

Gem Stones

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AS IN past years, gem production in the United States resulted largely from the efforts of amateur lapidaries who spent their leisure time searching for cuttable material. The many varieties of quartz, such as agate, jasper, and petrified wood, were the chief materials recovered in this way.

A few small gem-mining companies operated deposits chiefly for turquoise, opal, tourmaline, and jade. Because only a small percentage of the total was produced on a commercial scale, precise statistics on the value of the domestic output of gems cannot be compiled. The value was estimated at \$500,000 to \$600,000.

The popularity of gem cutting as a hobby has increased tremendously in the past 10 years. An editor of one of the leading magazines in this field estimated that there were perhaps 50,000 home gem-cutting shops, and the total value of gems produced was millions of dollars. Almost all such production remained in private collections without passing through trade channels.

DOMESTIC PRODUCTION

In the following section the principal gems produced domestically in 1953 and areas for which information was obtained are given in detail. Materials produced in small quantities and their sources are listed in table 1.

Agate.—There was no significant change in agate production in the United States in 1953 compared with 1952.

In Oregon an estimated 15 tons of agate was recovered, with a total value of about \$12,000. The Fulton agate beds, Jefferson County, reportedly produced about 7 tons valued at \$1,000 per ton. An area in Crook County northeast of Prineville, reportedly yielded 11,500 pounds of agate valued at 10 cents per pound, while 2,000 pounds was reported found in the Crooked River area.

Production of agate in Montana was reported to have been about 2,000 tons; from the quantity worked stones valued at perhaps \$15,000 were cut.

In Texas the Marfa-Alpine area in Presidio and Brewster Counties and the Big Bend area in Brewster County were the chief sources, with a reported production valued at about \$8,000.

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TABLE 1.—Localities in the United States where gem materials were reported to have been found in 1953

State, county, and locality	Gem material
Alabama: Jackson County: Bridgeport.....	Chalcedony.
Alaska:	
Homer.....	Black petrified wood.
Jade Mountain, north of Kobuk River.....	Jade (nephrite).
Sequoia (southeast Alaska).....	Petrified wood.
Arizona:	
Apache County: Apache Indian Reservation....	Obsidian and peridot.
Cochise County: Mule Mountain.....	Agate and amethyst.
Gila County:	
Globe-Miami area.....	Azurite, chrysocolla, epidote, garnet, obsidian, opal, amethyst, carnelian, bloodstone, agate, agatized wood, crocidolite, serpentine, turquois, and peridot.
Rice.....	Peridot.
Roosevelt Dam.....	Amethyst.
Graham County:	
Ash Spring Canyon, San Francisco River....	Petrified wood, banded agate (blue and green), and obsidian.
Moonshine Canyon, San Francisco River....	Opal, opalized wood, onyx, and chalcedony.
Potter Canyon, San Francisco River.....	Turquois, azurite, malachite, agate, and opalized wood.
Greenlee County:	
Clifton.....	Agate.
Coronado Trail, Metcalf.....	Turquois, malachite, azurite, variseite, chalcedony, amethyst, garnet, agate (blue banded), and chrysocolla.
Granville.....	Onyx.
Guthrie, York, and Sheldon.....	Chalcedony, turquois, azurite, opal, onyx, petrified and opalized wood, agate (black banded, orchid), quartz (rose and white).
Morenci.....	Turquois and agate.
Maricopa County:	
Bronco Canyon.....	Agate and jasper.
Cavecreek.....	Onyx, agate, petrified wood.
Fish Creek.....	Agate.
Gila Bend Mountains.....	Chalcedony.
Lake Pleasant—Slow Springs.....	Agate.
New River.....	Agate, opal, and jasper.
Phoenix.....	Amethyst and agate.
Saddle and Fourth of July Mountains.....	Agate and chalcedony.
Seven Springs.....	Jasper.
Wickenburg.....	Agate.
Wintersburg.....	Do.
Navajo County:	
Holbrook.....	Agatized wood.
Navajo Indian Reservation.....	Garnet.
Pinal County: Perlite.....	Obsidian.
Yavapai County:	
Bradshaw Range.....	Agate.
Castle Hot Springs.....	Do.
Limestone Canyon—	
Cottonwood Springs.....	Agate (purple banded); petrified, opalized, and agatized wood; chalcedony; limonite; jasper (red and green); carnelian; and moonstone.
Rock Springs.....	Agate.
Yuma County:	
Bouse.....	Jasper and agate.
Castle Dome district.....	Agate, jasper, opal, and petrified wood.
Arkansas:	
Garland County.....	Rock quartz.
Hot Spring County: Magnet.....	Smoky quartz.
Montgomery County.....	Rock quartz.
California:	
Alameda County: Berkeley Hill.....	Agate.
Calaveras County.....	Chrysoprase.
Del Norte County: Crescent City.....	Agate, jasper, and petrified wood.
El Dorado County: Placerville.....	Petrified and opalized wood, jasper, and agate.
Fresno County: Coalinga district.....	Jasper, chert, and petrified wood.
Humboldt County: Eel River and Van Duzen River.....	Jasper and jade.
Imperial County:	
Black Mesa.....	Petrified wood and dumortierite.
Picacho district.....	Agate.
Winterhaven.....	Agate and fossil wood.
Inyo County:	
Bishop area.....	Garnet, epidote, clear and smoky quartz crystal, obsidian, petrified wood, agate, and jasper.
Owl Springs.....	Agate.

TABLE 1.—Localities in the United States where gem materials were reported to have been found in 1953—Continued

State, county, and locality	Gem material
California—Continued	
Kern County:	
Horse Canyon.....	Agate and jade.
Rosamond.....	Rhodonite.
Mendocino County: Northern part.....	Jade, jasper, opal, and quartz.
Monterey County:	
Monterey Coast.....	Agate, nephrite, and jadeite.
Monterey.....	Jade, rhodonite, jasper, and agate.
Plumas County.....	Rose quartz.
Riverside County:	
Banning.....	Corundum.
Beaumont.....	Garnet, epidote, and tourmaline.
Cabazon.....	Chalcedony and agate.
Hemet.....	Rose quartz, tourmaline, topaz, and beryl.
Juniper Flats (between Lakeview and Hemet).....	Aquamarine.
Near Wiley Well.....	Agate.
Nuevo.....	Asteriated rose quartz.
Thomas Mountain (between Hemet and Palm Springs).....	Rose quartz and amazonstone.
San Benito County: Dallas gem mine.....	Benitoite, nephrite, and jadeite.
San Bernardino County:	
Mojave and Needles district.....	Jasper, agate, and bloodstone.
Yucaipa and Mentone district.....	Rhodonite.
San Diego County:	
George Ashley mine, Pala.....	Kunzite, beryl, tourmaline, and quartz.
Himalaya and Herriot Mines.....	Tourmaline, beryl, topaz, and quartz.
Mesa Grande district.....	Tourmaline.
Pala.....	Kunzite.
Ramona.....	Tourmaline and garnet.
Rincon.....	Tourmaline and kunzite.
San Diego.....	Do.
San Luis Obispo County:	
Cayucos.....	Quartz.
Morro Bay.....	Jasper and jade.
Nipomo area.....	Agate, jasper, and moss agate.
Northern part of county.....	Jasper.
Shell Beach.....	Onyx (travertine).
Santa Clara County: Morgan Hill and Stone Canyon.....	Jasper.
Siskiyou County: Happy Camp district.....	Nephrite, jade, and idocrase.
Trinity County.....	Agate, jasper, and rhodonite.
Colorado:	
Chaffee County:	
Brown Canyon.....	Petrified wood and agate.
Salida.....	Jasper.
Delta County: Roubideau Canyon.....	Do.
Elbert County: Bijou Basin (near Elbert).....	Opalized wood.
El Paso County:	
Cheyenne Canon.....	Garnet and tourmaline.
Colorado Springs.....	Topaz.
Tarryall Mountains.....	Do.
Fremont County:	
Canon City.....	Agate.
Garden Park.....	Do.
Larimer County:	
Red Feather Lakes.....	Amethyst.
Wellington.....	Amazonstone.
Mesa County:	
Fruita.....	Agate.
Unaweep Canyon.....	Amethyst.
Whitewater.....	Flint and petrified wood.
Montrose County: Crystal.....	Amazonstone, phenacite, smoky quartz, and topaz.
Saguache County:	
Poncho Pass.....	Agate.
Villa Grove.....	Turquoise.
Teller County:	
Clyde.....	Topaz.
Cripple Creek.....	Zircon.
Divide.....	Amethyst.
Florissant.....	Petrified wood.
Pike's Peak.....	Agate.
Florida: Hillsborough County: Tampa Bay (Ballast Point).....	Agatized coral.
Georgia:	
Cobb County: Kennesaw Mountain (near Marietta).....	Topaz.
Morgan County: Buckland.....	Amethyst.
Paulding County: Dallas.....	Garnet.
Rabun County: Clayton area.....	Ruby, garnet, amethyst, and smoky quartz.

TABLE 1.—Localities in the United States where gem materials were reported to have been found in 1953—Continued

State, county, and locality	Gem material
Georgia—Continued	
Troup County: La Grange.....	Rose quartz, aquamarine, and amethyst.
Wilkes County: Graves Mountain (11 miles from Washington).	Rutile, kyanite, and lazulite.
Idaho:	
Beneah County: Emerald and Ruby Creeks.....	Star garnet.
Blaine County: Muldoon location.....	Agate and petrified wood.
Butte County: Craters of the Moon.....	Do.
Canyon County: Caldwell.....	Agate and agatized wood.
Lemhi County: Salmon.....	Opalized wood.
Nez Perce County: Lewiston.....	Opal, star garnet, petrified wood, agate, jasper, and sapphire.
Owyhee County: Bruneau Dester location.....	Petrified wood, jasper, opalized wood, and agate.
Indiana: Elkhart County: Goshen.....	Agate and jasper.
Iowa:	
Lee County: Fort Madison.....	Jasper.
Page County: Clarinda.....	Agate.
Kansas:	
Franklin County: Ottawa.....	Petrified wood.
Wallace County: Wallace.....	Opal.
Louisiana:	
Ouachita County: West Monroe.....	Agate, jasper, and petrified wood.
Vernon County: Leesville.....	Petrified wood.
Maine: Androscoggin County: Minot.....	Garnet.
Maryland:	
Baltimore County:	
Baltimore Harbor.....	Flint.
Butler.....	Garnet.
Dyer Quarry.....	Serpentine.
Calvert County: Calvert Cliffs.....	Jasper.
Carroll County: New Windsor.....	Azurite and malachite.
Cecil County: State Line Chrome Pits.....	Serpentine.
Frederick County: Libertytown.....	Malachite.
Harford County: Cardiff.....	Serpentine.
Washington County: Camp Ritchie.....	Cuprite.
Michigan:	
Emmet County: Petoskey.....	Fossil coral ("Petoskey stone").
Keweenaw County:	
Ahmeek.....	Agate and thomsonite.
Delaware mines.....	Chlorastrolite.
Isle Royale beaches.....	Agate and thomsonite.
Minnesota:	
Carlton County: Moose Lake.....	Agate and jasper.
Cook County:	
North shore of Lake Superior.....	Thomsonite and agate.
Tom Lake.....	Do.
Lake County: Grand Marais.....	Do.
Mississippi:	
Harrison County: Biloxi.....	Jasper.
Wayne County: Waynesboro.....	Petrified wood.
Missouri: Cape Girardeau County: Ozark Mountains (west of Cape Girardeau).	Agate and jasper.
Montana:	
Custer County: Miles City.....	Agate and sapphire.
Fergus County: Lewistown.....	Sapphire.
Granite County:	
Anaconda and Meyers Gulches.....	Do.
West fork of Rock Creek.....	Do.
Lewis and Clark County: Helena.....	Sapphire, garnet, ruby, and spinel.
Madison County.....	Tourmaline.
Missoula County: Lola Creek district.....	Smoky and colorless quartz.
Park County to Dawson County: Yellowstone River.....	Agate.
Powell County: Dry Cottonwood Creek Gulch.....	Sapphire.
Prairie County: Terry.....	Agate and petrified wood.
Silver Bow County: Butte.....	Sapphire.
Yellowstone County: Billings.....	Moss agate.
Nebraska:	
Jefferson County:	
Fairbury.....	Jasper, agate, and petrified wood.
Steele City.....	Do.
Sioux County: Orella.....	Agate, chalcedony, and petrified wood.
Nevada:	
Clark County: Las Vegas Wash.....	Amethyst.
Douglas County.....	Topaz.
Humboldt County: Virgin Valley, Thousand Creek.....	Opal and rhodonite.
Lander County: Battle Mountain area.....	Turquois.

TABLE 1.—Localities in the United States where gem materials were reported to have been found in 1953—Continued

State, county, and locality	Gem material
Nevada—Continued	
Lincoln County:	
Acoma district.....	Chalcedony.
Bristol silver-mining district.....	Chrysocolla and malachite.
Hiko district.....	Jasper.
Washoe County: Sparks.....	Petrified wood, agate, jasper, idocrase, garnet, and obsidian.
New Hampshire:	
Cheshire County:	
Alstead.....	Aquamarine.
Marlow.....	Green tourmaline.
Surry.....	Amethyst.
Walpole.....	Blue tourmaline.
Westmoreland.....	Amethyst.
Coos County	
Milan.....	Topaz.
Stark.....	Amethyst and smoky quartz.
Grafton County: Plymouth.....	Aquamarine.
Rockingham County: Raymond (Chandler field-spar mine).	Spodumene.
Sullivan County: Tempster.....	Aquamarine.
New Jersey:	
Morris County: Stirling.....	Carnelian.
Passaic County: New Street quarry in Paterson.	Prehnite.
Sussex County: Franklin.....	Friedelite.
New Mexico:	
Luna County: Deming.....	Agate.
Santa Fe County: Santa Fe.....	Beryl.
New York:	
Eric County: Buffalo.....	Satin-spar (calcite)
Orange County: Forest of Dean magnetite mine.	Sunstone.
North Carolina:	
Ashe County.....	Garnet, moonstone, rutile, aquamarine, and golden beryl.
Avery County: Cranberry.....	Unakite.
Macon County: Caler Fork of Cowee Creek.....	Corundum.
Orange County: Hillsboro.....	Moss agate.
North Dakota: McLean County: Coleharbor.....	Petrified wood.
Oklahoma:	
Canadian County: El Reno.....	Jasper, petrified wood, and agate.
Comanche County: Zircon mine, Wichita Mountain.	Zircon.
Dewey County: Taloga.....	Jasper, petrified wood, and agate.
Greer County: Mangum.....	Alabaste.
Jackson County: Altus.....	Smoky quartz.
Ottawa County: Miami-Oklahoma district.....	Sphalerite.
Fushmataha County: Antlers.....	Green quartz.
Oregon:	
Baker County: Greenhorn.....	Agatized fern.
Crook County:	
Carey Ranch.....	Agate.
Crooked River country.....	Moss agate.
Eagle Rock.....	Agate.
Ochoco Mountains, Lucky Strike bed.....	Moss agate and carnelian.
Powell Butte.....	Agate.
Prineville.....	Do.
View Point beds.....	Do.
Curry County: Brookings.....	Jade.
Deschutes County.....	Moss agate and carnelian.
Harney County:	
Glass Butte obsidian field.....	Obsidian.
Steens Mountains.....	Agate.
Jackson County: Medford.....	Agate, jasper, and petrified wood.
Jefferson County:	
Fulton agate beds.....	Agate.
Madras.....	Amethyst.
Pony Butte-Priddy Ranch.....	Agate.
Lane County: Bear Creek.....	Do.
Malheur County: Sucker Creek.....	Agate, jasper, and petrified wood.
Folk County: Dallas.....	Jasper, agate, and petrified wood.
Union and Wallowa Counties: Wallowa Mountains.	Agate.
Wheeler County: Fossil district.....	Do.
Pennsylvania:	
Adams County: Greenstone.....	Cuprite.
Lancaster County: Woods mine.....	Serpentine.

TABLE 1.—Localities in the United States where gem materials were reported to have been found in 1953—Continued

State, county, and locality	Gem material
South Carolina:	
Anderson County: Pelzer.....	Tourmaline.
Chesterfield County: Chesterfield (Old Brewer gold mine).....	Topaz.
Florence County: High Hill Creek.....	Petrified wood.
South Dakota:	
Custer County:	
Black Hills and Bad Lands.....	Rose quartz, star beryl, jasper, jade, chert, and agate.
Custer.....	Beryl, rose and star quartz, and agate.
Pennington County: Keystone.....	Beryl, rose and star quartz, and tourmaline.
Tennessee: Carter County: Roan Mountain.....	Unakite.
Texas:	
Brewster County:	
Alpine.....	Agate.
Rio Grande River and Big Bend area.....	Agate and jasper.
DeWitt County.....	Agate, agatized and opalized wood, and jasper.
Duval County.....	Do.
Fayette County: Muldoon.....	Opalized and petrified wood.
Gonzales County:	
Gonzales.....	Do.
Nixon.....	Do.
Hidalgo County: Mission.....	Agate.
Lee County: Giddings.....	Opalized and petrified wood.
Llano County: Llano.....	Amethyst, garnet, smoky quartz, quartz, and black tourmaline.
Mason County: Streeter.....	Topaz.
Potter County: Amarillo.....	Petrified wood.
Presidio County: Maria.....	Agate and jasper.
Trinity County: Trinity.....	Opalized and petrified wood.
Walker County: Huntsville.....	Do.
Webb County: Laredo.....	Agate.
Zapata County: Zapata and Falcon Dam on Rio Grande River.....	Do.
Utah:	
Box Elder County: Lucin.....	Variscite.
Garfield County: Escalante.....	Agate, dinosaur bone, and petrified wood.
Kane County: Orderville.....	Agate.
Millard County: Black Rock.....	Obsidian.
Salt Lake County: Murray.....	Onyx.
Sevier County: Salina.....	Agate.
Tooele County: Dugway Pass.....	Quartz.
Washington County: Hurricane.....	Agate.
Wayne County:	
Hanksville.....	Agate and petrified wood.
Torrey.....	Petrified wood, dinosaur bone, jasper, and agate.
Vermont: Windsor County: Chester.....	Pyrite.
Virginia: Rockbridge County: Vesuvius.....	Unakite.
Washington:	
Cowlitz County: Kalama.....	Carnelian and sardonyx.
Kittitas County:	
Cle Elum.....	Agate.
Ellensburg.....	Do.
Horse Canyon.....	Chalcedony.
Lewis County:	
Chehalis.....	Carnelian and sardonyx.
Toledo.....	Do.
Yakima County: Toppenish.....	Do.
Wisconsin:	
Ashland County: Chippewa River.....	Jasper.
Clark County: Owen.....	Agate and jasper.
Wyoming:	
Carbon County: Kortez Dam.....	Jade (nephrite).
Fremont County:	
"Cottonwood-Haypress" and Warm Springs.....	Do.
Dubois.....	Agate.
Lander.....	Jade (nephrite) and agate.
North side Beaver Divide and Green Mountains.....	Jade (nephrite), iris agate, moss agate, jasper, agatized wood, sapphire, garnet, aventurine, hematite, and serpentine.
Sweetwater County:	
Agate fields.....	Agate.
Eden Valley.....	Petrified wood.
Between Liman and Little America.....	Agate.

Agate valued at \$2,200 was found in San Bernardino County, Calif., principally in the Mojave Desert region. The value of gem stones from other areas in California, as shown in table 1, is not known.

The total production of agate in Arizona was reported to be 12 tons, valued at about \$12,000. The principal localities were the Saddle Mountain area, in Maricopa, Pinal, and Graham Counties, in the Bradshaw Range east of Wickenburg, Maricopa County, and near Holbrook, Navajo County, from areas just outside the Petrified Forest National Monument.

The agate fields near Deming, Luna County, N. Mex., reportedly yielded about 50 tons of material (value not reported). Production from the Salida and Pike's Peak area, Chaffee County, Colo., was valued at \$2,000. In Florida production of agatized coral from Tampa, Hillsborough County, was reported as 1,000 pounds, valued at \$3,000.

The Iris and Fairburn agate were described in 1953.⁴

Jade.—The decline in jade mining in Wyoming, noted in the past several years, continued in 1953 owing to depletion of known deposits. There was virtually no production of good-quality material worth \$30 to \$100 per pound. Production was reported as follows: Apple green, 100 pounds at \$30 per pound; black, olive, etc., 2,000 pounds at \$1 per pound; snowflake, 1,500 pounds at \$2 per pound.

A jade boulder (possibly idocrase) weighing 1,350 pounds was found in Shasta County, Calif., and it was estimated that after cutting it may be worth about \$25,000.⁵ A small quantity of jade, none of fine quality, was produced in Mendocino, Monterey, and San Benito Counties, Calif.

The Empire Jade Co. and the Shungnak Jade Products Co. produced a small quantity of nephrite jade from the Shungnak district, Northwestern Alaska region, in 1953. By careful selection and cutting gem-quality jade was obtained and made into jewelry. Scraps from the cutting and inferior-quality grade, unsuitable for cutting, were cut into blocks and sold to tourists as souvenirs.

Three articles were published in 1953 on jade.⁶

Opal.—The opal mines in Virgin Valley, Humboldt County, Nev., produced opal valued at approximately \$60,000.

Topaz.—Topaz continued to be produced from the Streeter-Kotempse area of Mason County, Tex. Both white and blue topaz were found by amateur gem collectors by washing and sifting stream gravels in the area. The 1953 production was reported as 10,000 grams, with an estimated value ranging from \$4,000 to \$10,000.

Tourmaline.—Operations in the famous gem-producing area of Mesa Grande, San Diego County, Calif., produced more tourmaline than in the past several years. Production from the Himalaya mine, operated by R. R. Potter, was reported as 168 pounds, valued at \$6,000. Morganite (pink beryl) also was produced, at a value of \$3,000.

⁴ Jones, F. T., The Iris Agate Described: *Mineralogist*, vol. 21, No. 1, January 1953, pp. 3-10.

Putnam, G. G., Fairburn Agate: *Mineral Notes and News*, No. 187, April 1953, pp. 8, 43.

⁵ California Mining Journal, vol. 23, No. 2, October 1953, p. 30.

⁶ Webster, Robert, Jade and Jadelike Minerals: *Mineralogist*, vol. 21, No. 12, December 1953, pp. 435-438.

Long, F. W., Some Alaska Jade Trails: *Mineralogist*, vol. 21, Nos. 6-7-8, June-August 1953, pp. 243-249, 253, 260, 262, 264, 266, 268, 270.

Halphern, J. M., Arctic Jade: *Rocks and Minerals*, vol. 28, No. 5-6, May-June 1953, pp. 237-242.

Turquoise.—Principal production of turquoise during 1953 was from mines in the vicinity of Battle Mountain, Humboldt County, Nev. The Royal Blue Mines Co., operated by Lee F. Hand of Battle Mountain, reported producing turquoise valued at more than \$110,000. About 2,000 pounds of good grade turquoise and 3,000 pounds of lighter colored material was produced in Arizona from the Miami-Globe district, Gila County. A small quantity of fine-quality turquoise was produced from Villagrove Turquoise Lode, near Villagrove, Saguache County, Colo.

SYNTHETIC GEMS

Synthetic star sapphire and ruby gem stones were produced in Europe and the United States in 1953. Production by domestic industry declined sharply in 1953 compared with 1952 because of increased imports of foreign synthetic stones, which were sold at lower prices than similar stones produced in the United States. Linde Air Products Co., Division of Union Carbide & Carbon Corp., a producer of synthetic star stones, petitioned the United States Tariff Commission to ban imports on these products originating in Europe.⁷

Synthetic emerald was produced only by the Chatham Research Laboratories in San Francisco, Calif. Production in 1953 was essentially the same as in 1952—about 60,000 carats, of which 50 percent was low-quality, 40 percent medium-quality, and 10 percent fine gem quality.

A small production of titania (synthetic rutile) was reported by two United States manufacturers.

The cultured-pearl industry in Japan, which had nearly regained its prewar status, was set back by a typhoon which destroyed much of the crop that was to have been harvested in late 1953. In some areas losses as high as 60 percent of the crop were reported. The damage was expected to cause a 20-percent rise in cultured-pearl prices. Major purchasers of cultured pearls urged the Japanese Government to establish marketing quotas to prevent flooding of the market with inferior quality material.

CONSUMPTION

Total sales of diamonds and other gem stones by retail jewelers in the United States declined slightly in 1953 compared with 1952. Total sales of diamonds, including both gem and industrial, by the Central Selling Organization on behalf of all major producers amounted to \$176,500,000 compared with \$201,600,000 in 1952. Sales of gem diamonds by the Diamond Trading Co. during 1953 were \$121,-341,000, a small decrease compared with 1952.

Large quantities of semiprecious gem stones were collected in the United States by gem-stone enthusiasts. The stones were cut and polished in home lapidary shops for handmade jewelry or private collections or by commercial lapidary shops. Activity in this field has been increasing through the efforts of several technical journals and local gem societies.

⁷ Chemical and Engineering News, vol. 31, No. 35, Aug. 31, 1953, pp. 3552-3553.

FOREIGN TRADE ³

Imports of gem stones into the United States increased 4 percent in 1953 compared with 1952 (table 2). Diamonds ranked first, with 83 percent of the imports, based on value, followed by imitation stones (synthetic and other), 12 percent; and pearls (natural and cultured), 3 percent, as shown in table 2.

TABLE 2.—Precious and semiprecious stones (exclusive of industrial diamonds) imported for consumption in the United States, 1952-53

[U. S. Department of Commerce]

Commodity	1952		1953	
	Carats	Value	Carats	Value
Diamonds:				
Rough or uncut (suitable for cutting into gem stones), duty-free.....	1709, 043	\$52, 192, 621	733, 630	\$57, 010, 629
Cut but unset, suitable for jewelry, dutiable.....	438, 546	51, 671, 643	444, 247	50, 549, 942
Emeralds:				
Rough or uncut, duty-free.....	8, 790	22, 213	15, 561	27, 987
Cut but not set, dutiable.....	11, 162	449, 726	26, 953	320, 739
Pearls and parts, not strung or set, dutiable:				
Natural.....		465, 165		264, 873
Cultured or cultivated.....		3, 373, 383		3, 769, 758
Other precious and semiprecious stones:				
Rough or uncut, duty-free.....		226, 632		203, 667
Cut but not set, dutiable.....		2, 125, 456		2, 218, 868
Imitation, except opaque, dutiable:				
Not cut or faceted.....		97, 502		40, 720
Cut or faceted:				
Synthetic.....		¹ 536, 047		677, 029
Other.....		¹ 13, 413, 526		14, 872, 795
Imitation, opaque, including imitation pearls, dutiable.....		39, 142		127, 641
Marcasites, dutiable:				
Real.....		75, 285		94, 813
Imitation.....		11, 061		2, 589
Total.....		¹ 124, 699, 402		130, 182, 050

¹ Revised figure.

TABLE 3.—Diamonds (exclusive of industrial diamonds) imported for consumption in the United States, 1952-53, by countries

[U. S. Department of Commerce]

Country	Rough or uncut			Cut but unset		
	Carats	Value		Carats	Value	
		Total	Average		Total	Average
1952						
Australia.....				142	\$41, 882	\$294. 94
Belgium-Luxembourg.....	4, 852	\$430, 417	\$88. 71	186, 682	22, 956, 814	122. 97
Bermuda.....	9, 545	300, 102	31. 44			
Bolivia.....	71	2, 119	29. 85			
Brazil.....	9, 719	479, 114	49. 30	2, 056	242, 763	118. 08
British Guiana.....	1, 061	53, 855	50. 78	22	3, 349	152. 23
British Malaya.....	1, 723	115, 367	66. 96			
Canada.....	3, 847	383, 463	99. 68	169	36, 694	217. 12
Denmark.....				15	2, 528	168. 53
France.....	50, 490	1, 075, 560	21. 30	784	321, 310	409. 83
French Equatorial Africa.....	13, 976	396, 924	28. 40			
French Morocco.....				6	602	100. 33
Germany, West.....				17, 658	1, 364, 251	77. 26
India.....				2, 821	25, 539	9. 05
Indonesia.....				14	2, 532	180. 86

¹ Figures on imports and exports compiled by Mae. B. Price and Elise D. Page, Division of Foreign Activities, Bureau of Mines, from records of the U. S. Department of Commerce.

TABLE 3.—Diamonds (exclusive of industrial diamonds) imported for consumption in the United States, 1952-53, by countries—Continued

[U. S. Department of Commerce]

Country	Rough or uncut			Cut but unset		
	Carats	Value		Carats	Value	
		Total	Average		Total	Average
Israel and Palestine.....	1	\$47	\$47.00	128,206	\$10,017,374	\$78.13
Italy.....	359	60,808	169.38	187	29,641	158.51
Japan.....				5	1,250	250.00
Lebanon.....				7	1,573	224.71
Mexico.....				111	13,143	118.41
Netherlands.....	2,271	219,467	96.64	33,636	4,246,138	126.24
Portuguese Asia, n. e. s.....				1,021	7,476	7.32
Surinam.....	135	8,999	66.66			
Switzerland.....	1 94,052	1 6,997,845	1 74.40	3,319	582,130	175.39
Thailand.....	1,338	153,564	114.77	968	134,883	139.34
Union of South Africa.....	1 48,515	1 1,276,049	1 26.30	54,011	10,737,727	198.81
United Kingdom.....	1 440,162	1 39,387,889	1 89.48	6,706	902,044	134.51
Venezuela.....	26,926	851,032	31.61			
Total 1952.....	1 709,043	1 52,192,621	1 73.61	438,546	51,671,643	117.82
1953						
Argentina.....				18	4,263	236.83
Australia.....				3	1,771	590.33
Belgian Congo.....				300	63,603	212.01
Belgium-Luxembourg.....	19,116	1,818,663	95.14	215,438	25,554,634	118.62
Bermuda.....	8,985	502,677	55.95			
Brazil.....	398	99,448	249.87	34	8,722	256.53
British Guiana.....	2,307	83,958	36.39	30	2,847	94.90
British Malaya.....	560	65,162	116.36			
British West Africa.....	121	726	6.00			
Canada.....	4,744	448,338	94.51	95	88,241	928.85
Dominican Republic.....				1	235	235.00
France.....	11,631	280,922	24.15	1,098	170,306	155.11
French Equatorial Africa.....	39,963	940,002	23.52			
Germany, West.....	167	1,667	9.98	22,196	1,633,341	73.59
Gold Coast.....	450	4,219	9.38			
Hong Kong.....				1	93	93.00
India.....				2,974	52,853	17.77
Israel and Palestine.....				122,218	10,276,874	84.09
Italy.....				48	30,647	638.48
Japan.....				55	4,919	89.44
Mexico.....				165	10,239	62.05
Netherlands.....	4,171	374,437	89.77	29,365	3,491,370	118.90
Switzerland.....	7,820	841,026	107.55	493	171,765	348.41
Union of South Africa.....	56,592	2,336,405	41.29	46,441	8,455,833	182.08
United Kingdom.....	524,826	47,625,107	90.74	3,271	526,641	161.00
Venezuela.....	51,779	1,587,872	30.67	3	745	248.33
Total 1953.....	733,630	57,010,629	77.71	444,247	50,549,942	113.79

¹ Revised figure.

TECHNOLOGY

Descriptions of lapidary equipment, the general principles of construction, and applications of the various cabochon and facet machines were described in magazine articles to guide amateur lapidaries.⁹

The merits of cutting certain gem stones by the freeform method were emphasized.¹⁰

The procedure for cutting and grading diamonds involves intricate steps and requires skills developed through years of painstaking work.

⁹ Morrow, I. L., Gem-Cutting Equipment to Make in the School Shop: Industrial Arts and Vocational Education, vol. 42, October 1953, pp. 285-286.

¹⁰ Sinkankas, John, Lapidary Machinery, part I—Cabochon Machinery: Rocks and Minerals, vol. 28, No. 1-2, January-February 1953, pp. 44-48; part II—Faceting Machinery, No. 3-4, March-April 1953, pp. 147-153.

Walker, D. B., A Horizontal Lap Wheel: Mineralogist, vol. 21, No. 10, October 1953, pp. 373-374, 376, 378.

¹⁰ Sanger, Lucille, Cutting the Freeform: Rocks and Minerals, vol. 28, No. 9-10, September-October 1953, pp. 493-494.

The history of diamond polishing and present-day methods for cutting and polishing diamonds for market were described.¹¹

On the basis of end use diamonds are classified as (1) gem and (2) industrial. Diamonds of good color and perfection are used for gem purposes, and the remainder are used in industry because of their hardness.¹² Studies were conducted to determine, by microscopic techniques, the growth features of diamonds, phenomena produced by etching, limitations of polishing, and the rate of abrasive resistance.¹³

Further work was done on coloring diamonds by irradiation in a cyclotron or nuclear reactor. Green was the main color obtained, but brown and other colors also were obtained. Formation of blue diamonds from yellow by exposure to high-energy electrons was described.¹⁴

Investigations of natural and synthetic emerald showed that synthetic stones had a greater transparency to short-wave ultraviolet light. Results of the experiments present a possible method for distinguishing natural from synthetic emerald.¹⁵

The history of gem-stone synthesis and methods used for producing synthetic sapphire, ruby, and emerald were discussed.¹⁶

Tumbling gems for polishing rough gem materials has been known for more than 100 years, but just recently the technique has become popular with amateur lapidaries. Mechanics and use of a tumbling barrel were described.¹⁷

A discussion to aid the layman, to clarify the meaning of brilliance and fire and the factors that influence each, was published in 1953.¹⁸

Patents were issued on methods for growing synthetic corundum and spinel gems on a seed¹⁹ and for growing synthetic rutile.²⁰

Absorption spectra of pink and green tourmaline were measured by a Hilger-medium quartz spectograph. Absorption curves showed that color was unaffected by heating at less than 800° C., and between 800°–1,000° C. the pink crystals were decolorized, with loss in weight and partial destruction of the lattice. Green tourmaline turned

¹¹ Industrial Diamond Review, Early Diamond Polishing in London: Vol. 13, No. 149, April 1953, p. 80. Grodzinski, P., The History of Diamond Polishing: Industrial Diamond Rev., vol. 13, No. 147, suppl. 1, February 1953, pp. 1–13. Diamond Technology; Production Methods for Diamond and Gem Stones: N. A. G. Press, Ltd., London, 2d rev., 1953, 784 pp.

Holstein, O., The Craft of Diamond Polishing: Jour. Gemmol., vol. 4, No. 1, January 1953, pp. 14–23.

Kaplan, G. R., Procedure for the Cutting and Grading of Diamonds: Gems and Gemology, vol. 8, Winter Issue, 1953, pp. 355–360.

¹² Kraus, E. H., Classification and Description of Varieties of Diamond: Ind. Diamond Rev., vol. 13, No. 149, April 1953, p. 86.

¹³ Tolansky, S., The Surfaces of Diamonds: Ind. Diamond Rev., vol. 13, No. 157, December 1953, pp. 271–276.

¹⁴ Custers, J. F. H., Artificial Coloration of Diamonds: Optima, vol. 3, 1953, pp. 8–12.

¹⁵ Anderson, R. W., A New Test for Synthetic Emerald: Gemmologist (London), vol. 22, No. 264, July, 1953, pp. 115–117.

¹⁶ Davids, E. B. and Tindula, R. W., Synthetic Gemstones: Off. Tech. Services, Tech. Div. Rept. IR-11392, May 1953, 7 pp.

Frondel, C., Commercial Synthesis of Star Sapphires and Star Rubies: Econ. Geol., vol. 48, No. 4, June-July 1953, p. 325.

Kaspar, J., Synthetic Corundum, part II: Ind. Diamond Rev., vol. 13, No. 149, April 1953, pp. 81–84. Synthetic Corundum, part III: Ind. Diamond Rev., vol. 13, No. 150, May 1953, pp. 102–104.

Miles, Joel, Man-Made Gem Stones: Mineralogist, vol. 21, No. 9, September 1953, pp. 325–326, 328, 330, 332.

Webster, R., Synthetic Gemstones: Gemmologist (London), vol. 21, No. 249, 1952, pp. 66–70.

Weyl, W. A., Synthetic Minerals: Econ. Geol., vol. 48, No. 4, June-July 1953, pp. 288–305.

¹⁷ Leeson, Bert, The Tumbling Barrel, How Does It Work: Min. Notes and News, No. 187, April 1953, pp. 9, 52.

Mitchell, R. C., How to Tumble Gems: Lapidary Jour., vol. 6, No. 6, February 1953, pp. 442–446.

¹⁸ Fough, F. H., Brilliance and Fire as Gemstone Properties, part I: Jewelers' Circ.-Keystone, vol. 123, No. 11, August 1953, pp. 140, 187–190; part II, No. 12, September 1953, pp. 112, 136–138, 140.

¹⁹ Barnes, M. H. (assigned to Union Carbide & Carbon Corp.), Synthetic Gem Production: U. S. Patent 2,634,554, Apr. 14, 1953.

²⁰ Eversole, W. G. and Drost, Wilfred (assigned to Union Carbide & Carbon Corp.), Synthetic Rutile and Method of Making: U. S. Patent 2,610,129, Sept. 9, 1952.

brownish at lower temperatures. Results of experiments to determine the relationship between color and either lattice structure or chemical composition were reported.²¹

A polariscope consisting of a cylindrical shell with polaroid plates can be used to determine whether a gem is singly or doubly refractive. Details were given for building a handmade instrument.²²

Certain gem stones, when exposed to ultraviolet rays, will glow or luminesce. Selected gem stones were subjected to ultraviolet and X-ray radiation and their reactions were recorded.²³

A historical survey of the spectroscope and its application in gemmology was published in a technical journal.²⁴

WORLD REVIEW

Production of diamonds (including industrial diamonds) in 1953 increased 7 percent compared with 1952, as shown in table 4. Belgian Congo ranked first, with 63 percent, principally industrial diamonds, and Union of South Africa second, with 13 percent, mainly gem-quality diamonds. A detailed review of the world diamond industry in 1952 was published in 1953.²⁵

Australia.—The value of opal production in 1953 was \$174,000—an increase of \$31,000 over the 1952 figure and the highest annual value recorded since 1907. The increase was probably due to a rise in average quality rather than to the quantity of material produced. Most of the opal produced in 1953 was from the Coober Pedy and Andamooka fields in South Australia.²⁶

A book describing the Lightning Ridge opal area was published in 1953.²⁷

The Anakie field in Central Queensland is the only Australian producer of sapphires. Production has been declining in recent years. Production for 1953 was valued at \$1,617. A geological report on the Anakie field published during the year stated that 21 men were engaged in mining sapphires in April 1953.²⁸

Belgian Congo.—The most important diamond fields are in the Kasai, Bushimae, and Kundelungu districts. Some sporadic deposits occur in Aruwimi, Izuri, and Itimbiri districts.²⁹ Tshikapa is considered the focal point for the diamond industry in Belgian Congo and was described in an article.³⁰

²¹ Bradley, J. E. S., and Bradley, Olive, The Coloring of Pink- and Green-Zoned Tourmaline: Mineral, Mag. (London), vol. 30, No. 220, March 1953, pp. 26-32.

²² Gems and Minerals, How to Make a Polariscope: No. 194, November 1953, pp. 10-12.

²³ Gemmologist (London), Luminescence in the Service of Gemmology: Vol. 22, No. 260, March 1953, pp. 46-49; No. 261, April 1953, pp. 74-76.

Webster, Robert, Gemstone Luminescence: Gemmologist (London), vol. 22, No. 262, May 1953, pp. 77-80; No. 263, June 1953, pp. 98-103; No. 264, July 1953, pp. 123-126; No. 265, August 1953, pp. 139-143; No. 266, September 1953, pp. 161-164; No. 267, October 1953, pp. 183-191; No. 269, December 1953, pp. 229-231.

Anderson, B. W., Crossed Filters for the Study of Fluorescence: Gemmologist (London), vol. 22, No. 260, March 1953, pp. 39-45.

²⁴ Anderson, B. W., The Spectroscope and Its Applications to Gemmology: Gemmologist (London), vol. 22, No. 266, September 1953, pp. 153-158; No. 267, October 1953, pp. 173-176; No. 268, November 1953, pp. 193-201; No. 269, December 1953, pp. 218-222.

²⁵ Foshag, W. F. and Switzer, George, Diamond Industry, 1952: Jewelers' Circ.—Keystone, vol. 123, No. 10, July 1953, pp. 98-100, 108-110, 142-144; No. 11, August 1953, pp. 142, 144, 238, 240, 243, 245; No. 12, September 1953, pp. 108, 110, 153.

²⁶ J. A. Dunn, chief mineral economist, Bureau of Mineral Resources, Department of National Development, Commonwealth of Australia, letter to Bureau of Mines.

²⁷ Idriess, I. L., Lightning Ridge, the Land of Black Opals: Anglobooks, New York, N. Y., 1953, 238 pp.

²⁸ Queensland Government Mining Journal (Australia), vol. 54, No. 622, August 1953, pp. 570-571.

²⁹ Fieremans, C. [Geology and Geochemistry of the Diamond Fields of Belgian Congo]: Tech. Wetensch. Tijdschr., vol. 22, 1953, pp. 71-82.

³⁰ Gemmologist (London), Diamond City of the Congo: Vol. 22, No. 267, October 1953, pp. 182-187; No. 268, November 1953, pp. 202-207.

TABLE 4.—World production of diamonds, 1950–53, by countries, in metric carats
(Including industrial diamonds)

	1950	1951	1952	1953
Africa:				
Angola.....	538,867	734,324	743,302	729,377
Belgian Congo.....	10,147,471	10,564,667	11,608,763	12,580,256
French Equatorial Africa.....	111,407	136,000	163,400	140,144
French West Africa.....	126,346	101,000	136,080	180,000
Gold Coast.....	¹ 950,000	1,752,878	2,189,557	2,167,364
Sierra Leone.....	655,474	475,759	451,426	472,934
South-West Africa.....	488,422	478,075	541,027	617,411
Tanganyika.....	164,996	108,625	143,023	170,679
Union of South Africa:				
Lode.....	1,516,194	1,967,272	2,093,138	² 2,397,755
Alluvial.....	³ 231,674	³ 289,063	³ 282,681	⁴ 300,000
Brazil ¹	200,000	200,000	200,000	200,000
British Guiana.....	37,462	43,260	38,305	35,306
Venezuela.....	60,389 ¹	63,226	98,291	84,790
Other countries.....	3,000	3,000	5,000	5,000
Grand total.....	15,232,000	16,917,000	18,694,000	20,081,000

¹ Estimate.

² Pipe mines under De Beers control.

³ Includes an estimated 100,000 carats for State mines of Namaqualand.

⁴ Includes: (1) Approximately 117,000 carats for pipe mines outside De Beers control and (2) an estimated 100,000 carats for State mines of Namaqualand.

British Guiana.—The Government increased its royalty on diamonds in 1953 to \$0.50 per carat.

There were several independent diamond buyers and cutters in Georgetown, but the domestic diamond market was controlled by a local syndicate, comprised of Krakowsky & Correia Co. and Morabisi Mining Co. There was considerable prospecting in the Kurupung area and Anaborong River area, as well as in the vicinity of Kurashi Creek, a tributary of the Cuyuni River.³¹ The Kurupung Placers Co. early in the year finished prospecting in the Kurupung area and found that the deposits were not large enough for commercial exploitation. The company began investigation in the Eping Basin.³²

Burma.—A book on the geology and gem stones of the Mogok Stone Tract was published.³³

Canada.—Several large diamonds were found along the banks of the Rainy River near Fort Francis, Ontario, and prospectors were lured to the area in expectation of finding more.³⁴

A supplementary list of gem materials found in Canada was compiled.³⁵

Ceylon.—Corundum gems produced in Ceylon include ruby and white and yellow sapphire; gem-quality alexandrite, amethyst, aquamarine, garnet, spinel, and zircon also are produced.³⁶ Production in 1953 was estimated to be worth \$420,000.

Colombia.—The Government-owned Muzo and Cosquez emerald mines were opened in 1953 on a full-time production basis after 4 years of sporadic production. The principal reason for production

³¹ Bureau of Mines, Mineral Trade Notes: Vol. 36, No. 5, May 1953, p. 33.

³² Mining Journal (London), vol. 241, No. 6172, December 1953, p. 656.

³³ Iyer, L. A. N., The Geology and Gem Stones of the Mogok Stone Tract, Burma: Mem. Geol. Survey India, vol. 82, 1953, 100 pp.

³⁴ California Mining Journal, Diamond Discovery in Canada Starts Prospecting: Vol. 22, No. 11, July 1953, p. 28.

³⁵ Field, D. S. M., List of Canadian Gems and Ornamental Minerals: Canadian Min. Jour., vol. 74, No. 4, April 1953, pp. 82-83.

³⁶ Parkinson Kenneth, Ceylon; the Island of Gems: Gemmologist (London), vol. 22, No. 258, January 1953, pp. 5-7.

being suspended was the guerilla activities in the area. With the change of government in July, the new administration was able to renew production.

French Equatorial Africa.—It was reported in 1953 that the Government expected to double its diamond production within the next 4 years. It was planned to increase output gradually until it reaches 400,000 carats per year.³⁷

India.—New gem-quality emerald occurrences were reported near Rajnagar near Deogarh in Kishangarh and in southwest Jaipur. The important deposits in Rajasthan are at Kalaguman. The emeralds are marketed at auctions held periodically under supervision of the Rajasthan State authorities at Jaipur.³⁸

As a result of a field examination in 1953, it was reported that profitable production could be increased from the diamond deposits in the Panna area, Vindhya Pradesh. It was recommended that accurate quantitative information be obtained regarding the extent and location of the reserves and that investment of greater capital in mining and milling equipment be considered in an effort to increase the production.³⁹

Japan.—Most of Japan's cultured-pearl fisheries are along the coast of the Ku Peninsula. The industry is based on the fact that a grain of sand put into the oyster irritates it and causes the particle to be coated with a secretion, which in 7 to 8 years will harden and form a gem pearl. Artificially cultivated pearls can be marketed at a much lower price than those that occur naturally. Japan is the most important producer of cultured pearls.⁴⁰

Union of South Africa.—De Beers Consolidated Mines recently divided the Diamond Corp. into two companies by forming a new company called De Beers Investment Trust, Ltd. Diamond Corp. will confine its activities to the diamond trade, and the new company will handle the financial affairs of Diamond Corp.

Descriptions of diamond mining and recovery at Kimberley⁴¹ and of the early diamond industry⁴² were published.

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³⁷ *Mining World*, vol. 15, No. 10, September 1953, p. 75.

³⁸ Bureau of Mines, *Mineral Trade Notes*: Vol. 36, No. 5, May 1953, pp. 36-37.

Brown, J. C., *Emeralds in India*: *Gemmologist* (London), vol. 22, No. 265, August 1953, pp. 133-136; No. 266, September 1953, pp. 165-168.

³⁹ Bureau of Mines, *Mineral Trade Notes*: Vol. 36, No. 5, May 1953, pp. 33-36. *Mining Journal* (London), *The Muzgawon Diamond Deposits of the Panna District, India*: Vol. 241, No. 6165, October 1953, p. 442.

⁴⁰ Messmer, Jacqueline, *S-H-H Pearls: Deco Trefoil*, vol. 17, No. 3, May-June 1953.

⁴¹ Daniel, R., *Diamond-Mining Practice in Kimberley, South Africa*: *Bull. Inst. Min. Met.*, vol. 62, 1953, pp. 201-228.

⁴² Kisch, T. B., *South Africa's First Diamonds*: *Gemmologist* (London), vol. 22, No. 258, January 1953, pp. 9-13.

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