was discovered near Helen Springs Station 90 miles north of Tennant Creek. Some black opal was produced. The Cretaceous rock formations in western New South Wales were reported to be favorable for opal discoveries.

Opal production was expected to exceed US$2.8 million in 1960, compared with US$1.9 million in 1959. Exports to Japan in 1959 were valued at over US$1 million; to West Germany, over US$400,000.

Information concerning Australia's gem stone deposits and production was published by the Australian Bureau of Mineral Resources.[23]

In an area between Southern Cross and York in Western Australia, mineral deposits were staked by several large mining companies. Included was a 30-square-mile tract 40 miles northeast of Hall's Creek staked for agate and other gem stones.[24]

A new syndicate was licensed by the State of Western Australia to operate cultured pearl farms in two areas in King Sound at Malumbo

---

[20] Bureau of Mines, Mineral Trade Notes: Vol. 52, No. 1, January 1961, pp. 15–17.
[21] Mining Journal (London), Mining in Tanganyike in 1960: Vol. 256, No. 6559, May 5. 1961, pp. 505. 507.
[22] U.S. Consulate, Cape Town, Union of South Africa, State Department Dispatch 110: Mar. 30. 1961, pp. 2, 6, encl. 2, pp. 1, 2.
[23] Mining Journal (London), Australia's Gemstone Industry: Vol. 255, No. 6521, Aug. 12, 1960, p. 173.
[24] Financial Standard (Melbourne), Mineral Interest Widens: Vol. 117, No. 2920, Jan. 26, 1961, p. 27.

Anchorage. The services of a Japanese technician and cultured pearl expert were to be obtained.[25]

ANTARCTICA

Antarctica.—Petrified wood of low-grade gem quality was found by a Bureau of Mines field engineer in perhaps the world's most remote location near the head of Mackay glacier west of the Ross Sea.

TECHNOLOGY

Newly developed prospecting techniques were mentioned as possible methods of searching for the original source of diamonds found in the Great Lakes glacial drift areas.[26]

Two publications on Maine minerals and mineral locations were issued during the year.[27]

The occurrence and description of 63 gem and ornamental stones in Washington was published.[28]

Descriptions and occurrences of many Malagasy minerals and gem materials were given.[29]

Each monthly issue of the Mine and Quarry Engineering (London) journal beginning with October 1953 described a mineral, giving the synonyms, nomenclature, varieties, composition, crystallography, physical and optical properties, tests, diagnoses, occurrences, and uses. Each mineral was illustrated in color. In the 1960 issues the minerals in chronological order were: Crocoite, lazurite, erythrite, manganite, serpentine, scheelite, stilbite, ulexite, brochantite, brucite, mispickel, and agate.

Deposits of minerals in Arkansas and Oklahoma, including diamond in peridotite, were described.[30]

A historical review and the characteristics of Brazilian diamonds were given, and the diamonds were compared with diamonds from other countries.[31]

A Russian book on the diamond fields of Yakutia, northern Siberia, was published in 1959. It contained 525 pages, 41 colored plates, and 305 photographs, drawings, and diagrams. The book was reviewed and abstracted in a British publication.[32]

A history of African diamond mining and recovery of diamond from alluvial and underground deposits were published.[33]

---

[25] Bureau of Mines, Mineral Trade Notes: Vol. 51, No. 5, November 1960, p. 28.

[26] Smith, Charles H., Diamonds in the Great Lakes Area—A Geological Enigma: Canadian Min. Jour., vol. 81, No. 7, July 1960, pp. 51–52.

[27] Morrill, Phillip, and others, Maine Mines and Minerals: Dillingham Natural History Museum, East Winthrop, Maine, vol. 1, Western Maine, 1960, 82 pp.; vol. 2, Eastern Maine, 1960, 82 pp.

Maine Geological Survey (Augusta), Maine Mineral Collecting: 1960, 23 pp.

[28] Valentine, G. M., and Huntting, M. J., Inventory of Washington Minerals, 2d Ed.: Wash. Dept. of Conserv., Div. of Mines and Geol., Bull. 37, vol. 1, pt. 1, 1960, pp. 43–46 (text); vol. 2, pt. 1, 1960, p. 35 (map).

[29] Behier, Jean, Madagascar Mineralogy: Rept. Malgache, Ann. Geol., Madagascar, No. 29, 1960, pp. 1–78; Chem. Abs., vol. 55, No. 2, Jan. 23, 1961, col. 1301e.

[30] Scull, B. J., The Age of Mineralization in the Ouachita Mountains of Arkansas and Oklahoma: Symposium on Geol. Ouachita Mts., Dallas Geol. Soc., Ardmore Geol. Soc. 1959, pp. 62–69; Chem. Abs., vol. 54, No. 1, Jan. 10, 1960, col. 178b.

[31] Reis, Esmaraldino, The Big Brazilian Diamonds: Brazil Dept. Natl. Prod. Mineral, Div. Geol. e Mineral., Rio de Janeiro, vol. 191, 1959, 65 pp.; Chem. Abs., vol. 54, No. 14, July 25, 1960, col. 13992i.

[32] Wilson, N. W., The Diamond Deposits of Yakutia: Min. Mag. (London), vol. 103, No. 4, October 1960, pp. 205–213.

[33] Daily, A. F., Africa's Key Role in Diamond Mining: World Mining, pt. 1, vol. 13, No. 10, September 1960, pp. 38–43; pt. 2, vol. 13, No. 11, October 1960, pp. 36–41; pt. 3, vol. 13, No. 12, November 1960, pp. 32–37.

Additional information on diamond mining, processing, and synthetic development may be found in the Abrasive Materials chapter of this volume.

Chemical, optical, and X-ray data on jadeite and associated minerals found in central Japan were given.[34] It was suggested that jadeite probably was formed under high pressure at a low temperature during metamorphism. Desilication of its host rock by the associated ultramafic rock might have promoted its formation.

The composition and structure of moonstones from Ceylon, Coimbatore, and Korea were studied, and results were given.[35]

The mechanism of quartz formation in the laboratory and some conclusions concerning the natural process was written.[36]

Equipment used by various research laboratories in the synthesis of diamond was described.[37]

The U.S. Air Force established a research laboratory at Bedford, Mass., to synthesize crystals, including diamonds. It was hoped that diamonds could be developed for making transistors that could be operated at high temperatures. Information on equipment used and results obtained was given.[38]

Diamond, kyanite, garnet, topaz, and jadeite were synthesized in the laboratory under ultra-high pressures.[39]

A new emerald substitute was manufactured in Austria. These emeralds, grown from a seed consisting of a faintly colored, faceted, beryl gem, were then coated with a thin layer of emerald by a hydrothermal or flux-fusion process. The result was an unpolished faceted gem.[40]

Star gem stones produced synthetically were described.[41]

Methods of producing quartz cat's eye,[42] garnet,[43] and unicrystalline bodies [44] were patented.

Cutting of jade minerals by diamond saws was compared with wire and disc cutting methods.[45]

---

[34] Seki, Yôtarô. Aiba, Mizuo, and Kato, Chigusa, Jadeite and Associated Minerals of Metagabbroic Rocks in the Sibukawa District, Central Japan: Am. Mineral, vol. 45, Nos. 5 and 6, May–June 1960, pp. 668–679.

[35] Jayaraman, A., X-Ray Study of the Structure of Moonstones: Proc. Indian Acad. Sci., vol. 50A, 1959, pp. 349–357; Chem. Abs., vol. 54, No. 15, Aug. 10, 1960, col. 15107a.

[36] Corwin, James F., Natural Quartz From the Laboratory: Jour. Chem. Ed., vol. 37, No. 1, January 1960, pp. 11–14.

[37] Giardini, A. A., Tydings, J. E., and Levin, S. B., A Very High Pressure-High Temperature Research Apparatus and the Synthesis of Diamond: Am. Mineral., vol. 45, Nos. 1 and 2, January–February 1960, pp. 217–221.

Schwartz, C. M., and Wilson, W. B., Ultra High Pressure for Materials Research: Battelle Tech. Rev., vol. 8, No. 6, June 1959, pp. 3–8.

[38] Pough, Frederick H., The "Gem" Factory on Route 128: Jewelers' Circ.-Keystone, vol. 130, No. 7, April 1960, pp. 78, 80, 92–94, 123.

[39] Metal Progress, Ultra-High-Pressure Techniques: Vol. 77, No. 4, April 1960, pp. 170, 172, 174.

Birch, Francis, and Robertson, E. C., Report P.B. 128556: U.S. Govt. Research Rept., vol. 29, No. 2, 1958, 55 pp.

[40] Holmes, Ralph J., and Crowningshield, G. Robert, A New Emerald Substitute: Reprint from Gems and Gemology, Spring 1960, 22 pp.

[41] Pough, Frederick H., New Star Stones Break With Tradition: Jewelers' Circ.-Keystone, vol. 131, No. 2, November 1960, pp. 64, 78, 80, 82.

[42] Watson, John E., Method of Making Synthetic Quartz Cat's-eye Gem: U.S. Patent 2,948,082, Aug. 9, 1960.

[43] Nielsen, James W. (assigned to Bell Telephone Laboratories), Method of Making Single Crystal Garnets: U.S. Patent 2,957,827, Oct. 25. 1960.

Wentorf, Robert H. (assigned to Union Carbide Corp.), Method of Making Garnet: U.S. Patent 2,941,861, June 27, 1960.

[44] Kebler, Richard W., Dutchess, Elmer E., and Hutcheson, Ralph L. (assigned to Union Carbide Corp.), Method for Making Synthetic Unicrystalline Bodies: U.S. Patent 2,962,838, Dec. 6, 1960.

[45] Shreve, R. Norris, Jade Cutting Today: Gems and Gemology, vol. 10, No. 3, Fall 1960, pp. 81–89.

The need for lapidary diamond saws, less costly than the circular type now being used, was discussed. It was suggested that hacksaw blades, diamond-charged and adapted to lapidary work, would be a good substitute since power tools suitable for operating this type of blade were already on the market.[46]

Cutting, grinding, and polishing techniques used in producing kunzite gem stones were described.[47]

A machine for faceting gems was patented in Switzerland. The patent was illustrated and showed details of the gem holder which was angularly adjustable but limited by stops.[48]

A brilliant-cut diamond with a new shape called the trilliant, having 44 facets and a polished girdle, was developed.[49]

Methods of testing pearls to determine if they are natural or cultured were described.[50]

A simple, quick, and cheap method of determining whether a diamond is naturally or artificially blue was developed.[51]

The color changes in diamond bombarded with neutrons and electrons in a high voltage accelerator were described.[52]

A method of preventing gem opal from cracking during processing was patented in Japan.[53]

A foldable device for use in examining transparent or translucent gem materials with polarized light was patented.[54]

An electrical detector was invented to sort transparent and translucent gem diamond from opaque gangue materials. The optical property of gem diamond to reflect light was used to develop this apparatus.[55]

Lists of reference books for gem collectors and lapidaries were given.[56] Some books on gems and gem materials were published in late 1959 and during 1960.[57]

---

[46] Mineralogist, New Lapidary Products: Vol. 28, Nos. 2–3, February–March 1960, pp. 39–40.

[47] Deane, N., Cutting a Kunzite: Jour. Gemology, vol. 7, No. 8, October 1960, pp. 294–295.

[48] Stachli, W., Machine for Faceting Series of Gems: Swiss Patent 343,829, Mar. 1, 1956.

[49] Gemmologist (London), Brilliant-Cut Diamond of New Shape Developed: Vol. 29, No. 345, April 1960, p. 63.

[50] Pough, Frederick H., Natural or Cultured? X-ray Will Tell All: Jewelers' Circ.-Keystone, vol. 130, No. 7, April 1960, pp. 74, 88–90.

[51] Custers, J. F. H., Dyer, H. B., and Raal, F. A., A Simple Method of Differentiating Between Natural Blue Diamonds and Diamonds Coloured Blue Artificially: Ind. Diamond Rev., vol. 30, No. 236, July 1960, pp. 134–135.

[52] Custers, J. F. H., and Wedepohl, P. T., Diamonds and the Atom: Jewelers' Circ.-Keystone, vol. 130, No. 13, September 1960, pp. 106, 125, 126.

[53] Nagao, C., Japanese Patent 311 (1960) Jan. 19, 1960.

[54] Chromy, Benjamin J., Device for Optical Examination of Gem Materials: U.S. Patent 2,934,993, May 3. 1960.

[55] Linari-Linholm, A. A., An Optical Method of Separating Diamond from Opaque Gravels: Inst. Min. and Met. (London), preprint 38, 1960, 11 pp.

[56] Pough, Frederick H., Basic Books and Tools for the Gem Specialist: Jewelers' Circ.-Keystone, vol. 130, No. 6, March 1960, pp. 80, 82, 115–116.

Pough, Frederick H., Information for Your Talks About Gems: Jewelers' Circ.-Keystone, vol. 130, No. 13, September 1960, pp. 108, 110, 127–128.

Pough, Frederick H., Good Source Material for Jeweler Lectures: Jewelers' Circ.-Keystone, vol. 130, No. 11, July 1960, pp. 66, 70, 72, 74, 76.

Jewelers' Circular-Keystone, Books: Vol. 130, No. 9, June 1960, p. 110.

Pough, Frederick H., Classic Gem Texts Stand Tests of Time: Jewelers' Circ.-Keystone, vol. 130, No. 8, May 1960, pp. 66, 68.

[57] Copeland, L., and others, The Diamond Dictionary: Gemological Inst. America, Los Angeles, Calif., 1960, 317 pp.

Lapham, Davis M., and Geyer, Alan R., Mineral Collecting in Pennsylvania: Pennsylvania Topographic and Geologic Survey Bull. G–33, 1959, 74 pp.

Sinkankas, John, Gemstones of North America: D. Van Nostrand Co., Inc., Princeton, N.J., 1959, 675 pp.

Northrop, Stuart A., Minerals of New Mexico, Rev. Ed.: Univ. of N. Mex. Press, Albuquerque, N. Mex., 1959, 665 pp.