

Gem Stones

By John W. Hartwell ¹ and Eleanor B. Waters ²



GEM-STONE production in the United States in 1956 was \$925,000, a 13-percent increase over 1955, due largely to the reported increased production of agate, diamond, jade, and turquoise. The reported United States production did not include considerable quantities of gem materials and mineral specimens gathered by individuals for their private collections.

During the year nationally distributed magazines and newspapers continued to publish articles on gem stones and reports of valuable discoveries by individuals, stimulating the hobby or "industry" of gem-stone collecting and effecting increased production in many States.

In 1956 the Rocky Mountain Empire Investors acquired the famous Yogo sapphire mines in Judith Basin County, Mont., from the New Mine Sapphire Syndicate owned by a British concern. These deposits produced an estimated \$20 million worth of gems during 37 years of operation.

On March 10, 1956, the Federal Trade Commission put into effect rules on the trade practices of the diamond industry, providing controls on sales and on advertised offers for sale to prospective purchasers of any diamonds that have been artificially colored or tinted by irradiation, heating, or any other means without disclosure.

The United States Atomic Energy Commission announced on March 17, 1956, that requests for irradiation of gems would be treated in the same manner as requests for irradiation of other materials.³

DOMESTIC PRODUCTION

In 1956 quartz gems and mineral specimens comprised approximately 50 percent of the value of all gem materials collected. Jade and turquoise followed in importance, with 11 and 8 percent, respectively. Gem diamonds, being reported for the first time in several years, were credited with over 1.5 percent of the total. Oregon was again the leading producing State, with a 67-percent increase over 1955. Other States that reported substantial increases were Arkansas, Arizona, Montana, New Mexico, New York, North Carolina, South Dakota, Utah, Washington, and Wyoming.

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³ Atomic Energy Commission, Commission Announces Gem Irradiation Policy: Release 798, Mar. 17, 1956, 2 pp.

TABLE 1.—Estimated production of gem stones in the United States for 1955 and 1956, in thousand dollars

State	1955	1956	State	1955	1956
Arizona.....	97	104	New Jersey.....	(²)	(²)
Arkansas.....	4	25	New Mexico.....	25	30
California.....	(¹)	90	New York.....	(²)	2
Colorado.....	48	30	North Carolina.....	(²)	1
Florida.....		(²)	Oregon.....	150	250
Georgia.....	(²)	(²)	Pennsylvania.....	(²)	(²)
Idaho.....	5	(¹)	South Dakota.....	7.4	10
Maine.....	5	(²)	Texas.....	115	115
Maryland.....		(²)	Utah.....	6	10
Michigan.....	(²)	(²)	Virginia.....	(²)	
Minnesota.....	(²)	(²)	Washington.....	65	75
Montana.....	(¹)	35	Wyoming.....	57	75
Nebraska.....	2.4	3	Other States and Territories.....	226	20
Nevada.....	(¹)	50			
New Hampshire.....	5	(²)	Grand total.....	818	925

¹ Included in other States and Territories.

² Figures of less than \$1,000 included in "Other States and Territories."

TABLE 2.—Localities in the United States where gem materials were reported to have been found in 1956

State, county, and locality	Gem material	State, county, and locality	Gem material
ALASKA		ARIZONA—continued	
Shungnak district: Kobuk.	Jade.	Yuma:	
Chichagof district: Petersburg.	Agates and petrified wood.	Quartzsite.....	Plume agate, purple agate, desert roses, and quartz crystal.
ARIZONA		Salome.....	Striped obsidian and jasper.
Apache: St. Johns.....	Agate.	Yuma.....	Petrified iron wood.
Cochise: Bisbee.....	Shattuckite.	Do.....	Rhyolite and agate.
Gila:		ARKANSAS	
Claypool.....	Apache tears.	Garland:	
Coolidge Dam.....	Agate.	Crystal Springs.....	Quartz crystal.
Four Peaks area.....	Amethyst.	Mountain Valley.....	Do.
Globe.....	Agate, chrysocolla, and serpentine.	Hot Spring: Hot Spring.	Do.
Miami.....	Turquoise.	Mountgomery: Mount Ida.	Do.
Salt River Canyon.....	Serpentine.	Pike: Murfreesboro.....	Diamond.
San Carlos Reservation.	Peridot.	CALIFORNIA	
Graham: Black Hills.....	Chalcedony.	Calaveras: Copperopolis.	Copper.
Greenlee:		Colusa: Sulphur Creek.	Onyx (chalcedony).
Ash Springs Canyon.....	Agate.	Fresno: Coalinga.....	Chert and petrified wood.
Black Jack.....	Do.	Humbolt.....	Jasper (Chalcedony).
Clifton.....	Do.	Imperial:	
U. S. Highway 666.....	Do.	Calexico.....	Sand spikes.
Duncan.....	Agate and jasper.	Ogilby.....	Garnet and kyanite ore.
Limestone Canyon.....	Jasper-agate, agate, and jasper.	Plaster City.....	Fossil oystershell.
Mule Creek.....	Agate.	Do.....	Palm wood and paisley agate.
Sunset Peak.....	Do.	Inyo:	
Maricopa:		Inyo Mountains.....	Quartz crystal.
Saddle Mountain.....	Fire agate and pink chalcedony.	Panamint Mountains.....	Bloodstone.
Superstition Mountains.	Agate.	Tecopa.....	Quartz (amethyst).
Mohave: Chloride.....	Chalk turquoise.	Kern:	
Navajo:		Boron.....	Jasper.
Holbrook.....	Petrified wood.	Rosamond.....	Rhodonite.
Petrified Forest.....	Do.	Tejon Ranch.....	Do.
Pima: Tuscon Mountains.	Chalcedony.	Lake.....	Cinnabar, obsidian, jasper, and myrickite.
Pinal: Mammoth-Sombrero.	Agate.	Marin: Bolinas.....	Whale bone.
Yavapai.....	Agate, jasper, chromium spar, and white jade.	Mendocino: Covelo.....	Jade and jasper.
		Modoc: Davis Creek.....	Obsidian.

TABLE 2.—Localities in the United States where gem materials were reported to have been found in 1956—Continued

State, county, and locality	Gem material	State, county, and locality	Gem material
CALIFORNIA—continued		COLORADO—continued	
Mono: Hot Creek.....	Geode.	Montrose:	
Monterey:		Long Park.....	Dinosaur bone.
King City.....	Limestone.	Naturita Canyon.....	Jasper.
Jade Cove, near Big Sur.....	Jade.	Park: Hartsell.....	Moss opal.
Napa:		Sagauche:	
Manhattan mine.....	Onyx.	Carnero Creek.....	Agate.
Do.....	Jasper (chalcedony).	Del Norte.....	Moss-plume agate.
Placer.....	Agate.	La Garita.....	Agate and amethyst.
Riverside:		Twin Mountains.....	Agate.
Blythe.....	Fire agate.	Villa Grove.....	Turquoise.
Chuckawalla Mountains.....	Agate geode.	San Juan: Eureka.....	Rhodonite.
Wiley Well.....	Chalcedony, jasper, and geode.	Sedgwick.....	Fossil wood and agate.
San Benito:		Teller:	
Hollister.....	Benitoite specimens.	Cripple Creek.....	Agate.
Do.....	Jadeite.	Crystal Peak area.....	Amazonstone.
San Bernardino:		Florrisant.....	Amazonite.
Blue Danube mine.....	Agate.	Lake George.....	Amazonite and smoky quartz.
Cadiz.....	Opalite.		
Kingston Mountains.....	Amethyst.	FLORIDA	
Havasu Lake.....	Blue agate.	Hillsborough: Tampa.....	Agatized coral.
Ludlow.....	Moss agate.		
Needles.....	Petrified palm, blue agate, black palm, chalcedony, and jasper.	GEORGIA	
Newberry area.....	Agate and petrified wood.	Towns: Bell Creek.....	Corundum.
Siam area.....	Crawfordite.	Troup: La Grange.....	Rose quartz.
Yermo.....	Petrified wood.		
San Diego:		IDAHO	
Mesa Grande.....	Spessartite garnet.	Canyon:	
Ramona.....	Tourmaline, topaz, and smoky quartz.	Nampa.....	White plume.
	Nephrite.	Do.....	Agate.
San Francisco: Indian Creek.....	Agate.		
San Luis Obispo: Nipomo.....	Jasper.	MAINE	
San Mateo.....	Do.	Oxford:	
Santa Clara: Morgan Hill.....		Albany.....	Rose quartz.
Siskiyou:		Stow.....	Amethyst.
Clear Creek.....	Jadeite.		
Happy Camp.....	Californite.	MARYLAND	
Do.....	Jade.	Cecil: Conowingo.....	Williamsite.
Tulare: Sequoia National Forest.....	Crystal (rock).		
		MICHIGAN	
COLORADO		Keweenaw:	
Chaffee:		Keweenaw Peninsula.....	Agate and thomsonite.
Salida.....	Aquamarine.		
Wellsville district.....	Agatized wood.	MINNESOTA	
Do.....	Agate, onyx, and garnet.	Lake: Shore of Lake Superior.....	Do.
Clear Creek: Buffalo Creek.....	Amazonite.		
Custer: Westcliffe.....	Agatized wood.	MONTANA	
Douglas: Devil's Head.....	Topaz and smoky quartz.	Custer: Miles City.....	Agate.
Elbert: Kiowa.....	Petrified wood.	Gallatin:	
Fremont:		Gallatin Gateway.....	Corundum and rose quartz.
Garden Park.....	Alabaster, coprolite, and satin spar.	Willow Creek.....	Petrified wood and blue agate.
Howard.....	Agatized wood.	Meagher: Fort Logan.....	Agate.
Jefferson:		Prairie: Terry.....	Do.
Crystal Peak.....	Amazonite.	Rosebud: Forsyth.....	Montana agate.
Pine.....	Amazonstone and topaz.	Yellowstone: Billings.....	Agate.
Las Animas: Kim.....	Rose agate.		
Mesa: Glade Park.....	Dinosaur bone.	NEVADA	
Mineral:		Esmeralda:	
Amethyst Mine.....	Amethyst.	Lone Mountain.....	Turquoise.
Bulldog Mountain.....	Banded agate.	Do.....	Howardite.
Creede.....	Agate and amethyst.	Humboldt.....	Fire opal.
		Lander:	
		Battle Mountain.....	Turquoise and rhodonite.
		Cortez Mining district.....	Turquoise.
		Ivanhoe.....	Opalite.
		Lincoln:	
		Empy Mountain.....	Agate and blue quartz.

TABLE 2.—Localities in the United States where gem materials were reported to have been found in 1956—Continued

State, county, and locality	Gem material	State, county, and locality	Gem material
NEVADA—continued		SOUTH DAKOTA—con.	
Mineral:		Custer—continued	
Fish Lake Valley.....	Obsidian.	French Creek.....	Jasper.
Montgomery Pass.....	Do.	Hells Canyon.....	Teepee agate.
Do.....	Turquoise.	Pennington:	
		Bad Lands.....	Blue chalcedony, agate, agatized wood, and jasper.
NEW HAMPSHIRE		Quinn.....	Petrified wood.
Coos:		TEXAS	
Bald Face Mountain.....	Topaz.	Brewster:	
		Alpine.....	Agate and fire opal.
NEW JERSEY		Rio Grande River.....	Agate.
Passaic:		El Paso: El Paso.....	Do.
Grove Brook.....	Carnelian.	Pecos: Hovey.....	Do.
Paterson.....	Amethyst and prehnite.	Taylor: Abilene.....	Topaz and smoky quartz.
NEW MEXICO		UTAH	
Bernalillo: Mud Springs.....	Desert scenic stone.	Emery: Castle Dale.....	Agate.
Catron:		Garfield:	
John Kerr Canyon.....	Agate.	Escalante.....	Petrified wood.
Hidalgo: Red Rock.....	Agate and serpentine.	Hatch.....	Onyx.
Luna: Deming.....	Agate.	Grand: Moab.....	Agate.
Sierra: Engle.....	Do.	Juab: Thomas Range.....	Do.
Socorro: Socorro.....	Do.	Kane:	
Valencia:		Kanab.....	Petrified wood and sep- tarian nodule.
Laguna Reservation.....	Selenite, jasper, and agate.	Orderville.....	Do.
NEW YORK		Do.....	Agate.
Herkimer: Middleville.....	Quartz.	Millard: Black Rock.....	Snowflake obsidian.
Orange: Tuxedo.....	Tourmaline.	Tooele: Dugway.....	Geode.
Rockland: Hillburn.....	Pink garnet.	Utah: Lehi.....	Onyx.
Warren: North Creek.....	Garnet.	Washington: Central.....	Agate and jasper.
Westchester.....	Garnet and quartz.	Wayne.....	Petrified wood, petrified bone, agate, and ob- sidian.
NORTH CAROLINA		WASHINGTON	
A very: Cranberry.....	Epidote and unakite.	Kittitas:	
Buncombe: Balsam Gap.....	Kyanite.	Columbia River.....	Petrified wood.
Iredell: Statesville.....	Rose quartz.	Klickitat:	
Macon:		Lyle.....	Agate.
Burningtown Gap.....	Corundum.	Roosevelt.....	Petrified wood.
Franklin.....	Do.	WYOMING	
Mitchell:		Albany: Bean Ranch.....	Dendritic agate.
Crabtree.....	Emerald.	Carbon.....	Petrified wood and black jade.
Roan Mountain.....	Unakite.	Fremont:	
Spruce Pine.....	Golden beryl, biotite, and feldspar.	Absaroka Range.....	Agate and petrified wood.
OREGON		Crooks Mountain.....	Jade.
Baker:		Dubois.....	Nephrite.
Baker.....	Petrified wood.	Lander.....	Jasper.
Green Horn.....	Do.	Shoshoni.....	Jade.
Benton: Corvallis.....	Purple agate.	Sweetwater River.....	Agate.
Crook:		Johnson.....	Petrified wood.
Prineville.....	Agate and thunderegg.	Natrona.....	Agate and petrified wood
Do.....	Polka-dot agate.	Park.....	Do.
Douglas.....	Carnelian agate.	Sweetwater:	
Jefferson:		Bitter Creek.....	Oolitic and agatized agate.
Madras.....	Agate.	Eden.....	Petrified wood.
Do.....	Thunderegg.	Eden Valley.....	Petrified algae, eden wood, turrifella, and petrified wood.
Lake: Glass Butte.....	Obsidian.	Farson.....	Fossil wood and petrified wood.
Lane:		Hays Ranch.....	Petrified wood.
London Mountain.....	Blue agate.	Oregon Butte.....	Do.
Malheur:		Rock Springs.....	Jade and turrifella agate.
Sucker Creek.....	Agate.	Wamsutter.....	Turrifella and algae agate.
Do.....	Petrified wood.	Unta: Carter.....	Petrified wood.
Morrow.....	Thunderegg.		
SOUTH DAKOTA			
Custer:			
Custer.....	Agate, rose quartz, jas- per, agatized wood, and breccia.		
Fairburn.....	Fairburn agate, jasper, breccia, and agatized wood.		

Agate.—Many sections of the United States reported sales of agate below the average of the last 5 years; but increased production from Arizona, Montana, Oregon, South Dakota, Texas, and Wyoming overshadowed any losses and resulted in agate becoming the principal gem material produced in 1956. It was estimated that agate valued at over \$100,000 was produced during the year. Considerable quantities of this material were "tumbled" and sold as baroque gems.

Oregon was the leading producer in 1956, with an estimated value of \$50,000, doubling the 1955 figure. Agate was found in most sections of the State, but the more important areas were in Jefferson, Crook, and Deschutes Counties.

Increased output in Arizona during 1956 resulted in the State producing the second largest quantity of agate, with a reported value of \$25,000. Areas in Greenlee, Yuma, and Yavapai Counties were the chief sources, with a reported production value at nearly \$10,000.

New Mexico continued production from a locality near Deming, Luna County, with an increase of 10 percent over 1955.

Fairburn agates of South Dakota were reported scarce, and prices were rising. In 1956, Sweetwater and Fremont Counties, Wyo., reported production over \$8,000. The Montana agate deposits have been exploited for nearly 75 years, and known areas are now reaching depletion.

Diamond.—A 15.33-carat diamond valued at \$8,000 was found at the Crater of Diamonds, Murfreesboro, Ark., on March 4, 1956. During the year, over 15,000 individuals hunted for diamonds in the Murfreesboro, Ark., area, and 93 more diamonds were found averaging 0.56 carat, with a total value of \$8,700.

A flawless, blue-white, rough diamond, 425 carats, the world's 9th largest, was purchased by a New York jeweler. The largest gem that could be obtained from this stone would be a 200-carat, emerald-cut stone.⁴

Jade.—The jade industry during 1956 experienced one of the best years since discovery of jade in Wyoming in 1930. It was estimated that United States and Alaska mined over 32,000 pounds valued at nearly \$100,000. The average price ranged from \$2 to \$8, depending upon quality and color. Large quantities of jade were exported to Germany and Japan for cutting and polishing.

In Wyoming, Fremont County was the leading producer, with a value estimated at \$50,000. Carbon and Sweetwater Counties produced smaller quantities, valued at approximately \$8,000.

The Empire Jade Co. and the Government-sponsored Shungnak Jade project continued procuring jade from the Shungnak district, Alaska. It was reported that a 2,000-pound jade boulder was successfully removed from this district and was expected to be sold in the Orient.⁵

A small quantity of white jade was produced in Yavapai County, Ariz.

In California a small production was reported from Monterey, Mendocino, and San Benito Counties.

Petrified Wood.—In 1956 over 150 tons of petrified wood was produced from an area west of the Petrified Forest National Monument

⁴ Life, The Big Diamond: Vol. 40, No. 8, Feb. 20, 1956, pp. 57-58, 60.

⁵ Engineering and Mining Journal, vol. 157, No. 10, October 1956, p. 136.

in Navajo County, Ariz. Most of this material was sold to tourists and lapidaries for cutting and polishing, but some was used as building material for rock gardens and fireplaces. Production from Arizona was estimated at \$35,000.

Sweetwater County, Wyo., continued production in 1956, with a value estimated at \$5,000. Utah production was valued at nearly \$3,000, principally from Garfield County. In Nevada approximately \$3,000 worth was produced in 1956.

Production was also reported from California, Colorado, Montana, Oregon, and Washington. Ginko, tempskya, and other rare fossil woods were produced in small quantities.

Turquoise.—Nevada was the leading turquoise producer in 1956, with a value estimated at \$25,000. R. J. Frank and James Klopper, lessees of the Lone Mountain mine, and T. E. Sabin, of the Battle Mountain deposits, mined 85 percent of the total State production.

Arizona production of turquoise in 1956 was nearly \$20,000, with most material originating from the Sleeping Beauty mine, Gila County.

The Villa Grove turquoise mine, Sagauche County, Colo., production was valued at over \$15,000.

A report contained information on the origin, occurrence, and properties of turquoise in three California and Nevada mines.⁶

CONSUMPTION

The United States, which depends completely upon foreign sources for gem diamonds, has increased consumption each year and in 1956 imported 39 percent of the world supply. In 1956 the value of all gem material consumed in the United States was estimated at \$189 million, of which less than 1 percent was produced domestically. Most gem stones produced in the United States were used by amateur lapidaries, but some jade and other less valuable stones were exported to Germany and Japan for cutting, carving, and polishing and returned for sale in the United States.

PRICES

In 1956 the average diamond prices per carat, imported into the United States, were: Cut, but unset, \$109.35; and rough or uncut, \$72.58. The average price of cut diamonds per carat decreased from 1946 to 1956, whereas the price of rough stones increased because of a shortage and greater demand for better grade diamonds.

⁶ Hewett, D. F., *Geology and Mineral Resources of the Ivanpah Quadrangle, California and Nevada*: Geol. Survey Prof. Paper 275, 1956, pp. 165-166.

As a result of negotiations between the United States and 21 other countries, tariff rates were reduced in 1956 on several categories of jewelry and related goods, including imitation semiprecious and precious stones, cut, uncut, or faceted.⁷

FOREIGN TRADE ⁸

The value of gem-stone imports into the United States in 1956 increased 7 percent over 1955. Gem diamonds accounted for 86 percent of the total, the same as in 1955. Imports of pearls and precious, semiprecious, and synthetic gem stones increased 8 percent in 1956 over 1955.

In 1956 the United States exported 27 percent less and reexported 48 percent more gem stones (precious, semiprecious, synthetic, and imitation) than in 1955.

TABLE 3.—Precious and semiprecious stones (exclusive of industrial diamonds) imported for consumption in the United States, 1955-56

[Bureau of the Census]

Item	1955		1956	
	Carats	Value	Carats	Value
Diamonds:				
Rough or uncut (suitable for cutting into gem stones), duty-free	¹ 1, 066, 637	^{1 2} \$76, 798, 651	1, 188, 332	\$86, 243, 214
Cut but unset, suitable for jewelry, dutiable	707, 859	² 74, 883, 550	693, 142	² 75, 795, 826
Emeralds: Cut but not set, dutiable	45, 235	1, 564, 676	50, 931	1, 688, 429
Pearls and parts, not strung or set, dutiable:				
Natural		669, 351		² 626, 237
Cultured or cultivated		² 6, 197, 897		² 8, 024, 660
Other precious and semiprecious stones:				
Rough or uncut, duty-free		228, 939		² 280, 692
Cut but not set, dutiable		² 2, 837, 932		² 3, 116, 372
Imitation, except opaque, dutiable:				
Not cut or faceted		² 25, 885		² 40, 496
Cut or faceted:				
Synthetic		^{1 2} 298, 133		² 402, 272
Other		^{1 2} 11, 806, 853		² 11, 448, 744
Imitation, opaque, including imitation pearls, dutiable		² 19, 185		² 30, 410
Marcasites, dutiable: Real and imitation		44, 439		38, 911
Total		^{1 2} 176, 325, 491		² 187, 736, 263

¹ Revised figure.

² Owing to changes in tabulating procedures by the Bureau of the Census, data known to be not comparable with years before 1954.

⁷ Jewelers' Circular-Keystone, vol. 76, No. 11, August 1956, p. 210.

⁸ Figures on imports and exports compiled by Mae B. Price and Elsie D. Page, Division of Foreign Activities, Bureau of Mines, from records of the Bureau of the Census.

TABLE 4.—Diamonds (exclusive of industrial diamonds) imported for consumption in the United States, 1955-56, by countries

[Bureau of the Census]

Country	Rough or uncut			Cut but unset		
	Carats	Value		Carats	Value	
		Total	Average		Total	Average
1955						
North America:						
Bermuda.....	2,205	\$228,467	\$103.61			
Canada.....	5,900	569,306	96.49	127	\$14,125	\$111.22
Netherland Antilles.....				29	39,955	1,377.76
Total.....	8,105	797,773	98.43	156	54,080	346.67
South America:						
Brazil.....	4,127	199,085	48.24	113	13,427	118.82
British Guiana.....	2,566	73,104	28.49			
Venezuela.....	1,91,348	2,642,087	128.92	48	7,662	159.63
Total.....	1,98,041	2,914,276	129.73	161	21,089	130.99
Europe:						
Austria.....				7	3,674	524.86
Belgium-Luxembourg.....	102,676	10,692,952	104.14	427,422	45,354,711	106.11
France.....	9,203	730,133	79.34	4,470	869,862	194.60
Germany, West.....	1,141	11,215	9.83	48,948	3,452,716	70.54
Italy.....				136	127,461	937.21
Netherlands.....	2,573	261,443	101.61	22,243	2,633,320	118.39
Switzerland.....	29,965	1,911,100	63.78	250	58,799	235.29
United Kingdom.....	1,728,878	157,023,753	178.23	5,464	947,127	173.84
Total.....	1,874,436	170,630,596	180.77	508,940	53,447,670	105.02
Asia:						
Hong Kong.....	294	1,177	4.00			
India.....				249	29,042	116.63
Indonesia.....	130	19,497	149.98			
Iraq.....				103	9,284	90.14
Israel.....	4,136	44,821	10.84	157,326	13,735,028	87.30
Japan.....				837	80,848	96.59
Lebanon.....	549	44,750	81.61			
Malaya.....	71	12,201	171.85			
Saudi Arabia.....				2	700	350.00
Total.....	5,180	122,446	23.64	158,517	13,854,902	87.40
Africa:						
French Equatorial Africa.....	8,110	383,815	47.33			
Liberia.....	14,536	422,726	29.08			
Nigeria.....	415	6,158	14.84			
Rhodesia and Nyasaland, Federation of.....				21	8,365	398.33
Union of South Africa.....	57,814	1,520,861	26.31	40,064	7,447,444	185.89
Total.....	80,875	2,333,560	28.85	40,085	7,455,809	186.00
Grand total.....	1,066,637	76,798,651	72.00	707,859	74,833,550	105.72
1956						
North America:						
Bermuda.....	498	48,664	97.72			
Canada.....	4,929	576,212	116.90	279	22,304	79.94
Mexico.....				57	23,467	411.70
Total.....	5,427	624,876	115.14	336	45,771	136.22
South America:						
Brazil.....	2,456	112,342	45.74	253	20,196	79.83
British Guiana.....	6,595	200,740	30.44			
Colombia.....	86	12,055	140.17			
Surinam.....				85	834	9.81
Uruguay.....				75	23,000	306.67
Venezuela.....	56,996	1,644,575	28.85	156	25,363	162.58
Total.....	66,133	1,969,712	29.78	569	69,393	121.96

See footnotes at end of table.

TABLE 4.—Diamonds (exclusive of industrial diamonds) imported for consumption in the United States, 1955-56, by countries—Continued

Country	Rough or uncut			Cut but unset		
	Carats	Value		Carats	Value	
		Total	Average		Total	Average
1956—Continued						
Europe:						
Austria.....				480	\$52,800	\$110.00
Belgium-Luxembourg.....	139,965	\$16,579,867	\$118.46	422,002	46,810,415	110.92
Czechoslovakia.....				25	5,660	226.40
France.....	4,634	436,790	94.26	9,293	1,173,809	126.31
Germany, West.....	2,442	108,457	44.41	38,333	2,750,098	71.74
Italy.....				64	8,806	137.59
Netherlands.....	3,776	212,270	56.21	21,987	2,696,243	122.63
Switzerland.....	11,085	429,418	38.74	385	340,049	883.24
United Kingdom.....	810,591	60,991,614	75.24	3,526	536,427	152.13
Total.....	972,493	78,758,416	80.99	496,095	54,374,307	109.60
Asia:						
Ceylon.....				14	1,058	75.57
Hong Kong.....	76	1,662	21.87	4	419	104.75
India.....				1,424	121,254	85.15
Israel.....	2,556	51,011	19.96	145,950	13,169,447	90.23
Japan.....				1,050	88,242	84.04
Lebanon.....	89	7,666	86.13			
Malaya.....				111	15,670	141.17
Total.....	2,721	60,339	22.18	148,553	13,396,090	90.18
Africa:						
Belgian Congo.....	11,500	27,042	2.35			
British East Africa.....	74	740	10.00			
Egypt.....				77	6,674	86.68
French Equatorial Africa.....	48,012	1,242,420	25.88			
Liberia.....	35,536	1,420,676	39.98	15	4,130	275.33
Southern British Africa.....				1	487	487.00
Union of South Africa.....	46,436	2,138,993	46.06	47,496	7,898,974	166.31
Total.....	141,558	4,829,871	34.12	47,589	7,910,265	166.22
Grand total.....	1,188,332	86,243,214	72.58	693,142	75,795,826	109.35

¹ Revised figure.

² Owing to changes in tabulating procedures by the Bureau of the Census data known to be not comparable with years before 1954.

TECHNOLOGY

Articles were published on cutting and polishing spinel;⁹ sapphire polishing, using rubber-bonded wheels;¹⁰ and gem-stone drilling.¹¹ Processes and techniques used in photographing minerals in color were published.¹² A history on manufacture of synthetic diamonds, rubies, sapphires, emeralds, and their industrial uses was written.¹³ An automatic Verneuil furnace was described, and details and illustrations regarding its operation were given.¹⁴

Faustite, a newly identified mineral similar to turquoise, was discovered in the Copper King mine, Eureka County, Nev. It occurred as an apple-green vein filling in altered shale. The mineral contains

⁹ Mineralogist, How to Cut Spinel: Vol. 24, No. 12, December 1956, pp. 478, 480.

¹⁰ Mineralogist, Rubber-Bonded-Wheel Sapphire Polishing: Vol. 24, No. 11, November 1956, pp. 425-426.

¹¹ Bowser, L. E., Notes on Gem Drilling: Mineralogist, vol. 24, No. 11, November 1956, pp. 426, 428, 430.

¹² Getsinger, F. R., Photographing Minerals in Color: Arizona Highways, vol. 32, No. 11, November 1956, pp. 15-17.

¹³ Wisconsin Engineer, vol. 60, No. 6, 1956, pp. 18-20; Chem. Abs., vol. 50, No. 22, Nov. 25, 1956, column 16208-1.

¹⁴ Verma, R. K., Sirkar, G. N., and Chatterjee, S., An Automatic Verneuil Furnace: Gemmologist (London), vol. 25, No. 296, March 1956, pp. 52-56.

zinc, in addition to the regular mineral composition of turquois.¹⁵ Lazulite with a sky-blue color and hardness of 6 was found in coarse-grained crystal aggregates.¹⁶ An unusual garnet with rare cubic and octahedral faces, found between Canton and Ball Ground, Cherokee County, Ga., was described.¹⁷ Pale-blue cordierite was unearthed in a mica mine in Monroe County, Ga. This gem material was found in irregular masses up to $\frac{3}{4}$ inch across.¹⁸

Twelve mineral specimens were described, giving the synonyms, nomenclature, varieties, compositions, crystallography, physical and optical properties, tests and diagnoses, occurrence, and uses. Each mineral was illustrated in color. These mineral specimens were: Rhodochrosite, cuprite, smaltite, smithsonite, chalcopyrite, magnetite, cerussite, sodalite, molybdenite, apatite, wulfenite, and gypsum.¹⁹

A historical article was published on the mining and production of emeralds in Columbia.²⁰

The origin of gem-quality corundum found in placer deposits in Ceylon was considered to be a contact zone where syenite was intruded into and desilicated by crystalline limestone.²¹

The gem material, benitoite ($\text{BaTiSi}_3\text{O}_9$), was synthesized hydrothermally.²²

Conversion of one mineral to another was achieved in the laboratory by duplicating the conditions developed in the earth at extreme depth.²³

A comprehensive report was written on the synthetic-gem-stone industry of India.²⁴

Experiments on diamond synthesis were continued in 1956 by the General Electric Co. The chamber in which the diamonds were formed was approximately $\frac{5}{16}$ inch in diameter and 1 inch in depth. Operating pressures were increased from the original 1.5 million p. s. i. to 2.5 million p. s. i., with temperatures up to 5,000° F. About 80 percent of the raw material used was converted into diamond. The largest diamond produced was one-hundredth carat.²⁵

A standard color code for diamond pastes, showing colors used by 15 manufacturers, was issued in chart form.²⁶ Methods of determining diamond color characteristics, with illustrations in color, were described.²⁷

A mixture of powdered TiO_2 and MgO , fused in a Verneuil furnace at 1,830°–1,870° C., produced a blue-black crystal. Subsequent

¹⁵ Erd, R. C., Foster, M. D., and Proctor, P. D., Faustite, A New Mineral and Zinc Analogue of Turquois: *Am. Mineralogist*, vol. 38, No. 11–12, November–December 1953, pp. 964–972; *Ceram. Abs.*, vol. 39, No. 11, November 1956, p. 248j.

¹⁶ De, Aniruddha, Lazulite From Sini, Saraikele (Bihar): *Sci. and Culture (India)*, vol. 21, 1956, p. 746; *Chem. Abs.*, vol. 50, No. 22, Nov. 25, 1956, column 16573-e.

¹⁷ Georgia Mineral Newsletter, vol. 9, No. 1, Spring 1956, p. 19.

¹⁸ Georgia Mineral Newsletter, vol. 9, No. 2, Summer 1956, p. 73.

¹⁹ Mine and Quarry Engineering (London), *Minerals Specimens* No. 28–39: Vol. 22, No. 1, January 1956⁶ pp. 12–13; No. 2, February 1956, pp. 58–59; No. 3, March 1956, pp. 102–103; No. 4, April 1956, pp. 136–137; No. 5, May 1956, pp. 174–175; No. 6, June 1956, pp. 220–221; No. 7, July 1956, pp. 270–271; No. 8, August 1956, pp. 318–319; No. 9, September 1956, pp. 362–363; No. 10, October 1956, pp. 412–413; No. 11, November 1956⁶ pp. 458–459; No. 12, December 1956, pp. 508–509.

²⁰ Morello, Ted, The Gem of Columbia: *Americas*, vol. 8, No. 10, October 1956, pp. 21–24.

²¹ Wells, A. J., Corundum From Ceylon: *Geol. (Hertford, England)*, vol. 93, No. 1, January–February 1956, pp. 25–31.

²² Rase, D. E., and Roy, Rustum, Phase Equilibria in the System $\text{BaTiO}_3\text{-SiO}_2$: *Jour. Am. Ceram. Soc.*, vol. 38, November 1955, pp. 389–395.

²³ Mining Journal (London), The Creation of Minerals: Vol. 246, No. 6284, Jan. 27, 1956, p. 125.

²⁴ Sarma, M. V., Manufacture of Synthetic Gems in India: [1956 (?) Revision of an earlier publication], 8 pp. The Huxley Press, 114 Armenian Street, Madras, India.

²⁵ Journal of Gemmology (London): Vol. 5, No. 7, July 1956, p. 387.

²⁶ Industrial Diamond Review, Color Codes for Diamond Pastes: Vol. 16, No. 188, 1956, pp. 136–137; *Ceram. Abs.*, vol. 39, No. 11, November 1956, p. 231e.

²⁷ Custers, J. F. H., Colors in Diamonds: *Optima (Johannesburg)*, vol. 6, No. 2, June 1956, pp. 48–51.

oxidation at decreasing temperatures from 1,100°–500° C. produced a substantially white material exhibiting asterism.²⁸ Patents were obtained on a lapidary wheel²⁹ and a lapidary template and dopstick.³⁰

Many agates can readily be colored by heat treating at 200°–300° C., cooling, and then applying inorganic salts by various methods.³¹

Polarized light regularly transmitted by fibrous chalcedony and the character of the spectra exhibited by iridescent agate were described.³²

In Japan the standard pearl necklace is 17 inches long, and the average center pearl is 7–7½ millimeters. The largest pearl produced is 11 millimeters but requires 5 to 6 years to grow. Normally, a 2-year cycle produces the average-size pearl.³³ Seeds for pearls and pearl oysters treated for several minutes in thyroxine solution, and cultured in the usual manner, gave nearly 100 percent pink or rainbow-colored pearls.³⁴

WORLD REVIEW

In 1956 world diamond production increased 1.6 million carats, or 7 percent, over 1955. Of the world total, 21 percent was of gem quality. Countries reporting increases in production were: Sierra Leone, 35 percent; South-West Africa, 22 percent; French West Africa, 22 percent; Tanganyika, 10 percent; Belgian Congo, 7 percent; and French Equatorial Africa, 6 percent.

Australia.—A joint Australian, Japanese, and United States pearl-culture farm was established in Brecknock Harbor between Augustus Island and the Australian mainland on June 20, 1956. It was reported that 35,000 immature oysters would be planted the first year. Most of the pearls produced were to be sold in the United States.³⁵

Belgian Congo.—Belgian Congo, the world's largest producer of diamonds, increased production nearly 1 million carats in 1956 over 1955; 5 percent was gem quality.³⁶ It was reported that inquiries were made by United States dealers regarding the feasibility of obtaining increased quantities of mineral specimens and semi-precious stones.³⁷ A low-grade diamond deposit in Belgian Congo being developed by the Société Minière de Beceka, in 1956, undertook to lower costs and increase production by using a heavy-medium separation process in its washing and concentration plant.³⁸

Colombia.—The quality and quantity of emeralds produced in Colombia during 1956 were below expectations. Three mines were in operation, one of which was owned by a United States company.³⁹

French Equatorial Africa.—A 149-carat diamond was found in the mine, Société Minière de l'Est Oubangui. It was estimated that 40

²⁸ Merker, Leon (assigned to National Lead Co.), Monocrystalline Rutile: U. S. Patent 2,760,874, Aug. 28, 1956.

²⁹ Vorado, P. A., Lapidary Wheel: U. S. Patent 2,745,225, May 15, 1956.

³⁰ Ponting, F. W., Lapidary Template and Dopstick: U. S. Patent 2,735,246, Feb. 21, 1956.

³¹ Gemmologist (London), Agate Coloring by Heat Treatment: Vol. 25, No. 304, November 1956, pp. 208–209.

³² Raman, C. V., and Jayarman, A., Optical Behavior of Cryptocrystalline Quartz: Proc. Indian Acad. Sci., vol. 41A, January 1955, pp. 1–6; Ceram. Abs., vol. 39, No. 4, April 1956, p. 84f.

³³ U. S. Consulate, Kobe-Osaka, Japan, State Department Dispatch 45: Sept. 13, 1956, p. 10.

³⁴ Takaoka, Susumu, Pink or Rainbow-Colored Cultured Pearls: Japanese Patent 1330, Feb. 26, 1955; Chem. Abs., vol. 50, No. 22, Nov. 25, 1956, column 17260b.

³⁵ U. S. Consulate, Perth, Australia, State Department Dispatch 1: July 27, 1956, p. 6.

³⁶ Gemmologist (London), vol. 25, No. 294, January 1956, p. 8.

³⁷ U. S. Consulate, Elisabethville, Belgian Congo, State Department Dispatch 45: Feb. 20, 1956, p. 1.

³⁸ U. S. Consulate, Elisabethville, Belgian Congo, State Department Dispatch 40: Mar. 19, 1957, pp. 1, 5.

³⁹ U. S. Embassy, Bogota, Colombia, State Department Dispatch 304: Nov. 9, 1956, p. 1.

TABLE 5.—World production of diamonds, 1947-51 (average) and 1952-56, by countries, in thousand carats¹ (including industrial diamonds)

	1947-51 (average)	1952	1953	1954	1955	1956
Africa:						
Angola.....	728	743	729	722	743	740
Belgian Congo.....	8,332	11,609	12,580	12,619	13,041	14,013
French Equatorial Africa.....	119	163	140	153	137	146
French West Africa.....	91	136	180	216	318	390
Ghana (Gold Coast) ²	1,076	2,190	2,181	2,135	2,277	2,127
Sierra Leone.....	539	451	473	399	930	1,427
South-West Africa.....	325	541	617	684	797	970
Tanganyika.....	141	143	172	326	326	359
Union of South Africa:						
Lode.....	1,259	2,093	2,398	2,544	2,277	2,235
Alluvial ³	273	283	300	314	310	300
South America:						
Brazil ²	235	200	200	200	200	300
British Guiana.....	35	38	35	30	33	30
Venezuela.....	63	98	85	97	141	94
Other countries ²	3	5	5	5	5	5
Grand total (rounded).....	13,225	18,695	20,095	20,445	21,540	23,135

¹ Rounded from Jewelers' Circular-Keystone, 32d Annual Report on the Diamond Industry: 1956, p. 7.

² Estimated.

³ Including unofficial production and Liberia.

⁴ Includes alluvial diggings at Kleinsee.

⁵ Including State owned mines of Namaqualand.

to 50 percent of the diamonds mined in French Equatorial Africa was of gem quality.⁴⁰

India.—In 1956 it was reported that the Switzerland synthetic gem industry was establishing a similar enterprise in India, to be called the Indo-Swiss Synthetic Gem Manufacturing Co., Ltd. Production would start early in 1957, with an annual production of 12 tons. In 1956 India consumed about 50 tons of synthetic gem materials in the cutting of gem stones.⁴¹

Israel.—In 1956 diamond exports increased 14 percent by weight and 19 percent by value over 1955. About 20 percent of the imported material was purchased from sources other than the London Diamond Syndicate. The United States was the largest purchaser, with 54 percent of the diamond exports.⁴²

Japan.—It was estimated that in 1956 \$1 million worth of hand-cut or carved semiprecious stones was produced in Japan. Wide varieties of semiprecious stones were imported by Japan for the hand-carving industry.⁴³

Large losses in the pearl industry, caused by typhoons, were announced. Investigations were made to determine the possibility of moving the pearl industry to the Inland Sea and of establishing a crop of 30 million oysters the first year.⁴⁴

Liberia.—A diamond rush was reported in western Liberia, around the Bomi Hills, and other areas.⁴⁵

⁴⁰ U. S. Consulate, Elisabethville, French Equatorial Africa, State Department Dispatch 18: Oct. 31, 1956, p. 3.

⁴¹ Bureau of Mines, Mineral Trade Notes: Vol. 44, No. 3, March 1957, pp. 20-21.

⁴² U. S. Embassy, Tel Aviv, Israel, State Department Dispatch 486: Mar. 22, 1956, pp. 1, 2.

⁴³ U. S. Consulate General, Yokohama, Japan, State Department Dispatch 22: Sept. 17, 1956, pp. 1, 2.

⁴⁴ U. S. Consulate, Nagoya, Japan, State Department Dispatch 16: Oct. 8, 1956, p. 5.

⁴⁵ U. S. Embassy, Monrovia, Liberia, State Department Dispatch 368: June 13, 1956, pp. 5, 6.

Thailand.—Few precious and semiprecious gem stones originate in Thailand—most were imported, cut and polished, and exported. In 1956 the value of imports was \$305,000 and exports \$660,000.⁴⁶

Tanganyika.—In 1956 Tanganyika produced 10 percent more diamonds than in 1955. The Williamson diamond mine produced 96 percent, and Alamasi, Ltd., mined the balance.⁴⁷ A new diamond-recovery plant with a crude-material capacity of 7,000 to 7,500 tons per day was installed at the Williamson diamond mine.⁴⁸

Union of South Africa.—A concession was obtained by the Planned Investment Trust, Ltd., Johannesburg, with Canadian financial support, to prospect for base metals and diamonds and other precious stones.⁴⁹ In 1956 Mallin diamond mines, Zwarttruggens, Transvaal, Union of South Africa, expanded its diamond production by mining 6,500 tons a month, averaging 10,500 carats; 20 percent was gem quality.⁵⁰

⁴⁶ U. S. Embassy, Bangkok, Thailand, State Department Dispatch 695: Apr. 4, 1956, p. 6.

⁴⁷ U. S. Consulate, Dar es Salaam, Tanganyika, State Department Dispatch 139: May 23, 1956, pp. 24, 25.

⁴⁸ U. S. Consulate, Dar es Salaam, Tanganyika, State Department Dispatch 139: May 23, 1956, p. 25.

⁴⁹ U. S. Consulate, Johannesburg, Union of South Africa, State Department Dispatch 108: Nov. 7, 1956,

p. 1.

⁵⁰ *Gemmologist* (London), vol. 25, No. 294, January 1956, p. 8.

