Gold

By W. C. Butterman[1]

The world price of gold more than tripled in 1978-79. After increasing steadily in 1978 and part of 1979, the price began to rise more steeply and at yearend 1979, impelled by political and economic unrest, was climbing very rapidly towards a peak in January 1980.

Total world mine production remained essentially unchanged, but production in the United States and a few other countries actually decreased somewhat, as mines were enabled to use leaner ores as the price of gold climbed. However, the increasingly strong gold price provided the incentive for extensive exploration for gold deposits and the development of new mines. Retreatment of old tailings dumps, and the heap leaching of low-grade ores, became economically feasible.

The International Monetary Fund (IMF) continued its monthly bullion auctions, begun in 1976, and the U.S. Department of the Treasury auctioned bullion monthly between May 1978 and November 1979. The Treasury bullion, and much of the IMF bullion, was delivered in the United States, but then most of it was promptly exported. Fed by auctioned bullion, U.S. exports tripled in 1979.

Table 1.—Salient gold statistics

	1975	1976	1977	1978	1979
United States:					
Mine production thousand troy ounces	1,052	1,048	1,100	999	920
Value thousands	$169,928	$131,340	$163,192	$193,324	$282,833
Ore (dry and siliceous) produced:					
Gold ore thousand short tons	5,722	3,063	5,806	4,292	6,091
Gold-silver ore do	137	1,027	481	738	756
Silver ore do	672	651	800	992	962
Percentage derived from:					
Dry and siliceous ores	62	61	60	58	56
Base-metal ores	36	36	38	40	43
Placers	2	3	2	2	1
Refinery production:					
Domestic ores thousand troy ounces	1,093	954	956	962	795
Secondary (old scrap) do	1,122	1,068	1,040	1,384	1,681
Exports:					
Commercial do	2,689	2,879	7,011	5,509	16,499
Monetary do	807	652	1,660	NA	NA
Imports do	2,662	2,656	4,454	4,690	4,630
Gold contained in imported coins do	1,673	1,333	1,614	3,736	2,790
Net sales from foreign stocks in Federal Reserve Bank do	577	2,125	6,406	1,569	40
Stocks, Dec. 31:					
Monetary do	274.7	274.7	277.6	276.4	264.6
Industrial[1] do	788	928	1,976	1,672	947
Consumption in industry and the arts do	3,993	4,648	r4,863	4,738	4,708
Price:[2] Average per troy ounce	$161.49	$125.32	$148.31	$193.55	$307.50
World:					
Production thousand troy ounces	38,476	r39,234	r39,121	39,304	39,238
Official reserves[3] do	1,174.1	1,163.9	1,154.8	1,146.6	1,126.5

rRevised. NA Not available.
[1]Unfabricated refined gold held by refiners, fabricators, and dealers.
[2]Engelhard Industries quotations.
[3]Held by market-economy-country central banks and Governments. Source: International Monetary Fund.

Table 2.—Volume of U.S. gold futures trading

(Million troy ounces)

Exchange	Location	1975	1976	1977	1978	1979
Commodity Exchange, Inc	New York	36.19	47.94	98.17	373.40	654.15
New York Mercantile Exchange	do	1.27	.08	.03	.85	.21
International Monetary Market	Chicago	40.70	34.09	90.82	281.30	355.87
Chicago Board of Trade	do	5.56	1.06	1.33	5.49	10.30
Mid-America Commodity Exchange	do	.23	.08	.09	1.50	6.65
Total		83.95	83.25	190.44	662.54	1,027.18

The volume of trading in gold futures on U.S. commodity exchanges quintupled in the 2-year period, exceeding 1 billion ounces[2] in 1979 (tables 1-2).

Legislation and Government Programs.—The U.S. Department of the Treasury held monthly public sales of bullion from May 1978 to November 1979. The IMF also continued its 4-year program, begun in 1976, of public bullion auctions and its restitutions (sales) of bullion to member countries.

On November 10, 1978, the President signed a bill authorizing the minting of 1/2- and 1-ounce gold medallions bearing the images of celebrated American artists. The legislation, effective October 1, 1979, required that 1 million ounces of gold be minted and offered for sale in each of the 5 years 1980-84.

The Federal Trade Commission determined that the amendments to its Trade Practice Rules for the jewelry industry that it proposed in 1977 would not be in the public interest. The proposed amendments would have allowed the use of the term "gold" in connection with jewelry items containing gold of less than 10-karat purity. Further, in July 1978, the Commission amended its Trade Practice Rules, to expressly prohibit the use of the term gold in such a context, since the previous rules prohibited the term only by implication.[3]

DOMESTIC PRODUCTION

Domestic mine production decreased in both 1978 and 1979 (tables 3-4). The main reason for the drop in output was the use of leaner ores, which became feasible as the price of gold rose. Average millhead grade at the Homestake mine dropped from 0.202 ounce per ton in 1977, to 0.180 ounce per ton in 1979. At the Carlin mine, the comparable figures were 0.302 and 0.186 ounce per ton. Contributing to the decline of output were the shutdown of one sizable gold mine for several months in 1978 while new reserves were blocked out, and the shutdown, by flooding, of a substantial byproduct producer for most of the 2-year period.

Table 3.—Mine production of gold in the United States, by State

(Troy ounces)

State	1975	1976	1977	1978	1979
Alaska	14,980	22,887	18,962	18,652	6,675
Arizona	85,790	102,062	90,167	92,989	101,840
California	9,606	10,392	5,704	7,480	3,195
Colorado	55,483	50,764	72,668	32,094	13,850
Idaho	2,529	2,755	12,894	20,492	24,140
Montana	17,259	24,075	22,348	19,967	24,050
Nevada	332,814	287,962	324,003	260,895	199,960
New Mexico	15,049	15,198	13,560	9,879	22,976
Oregon	W	28	675	340	W
South Dakota	304,935	318,511	304,846	285,512	245,912
Tennessee	W	W	13	W	--
Utah	189,620	187,318	210,501	235,929	260,916
Washington	W	W	24,006	W	W
Other States	24,187	26,085	--	14,603	16,269
Total	1,052,252	1,048,037	1,100,347	998,832	919,783

W Withheld to avoid disclosing company proprietary data; included in "Other States."

Table 4.—Mine production of gold in the United States, by month

(Troy ounces)

Month	1975	1976	1577	1978	1979
January	88,441	91,121	90,768	82,304	72,239
February	82,358	82,215	81,705	89,695	69,245
March	75,739	88,096	93,498	87,198	76,000
April	86,234	91,488	87,294	89,196	75,653
May	88,252	93,317	94,166	81,305	76,590
June	91,578	87,760	86,924	84,701	76,939
July	75,787	83,776	82,238	69,119	80,013
August	84,302	84,971	93,690	83,502	82,930
September	94,255	88,727	85,855	85,600	79,077
October	93,667	93,195	99,402	94,090	82,356
November	95,908	81,377	101,034	80,506	76,148
December	95,731	81,994	103,773	71,616	72,593
Total	1,052,252	1,048,037	1,100,347	998,832	919,783

Approximately two-thirds of domestic gold mine output was accounted for by three mines - Utah Copper (Bingham Canyon), Homestake, and Carlin.

The 25 largest mines (tables 5-6) accounted for 96% of domestic production in 1978 and 97% in 1979. Byproduct production from mines among the top 25 declined only 2% during the 2-year period, while production from precious metal ores in the top 25 mines decreased 23%.

Gold production in 1978 (1979 figures in parentheses) was reported by 171 (154) mines, of which 37 (23) were placer mines, 32 (39) were lode mines producing from precious metal ores, and 102 (92) were lode byproduct producers. About 58% (55%,) of the gold came from precious metal ores, 40% (44%) from base metal ores, and 2% (1%) from placers (figure 1, tables 7-8). The methods by which gold was extracted from its ores reflected the nature of the ores; thus, most of the gold was recovered by cyanidation of precious metal ores, and by smelting of base metal ores, while minor quantities were recovered by amalgamation and by gravity methods (tables 9-11). The average recovery grade of gold ores mined in lode gold mines was 0.12 (0.08) ounce per ton, while placer mines averaged 0.015 (0.009) ounce per cubic yard of gravel washed.

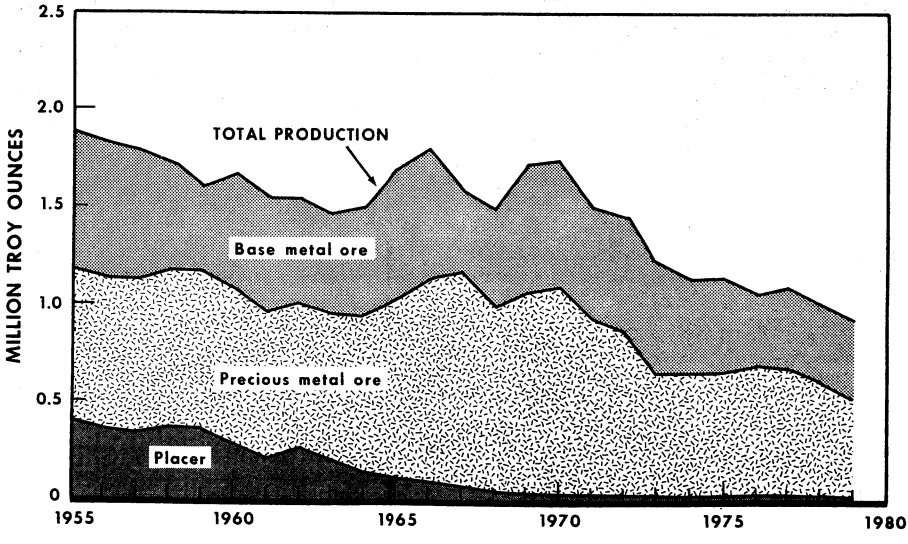

Figure 1.—Gold mined in the United States.

Table 5.—Twenty-five leading gold-producing mines in the United States in 1978, in order of output

Rank	Mine	County and State	Operator	Source of gold
1	Homestake	Lawrence, S. Dak	Homestake Mining Co	Gold ore.
2	Utah Copper	Salt Lake, Utah	Kennecott Copper Corp	Copper ore.
3	Carlin	Eureka, Nev	Carlin Gold Mining Co	Gold ore.
4	Round Mountain	Nye, Nev	Smokey Valley Mining Corp	Do.
5	Copper Canyon	Lander, Nev	Duval Corp	Copper ore.
6	San Manuel	Pinal, Ariz	Magma Copper Co	Do.
7	Magma	do	do	Do.
8	Sunnyside	San Juan, Colo	Standard Metals Corp	Lead-zinc ore.
9	New Cornelia	Pima, Ariz	Phelps Dodge Corp	Copper ore.
10	Delamar	Owyhee, Idaho	Earth Resources Co	Gold-silver ore.
11	Berkeley Pit	Silver Bow, Mont	The Anaconda Company	Copper ore.
12	Trixie	Utah, Utah	Kennecott Copper Corp	Gold-silver ore.
13	Morenci	Greenlee, Ariz	Phelps Dodge Corp	Copper ore.
14	Nome Unit	Seward Peninsula, Alaska	Alaska Gold Co	Placer.
15	Atlanta	Lincoln, Nev	Standard Slag Co	Gold ore.
16	Knob Hill	Ferry, Wash	Day Mines, Inc	Do.
17	Bootstrap	Elko, Nev	Carlin Gold Mining Co	Do.
18	Gooseberry	Storey, Nev	West Coast Oil & Gas Corp	Do.
19	Leadville Unit	Lake, Colo	ASARCO Incorporated	Lead-zinc ore.
20	Metcalf	Greenlee, Ariz	Phelps Dodge Corp	Copper ore.
21	Windfall	Eureka, Nev	Idaho Mining Co	Gold ore.
22	Ruth Pit	White Pine, Nev	Kennecott Copper Corp	Copper ore.
23	Pinto Valley	Gila, Ariz	Cities Service Co	Do.
24	Center	Grant, N. Mex	Dresser Industries, Inc	Gold ore.
25	Idarado	Ouray and San Miguel, Colo	Idarado Mining Co	Copper-lead-zinc ore.

Table 6.—Twenty-five leading gold-producing mines in the United States in 1979, in order of output

Rank	Mine	County and State	Operator	Source of gold
1	Utah Copper	Salt Lake, Utah	Kennecott Copper Corp	Copper ore.
2	Homestake	Lawrence, S. Dak	Homestake Mining Co	Gold ore.
3	Carlin	Eureka, Nev	Carlin Gold Mining Co	Do.
4	Round Mountain	Nye, Nev	Smokey Valley Mining Corp	Do.
5	San Manuel	Pinal, Ariz	Magma Copper Co	Copper ore.
6	Magma	do	do	Do.
7	Berkeley Pit	Silver Bow, Mont	The Anaconda Company	Do.
8	Delamar	Owyhee, Idaho	Earth Resources Co	Gold-silver ore.
9	New Cornelia	Pima, Ariz	Phelps Dodge Corp	Copper ore.
10	Morenci	Greenlee, Ariz	do	Do.
11	Knob Hill	Ferry, Wash	Day Mines, Inc	Gold ore.
12	Gooseberry	Storey, Nev	West Coast Oil & Gas Corp	Do.
13	Leadville Unit	Lake, Colo	ASARCO Incorporated	Lead-zinc ore.
14	Trixie	Utah, Utah	Kennecott Copper Corp	Gold-silver ore.
15	Atlanta	Lincoln, Nev	Standard Slag Co	Gold ore.
16	Chino	Grant, N. Mex	Kennecott Copper Corp	Copper ore.
17	Bootstrap	Elko, Nev	Carlin Gold Mining Co	Gold ore.
18	Continental	Grant, N. Mex	UV Industries, Inc	Copper ore.
19	Tyrone	do	Phelps Dodge Corp	Do.
20	Pinto Valley	Gila, Ariz	Cities Service Co	Do.
21	Sacaton Unit	Pinal, Ariz	ASARCO Incorporated	Do.
22	Windfall	Eureka, Nev	Idaho Mining Co	Gold ore.
23	Nome Unit	Seward Peninsula, Alaska	Alaska Gold Co	Placer.
24	Summit Mountain	Grant, N. Mex	Summit Minerals, Inc	Gold-silver ore.
25	Metcalf	Greenlee, Ariz	Phelps Dodge Corp	Copper ore.

Table 7.—Gold produced in the United States in 1978, by State, type of mine, and class of ore

State	Placer (troy ounces of gold)	Lode							
		Gold ore		Gold-silver ore		Silver ore		Copper ore	
		Short tons	Troy ounces of gold	Short tons	Troy ounces of gold	Short tons	Troy ounces of gold	Short tons	Troy ounces of gold
Alaska	18,599	35	18	W	W	3,449	33	139,806,789	92,507
Arizona	3,559	15,323	3,227	W	W	--	--	--	--
California	W	W	W	5,982	797	W	W	--	--
Colorado	--	82	75	W	W	794,486	2,219	--	--
Idaho	44	41,191	1,200	5,636	1,221	80,858	544	17,889,635	16,949
Montana	W	2,593,102	228,991	14	6	1,050	12	W	W
Nevada	--	W	W	10,282	1,214	--	--	W	W
New Mexico	--	2,470	340	--	--	--	--	--	--
Oregon	--	1,590,406	285,512	--	--	--	--	--	--
South Dakota	--	49,761	15,205	715,688	35,800	111,896	1,167	54,181,706	257,703
Other States[1]	89								
Total	22,291	4,292,370	534,568	737,602	39,038	991,739	3,975	211,878,130	367,159
Percent of total gold	2	XX	54	XX	4	XX	(2)	XX	37

State	Lode						Total[3]	
	Lead and zinc ores		Copper-lead, lead-zinc, copper-zinc, and copper-lead-zinc ores		Old tailings, etc.			
	Short tons	Troy ounces of gold	Short tons	Troy ounces of gold	Short tons	Troy ounces of gold	Short tons	Troy ounces of gold
Alaska	--	--	--	--	W	W	53	18,652
Arizona	25	1	--	--	46,402	448	139,856,665	92,989
California	--	--	--	--	W	W	17,065	7,480
Colorado	40	4	510,977	30,045	--	--	624,398	32,094
Idaho	W	W	859,860	767	--	--	2,294,553	20,492
Montana	--	--	65	9	--	--	18,017,385	19,967
Nevada	--	--	87,758	39	--	--	5,166,857	260,895
New Mexico	W	W	--	--	--	--	15,638,930	9,879

Oregon	--	--	--	--	--	--	2,470	340
South Dakota	--	--	--	--	--	--	1,590,406	285,512
Other States[1]	48,151	106	2,128,338	232	14	[4]150	38,372,689	250,532
Total	48,216	111	3,586,998	31,092	46,416	598	221,581,471	998,832
Percent of total gold	XX	([2])	XX	3	XX	([2])	XX	100

W Withheld to avoid disclosing company proprietary data; included in "Other States." XX Not applicable.
[1]Includes Tennessee, Texas, Utah, Washington and items indicated by symbol W.
[2]Less than 1/2 unit.
[3]Data may not add to State totals because of items withheld to avoid disclosing individual company proprietary data.
[4]Includes byproduct gold recovered from tungsten ore in California.

Table 8.—Gold produced the United States in 1979, by State, type of mine, and class of ore

State	Placer (troy ounces of gold)	Lode							
		Gold ore		Gold-silver ore		Silver ore		Copper ore	
		Short tons	Troy ounces of gold	Short tons	Troy ounces of gold	Short tons	Troy ounces of gold	Short tons	Troy ounces of gold
Alaska	6,675	--	--	--	--	--	--	--	--
Arizona	--	80,521	1,794	--	--	W	W	159,750,391	99,542
California	W	9,384	2,060	2,037	714	--	--	--	--
Colorado	W	--	--	6,410	574	108,642	1,206	--	--
Idaho	--	W	W	W	W	775,298	2,583	--	--
Montana	W	285	170	3,633	259	78,055	2,007	17,122,259	21,356
Nevada	12	4,523,166	199,733	W	W	W	W	W	W
New Mexico	12	1,730	567	13,486	3,112	--	--	27,122,254	19,284
South Dakota	--	1,429,886	245,912	--	--	--	--	--	--
Other States[1]	348	45,742	16,241	730,654	30,525	294	20	37,898,858	251,309
Total	7,047	6,090,714	466,477	756,220	35,184	962,289	5,816	241,893,762	391,491
Percent of total gold	1	XX	51	XX	4	XX	1	XX	42

State	Lode						Total[3]	
	Lead and zinc ores		Copper-lead, lead-zinc, copper-zinc, and copper-lead-zinc ores		Old tailings, etc.			
	Short tons	Troy ounces of gold	Short tons	Troy ounces of gold	Short tons	Troy ounces of gold	Short tons	Troy ounces of gold
Alaska	--	--	--	--	--	--	--	6,675
Arizona	W	W	--	--	37,491	490	159,868,974	101,840
California	--	--	--	--	--	W	11,421	3,195
Colorado	W	W	180,236	11,899	W	W	295,302	13,850
Idaho	673	80	821,649	550	--	--	2,288,784	24,140
Montana	12,762	196	188	48	W	W	17,217,287	24,050
Nevada	--	--	--	--	--	--	4,562,709	199,960
New Mexico	192	1	--	--	--	--	27,137,662	22,976

South Dakota	--	--	--	--	--	--	1,429,886	245,912
Other States[1]	3,365,294	157	--	--	5,002	[4]347	41,314,547	277,185
Total	3,379,021	434	1,002,073	12,497	42,493	837	254,126,572	919,783
Percent of total gold	XX	([2])	XX	1	XX	([2])	XX	100

W Withheld to avoid disclosing company proprietary data; included in "Other States." XX Not applicable.
[1]Includes Missouri, Oregon, Utah, Washington, and States indicated by symbol W.
[2]Less than 1/2 unit.
[3]Data may not add to State totals because of items withheld to avoid disclosing company proprietary data.
[4]Includes byproduct gold recovered from tungsten ore in California.

Table 9.—Gold produced in the United States from ore, old tailings, etc., by State and method of recovery

State	Total ore, old tailings, etc., treated[1] (thousand short tons)	Ore and old tailings to mills: Thousand short tons[1]	Recoverable in bullion: Amalgamation (troy ounces)	Recoverable in bullion: Cyanidation (troy ounces)	Concentrates smelted and recoverable metal: Concentrates (short tons)	Concentrates smelted and recoverable metal: Troy ounces	Crude ore, old tailings, etc., to smelters[1]: Thousand short tons	Crude ore, old tailings, etc., to smelters[1]: Troy ounces
1978:								
Alaska	[2]	[2]	--	--	1	18	[2]	35
Arizona	178,895	178,000	--	--	3,112,494	92,459	895	530
California	[3]17	[3]17	1,337	6	3,095	2,376	[2]	202
Colorado	809	800	908	--	81,450	30,361	9	743
Idaho	2,394	2,393	9	17,371	153,166	2,921	1	191
Montana	[4]18,022	[4]17,932	--	822	333,047	17,949	90	1,152
Nevada	[4]7,117	[4]7,083	--	228,956	75,422	31,775	34	157
New Mexico	21,920	21,818	--	--	660,674	4,557	102	5,322
Oregon	2	[2]	--	3	--	--	2	337
South Dakota	1,590	1,590	--	285,512	--	--	--	--
Utah	36,147	36,046	--	--	744,360	218,138	101	17,791
Other	5,881	5,881	--	--	263,497	14,601	[2]	2
Total	272,794	271,560	2,254	532,670	5,427,206	415,155	1,234	26,462
1979:								
Arizona	[4]204,463	[4]203,902	48	1,746	3,481,562	99,089	561	957
California	[3]12	[3]11	812	--	2,900	1,694	1	368
Colorado	393	382	374	--	39,554	12,555	11	898
Idaho	2,339	2,335	--	20,855	149,062	2,840	4	445
Montana	17,230	17,135	4	47	306,115	21,562	95	2,433
Nevada	[4]4,563	[4]4,563	--	199,724	937	155	[2]	69
New Mexico	27,161	27,062	--	--	920,305	19,284	99	3,680
South Dakota	1,430	1,430	--	245,912	--	--	--	--
Utah	37,905	37,859	--	--	83,826	250,965	46	9,951
Other	9,154	9,152	--	--	875,613	15,967	2	302
Total	304,650	303,831	1,238	468,284	5,859,874	424,111	819	19,103

[1]Includes some non-gold-bearing ores not separable.
[2]Less than 1/2 unit.
[3]Excludes tonnage of tungsten ore from which gold was recovered as a byproduct.
[4]Includes tonnages from which gold was recovered by heap leaching.

Table 10.—Gold produced at amalgamation and cyanidation mills in the United States and percentage of gold recovered from all sources

Year	Bullion and precipitates recovered (troy ounces): Amalgamation	Bullion and precipitates recovered (troy ounces): Cyanidation	Gold recovered from all sources (percent): Amalgamation	Cyanidation	Smelting[1]	Placers
1975	13,783	617,330	1.3	58.7	38.1	1.9
1976	18,207	587,540	1.7	56.1	39.6	2.6
1977	26,615	597,633	2.4	54.3	41.2	2.1
1978	2,254	532,670	.2	53.3	44.3	2.2
1979	1,238	468,284	.1	50.9	48.2	.8

[1]Crude ores and concentrates.

Table 11.—Gold produced at placer mines in the United States, by method of recovery

Method and year	Mines producing	Washing plants	Material washed (thousand cubic yards)	Gold recoverable		
				Thousand troy ounces	Value (thousands)	Average value per cubic yard
Bucketline dredging:						
1975	4	5	[1]2,715	14	$2,314	$0.852
1976	3	4	[1]2,816	17	2,124	.754
1977	3	4	1,377	12	1,742	1.265
1978	2	3	1,010	11	2,187	2.164
1979	2	3	475	3	977	2.056
Dragline dredging:						
1975	6	6	210	3	469	2.229
1976	3	3	245	5	606	2.474
1977	7	7	[2]10	[3]2	311	[4]5.932
1978	9	9	[2]60	[3]3	519	[4]4.339
1979	3	3	86	1	347	4.019
Hydraulicking:						
1975	16	17	131	1	171	1.302
1976	14	14	129	1	157	1.212
1977	12	13	273	5	754	2.762
1978	10	10	233	4	784	3.367
1979	8	8	176	2	613	3.480
Nonfloating washing plants:						
1975	11	11	[2]__	[3]2	269	__
1976	25	26	[2]136	[3]4	560	[4]2.097
1977	7	7	[2]106	[3]3	477	[4]2.319
1978	11	11	[2]152	[3]4	812	[4]2.448
1979	7	8	[2]42	[3]1	225	[4]2.988
Underground placer, small-scale mechanical and hand methods, and suction dredge:						
1975	12	8	27	([5])	47	1.752
1976	4	4	2	([5])	15	8.881
1977	7	7	41	1	159	3.901
1978	5	5	1	([5])	13	13.431
1979	3	3	4	([5])	5	1.281
Total placers:						
1975	49	47	[1] [2]3,083	[3]20	[6]3,269	[4].973
1976	49	51	[1] [2]3,328	[3] [6]28	3,462	[4].958
1977	36	38	[2]1,807	[3]23	3,443	[4]1.638
1978	37	38	[2]1,456	[3]22	[6]4,314	[4]2.483
1979	23	25	[2] [6]784	[3]7	2,167	[4]2.639

[1]Does not include platinum-bearing material from which byproduct gold was recovered.
[2]Excludes tonnage of material treated at commercial sand and gravel operations recovering byproduct gold.
[3]Includes gold recovered at commercial sand and gravel operations.
[4]Gold recovered as a byproduct at sand and gravel operations not used in calculating average value per cubic yard.
[5]Less than 1/2 unit.
[6]Data do not add to total shown because of independent rounding.

Kennecott Copper Corp.'s Utah Copper (Bingham Canyon) mine, south of Salt Lake City, the largest copper mine in the United States, became also the country's largest gold producer in 1979, and was the second largest producer in 1978.

The Homestake mine, in the Black Hills, accounted for essentially all of South Dakota's gold output. As the grade of ore mined by Homestake decreased in response to higher prices, the mine's cost of production per ounce of gold climbed from $140 in 1977, to $176 in 1978, to $250 in 1979. To counter rising costs, Homestake was shifting away from cut-and-fill mining towards bulk mining methods, obtaining 29% of their production in 1979 by those methods. Ore reserves in 1979 were 16.9 million tons grading 0.211 ounce per ton.

Eight mines in Nevada were among the top 25 gold-producing mines in the country in 1978-79. They were the Carlin, Round Mountain, Copper Canyon, Atlanta, Bootstrap, Gooseberry, Windfall, and Ruth Pit (closed in 1978) mines. Output of the Carlin mine, north of Elko, decreased to 152,400 ounces in 1978, and to 133,000 ounces in 1979. Ore was mined from the Carlin, Blue Star, and Bootstrap pits; mining was completed at the latter in 1978, but ore was being heap-leached there in 1979. In April 1978, the new double-oxidation plant, developed to treat carbonaceous ores, was started up. By the end of 1979, drilling at the Les ore body, 14 miles south of the Carlin mill, had outlined 2.3 million tons of ore grading 0.157 ounce per ton, and an additional 3.1 million tons of lower grade ore which was to

be tested to determine its amenability to heap leaching. Carlin's total reserves at yearend 1979, excluding the low-grade Les reserves, were 8.2 million tons grading 0.174 ounce per ton. Smokey Valley Mining Co.'s Round Mountain mine, north of Tonopah, increased output at its large heap leach, open pit operation by about one-third in 1978, moving closer to the design production of 55,000 ounces per year. Duval Corp.'s Copper Canyon mine, near Battle Mountain, was converted in 1978 from being primarily a copper producer to being primarily a gold producer. A substantial output in 1978 made Copper Canyon the seventh largest gold producer that year.

The Gooseberry mine of West Coast Oil & Gas Corp., east of Reno, appeared on the list of 25 leading mines in 1977, and by 1979 had climbed to 12th place on the list. Output at the Atlanta mine, north of Pioche, and at the Windfall mine, near Eureka, fell off somewhat in 1978-79. Kennecott Copper Corp.'s Ruth Pit copper mine, still a substantial producer of byproduct gold in 1978, was closed in April that year because of the depressed copper market.

Nearly all of Arizona's gold output came as a byproduct of the seven copper mines listed in tables 5-6.

In Colorado, the Sunnyside mine, near Silverton, producing gold from lead-zinc ore, was flooded out in June 1978. The Idarado mine, a byproduct gold producer at Ouray, was closed down in 1978 after nearly a century of operation.

The Delamar open pit silver-gold mine in southwestern Idaho opened a second pit in 1978, its second year of operation, which gave more flexibility in the ratio of gold to silver produced. The Knob Hill mine, at Republic, Wash., was closed for 6 months in 1978 while its new owner, Day Mines, Inc., explored for new reserves and rehabilitated the mill. New ore was successfully located, and the mill recommenced operation in August.

The rising price of gold in 1978-79 stimulated the search for gold in the Western States. Nevada, Idaho, Montana, and California attracted most of the exploration activity. There were about 3 dozen substantial deposits being explored, and about half of these entered the development or production stage during the 2-year period. The most important deposit appeared to be the Freeport Minerals-FMC Corp. deposit in Jerritt Canyon, Elko County, Nev. Similar in type and size to the Carlin deposit, 60 miles to the south, the Jerritt Canyon property was expected to come into production as a major gold mine by about 1982.

Refinery production of gold from old scrap grew substantially in both 1978 and 1979 (table 12). Production from new (manufacturer's) scrap, after increasing in 1978, dropped abruptly in the last 2 quarters of 1979, presumably because manufacturers were holding the scrap back as the price of gold rose precipitously. Less than one-fourth of refinery production was derived from domestic ores.

Table 12.—U.S. refinery production of gold

(Thousand troy ounces)

Source	1975	1976	1977	1978	1979
Concentrates and ores:					
Domestic	1,093	954	956	962	795
Foreign	250	123	62	71	83
Old scrap[1]	1,122	1,068	1,040	1,384	1,689
New scrap	1,574	1,436	1,414	1,701	1,209
Total	4,039	3,581	3,472	4,118	3,776

[1]Excludes upgrading of U.S. Government-owned gold (mostly coin gold) by the U.S. Assay Office, amounting to 316,137 ounces in 1977, 2,386,874 ounces in 1978, and 3,000,068 ounces in 1979.

CONSUMPTION

Domestic consumption of refined gold, as measured by its conversion into fabricated and semifabricated forms, declined slightly in 1978-79 (figure 2, table 13). As in recent years, jewelry accounted for about 56% of consumed gold, industrial uses for nearly 30%, and dental uses for about 13%. The rapidly rising gold price in 1979 had only a modest effect on consumption, as users worked down their inventories of refined gold. However, it lent impetus to efforts to reduce the quantities of gold used in manu-

factured items. Thus, electronics manufacturers were substituting palladium, tin, and other suitable metal for gold where possible, and jewelry makers were reportedly beginning to shift away from karat golds to gold-filled, rolled gold, gold plated, and gold-silver combinations.

Although data are not reported on the purchase or "consumption" of gold bullion by the private sector, the quantities purchased annually are believed to be represented approximately by the sizable supply surpluses that have occurred each year since 1975, when the right of U.S. citizens to own gold bullion was reinstated. In 1975, the supply surplus was 520,000 ounces, and reached 2.4 million ounces in 1976, 2.7 million ounces in 1977, and 4.1 million ounces in 1978 and again in 1979. Also, the flow of gold coins, mostly "bullion coins," into the United States has been substantial since the purchase of nonnumismatic coins in quantity was authorized in 1974. Estimated imports of gold coins, in millions of ounces, were: 1974, 3.1; 1975, 1.7; 1976, 1.3; 1977, 1.6; 1978, 3.7; 1979, 2.8.

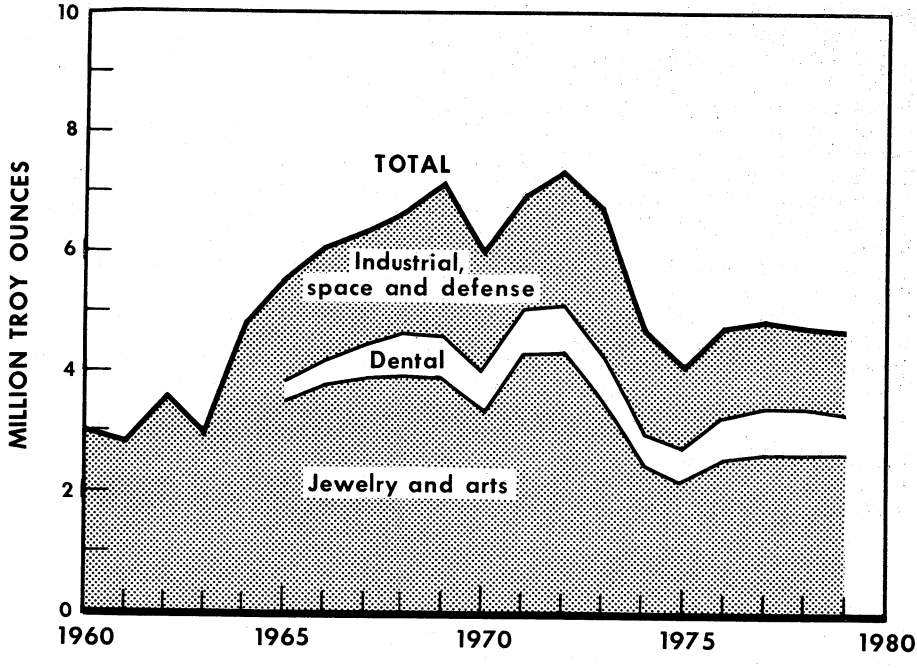

Figure 2.—Fabrication of gold in the United States.

Table 13.—U.S. fabrication of gold, by end use

(Thousand troy ounces)

End use	1975	1976	1977	1978	1979
Jewelry and arts:					
Karat gold	1,747	2,153	2,236	2,224	2,256
Fine gold for electroplating	31	29	37	42	32
Gold filled and other	302	380	385	385	361
Total	2,080	2,562	2,658	2,651	2,649
Dental	595	694	728	706	611
Industrial:					
Karat gold	39	56	60	64	64
Fine gold for electroplating	592	686	656	687	797
Gold filled and other	428	491	r494	562	542
Total	1,059	1,233	r [2]1,209	1,313	1,403
Small items for investment[1]	258	159	268	68	45
Total consumption	[2]3,993	4,648	r [2]4,863	4,738	4,708

rRevised.
[1]Fabricated bars, medallions, coins, etc.
[2]Data do not add to total shown because of independent rounding.

STOCKS

Official.—U.S. stocks declined 1.0 million ounces in 1978, the net result of deliveries of 2.5 million ounces from the U.S. Department of the Treasury's public bullion auctions, and the restitution of 1.4 million ounces to the United States by the IMF. In 1979, the stocks declined 11.8 million ounces, after deliveries of 13.2 million ounces from auctions, and restitution of another 1.4 million ounces from the IMF.

Gold held for foreign and international accounts at the New York Federal Reserve Bank declined in 1978-79 as a result of net deliveries to the market of 1.6 million ounces and transfers of bullion abroad.

Official stocks in the market economy countries declined 28.3 million ounces in the 2-year period, mainly as a result of bullion sales by the United States and the IMF (figure 3).

Commercial.—Industrial stocks of refined gold held by U.S. refiners, fabricators, and dealers was 1.66 million ounces at yearend 1978, and then declined in 1979 to 0.96 million ounces at yearend, apparently as a result of rapidly rising prices and a strike at one of the major refineries in the second half of the year. Futures exchange stocks grew in 1978 as the market expanded rapidly, then contracted slightly in 1979 (table 14).

Table 14.—Stocks of gold in the United States, end of period

(Thousand troy ounces)

	1975	1976	1977	1978	1979
Treasury Department[1]	274,728	274,704	277,570	276,433	264,614
Industry	788	928	1,976	1,672	947
Futures exchange	530	320	1,835	2,752	2,473
Earmarked gold[2]	396,613	388,773	378,683	366,248	359,285

[1]Includes gold in Exchange Stabilization Fund.
[2]Gold held for foreign and international official accounts at New York Federal Reserve Bank.

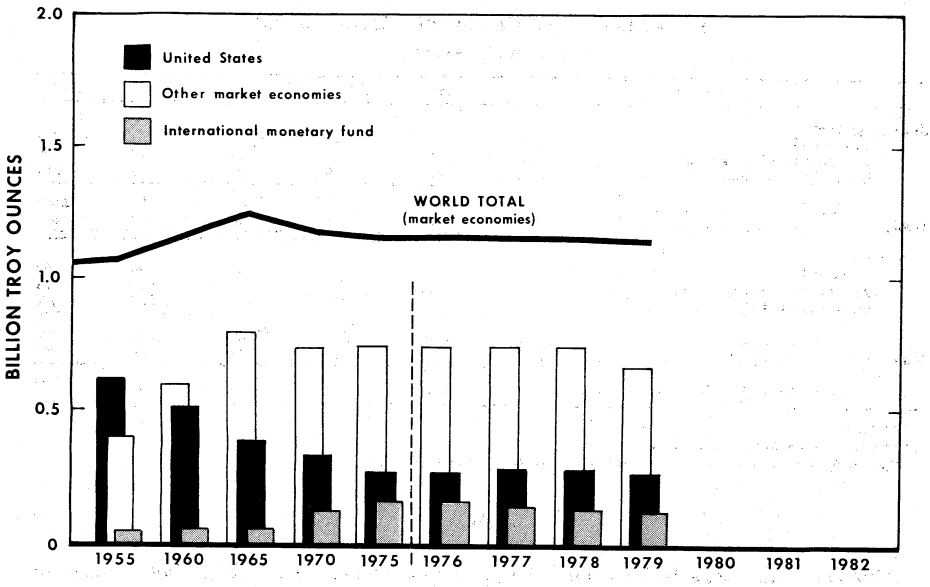

Figure 3.—World monetary gold stocks.

PRICE

The price of refined gold (table 15, figure 4) increased fairly steadily in 1978 and the first quarter of 1979, then began to accelerate upwards until yearend 1979 when it reached the $500 per troy ounce level. The substantial rise in the world price was ascribed by gold market observers to continuing purchase of gold bullion as a hedge against currency inflation, and was said to reflect unstable political and economic conditions. The high gold price stimulated a search for new ore deposits and the reexamination of abandoned mines and tailings dumps, but on the other hand, did not inhibit consumption in the United States appreciably. By the end of 1979, however, the high and rapidly rising price (together with the high interest rates then prevailing) was creating financial difficulties for some U.S. gold users, especially the manufacturers of jewelry.

The second amendment to the IMF articles of agreement, ratified on March 30, 1978, abolished the official IMF price for gold. By the end of 1979, many of the industrialized nations had adopted market-related prices for valuation of their bullion reserves, leaving the United States as the only holder of large gold stocks still valuing its bullion at a fixed price ($42.22 per ounce).

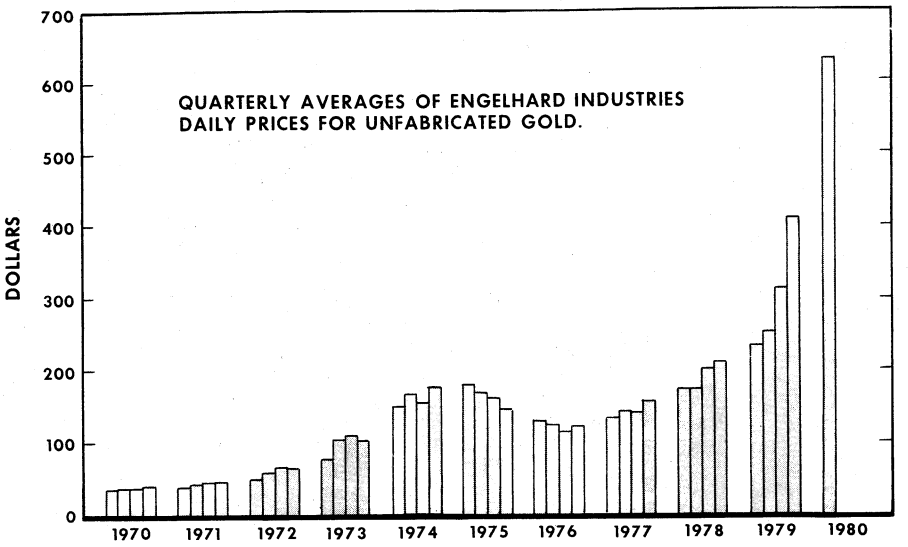

Figure 4.—U.S. gold prices.

Table 15.—U.S. monthly gold prices[1]

(Dollars per troy ounce)

Month	1978			1979		
	Low	High	Average	Low	High	Average
January	166.20	178.00	173.69	217.15	236.40	227.57
February	173.35	183.70	178.59	229.65	252.65	245.84
March	177.80	190.50	184.05	238.45	249.10	242.35
April	168.15	183.90	175.78	232.20	245.60	239.12
May	169.40	184.65	176.49	246.60	274.90	257.64
June	180.85	186.80	184.06	273.20	284.15	279.37
July	183.50	201.60	189.27	281.65	306.10	295.57
August	198.30	216.05	206.30	283.00	319.45	301.67
September	205.95	218.70	212.41	325.40	397.60	357.17
October	217.40	243.05	227.69	372.35	426.40	391.99
November	193.70	227.80	206.20	373.10	415.95	392.64
December	194.95	226.30	208.13	426.75	517.00	459.04
Year	166.20	243.05	193.55	217.15	517.00	307.50

[1]Engelhard Industries daily quotation.

FOREIGN TRADE

Fed by bullion auctioned by the U.S. Department of the Treasury and by the IMF, exports jumped from 5.5 million ounces in 1978 to 16.5 million ounces in 1979. The United Kingdom received 43% of the exports in each year, and most of the remainder went to Switzerland and Canada (figure 5, tables 17-18).

Ninety percent of the 9.3 million ounces of gold imported into the United States in 1978-79 came from Canada, the U.S.S.R., and Switzerland. Another 6.5 million ounces of gold in coins was imported in the 2 years, of which three-fourths came from the Republic of South Africa, and important amounts came from Mexico, Canada, and Switzerland (table 16).

Table 16.—U.S. exports of gold, by country

Year and destination	Ore, base bullion, and scrap		Refined bullion		Total	
	Troy ounces	Value (thousands)	Troy ounces	Value (thousands)	Troy ounces	Value (thousands)
1978:						
Belgium-Luxembourg	144,256	$25,298	13	$2	144,269	$25,300
Brazil	1,639	309	13,333	2,594	14,972	2,903
Canada	32,702	5,968	654,108	139,656	686,810	145,624
Ecuador	--	--	1,980	413	1,980	413
France	1,025	162	860	166	1,885	328
Germany, Federal Republic of	9,062	1,885	975,064	233,029	984,126	234,914
Hong Kong	1,258	191	8	1	1,266	192
Italy	224	40	8,033	1,697	8,257	1,737
Japan	72,004	12,897	83,342	16,254	155,346	29,151
Mexico	80	14	347,949	65,003	348,029	65,017
Netherlands	160	37	428,574	75,709	428,734	75,746
Paraguay	--	--	2,501	469	2,501	469
Singapore	876	134	40	12	916	146
Spain	9,661	1,922	34	5	9,695	1,927
Sweden	11,477	2,149	7	1	11,484	2,150
Switzerland	34,596	6,693	287,733	55,483	322,329	62,176
Taiwan	216	34	40,102	8,722	40,318	8,756
United Kingdom	165,491	31,101	2,176,503	424,934	2,341,994	456,035
Venezuela	12	3	3,524	633	3,536	636
Other	280	45	763	129	1,043	174
Total	485,019	88,882	5,024,471	1,024,912	5,509,490	1,113,794
1979:						
Argentina	--	--	1,616	567	1,616	567
Belgium-Luxembourg	93,680	28,644	72,651	18,650	166,331	47,294
Brazil	11,053	2,627	24,805	7,828	35,858	10,455
Canada	300,580	101,974	2,303,588	814,059	2,604,168	916,033
Costa Rica	--	--	1,088	226	1,088	226
Ecuador	--	--	3,308	996	3,308	996
El Salvador	122	20	673	125	795	145
France	3,176	875	68,810	19,760	71,986	20,635
Germany, Federal Republic of	17,325	5,808	222,675	70,975	240,000	76,783
Italy	260	56	9,934	2,670	10,194	2,726
Japan	29,840	7,421	111,267	28,313	141,107	35,734
Mexico	1,667	512	679,140	216,976	680,807	217,488
Netherlands	36	8	382,873	125,058	382,909	125,066
Panama	100	22	843	161	943	183
Philippines	--	--	3,214	629	3,214	629
Spain	26,125	6,912	--	--	26,125	6,912
Sweden	8,203	2,547	--	--	8,203	2,547
Switzerland	9,558	2,372	4,995,472	1,432,743	5,005,030	1,435,115
United Kingdom	399,149	127,428	6,706,909	1,880,550	7,106,058	2,007,978
Other	653	135	1,006	217	1,659	352
Total	901,527	287,361	15,589,872	4,620,503	16,491,399	4,907,864

Table 17.—U.S. imports for consumption of gold, by country

Country	Ore, base bullion, and scrap		Refined bullion		Total	
	Troy ounces	Value (thousands)	Troy ounces	Value (thousands)	Troy ounces	Value (thousands)
1978:						
Argentina	5,792	$1,061	10,887	$1,953	16,679	$3,014
Australia	1,105	230	230	46	1,335	276
Austria	--	--	72,229	13,475	72,229	13,475
Brazil	--	--	1,608	322	1,608	322
Canada	118,436	22,360	1,641,636	316,901	1,760,072	339,261
Chile	206	41	46,628	8,857	46,834	8,898
Dominican Republic	4,980	983	19,569	4,100	24,549	5,083
Germany, Federal Republic of	5,880	1,080	57	8	5,937	1,088
Guyana	1,402	252	166	30	1,568	282
Hong Kong	3,491	644	43	10	3,534	654
Japan	--	--	123,336	23,640	123,336	23,640
Korea, Republic of	2,236	370	--	--	2,236	370
Malaysia	8,100	1,524	--	--	8,100	1,524
Mexico	11,831	2,113	4,922	890	16,753	3,003
Nicaragua	22,481	4,056	8,817	1,662	31,298	5,718
Peru	11,765	2,279	26,494	5,020	38,259	7,299
Philippines	1,510	300	--	--	1,510	300
Singapore	10,643	2,051	--	--	10,643	2,051
South Africa, Republic of	6,476	1,022	964	215	7,440	1,237
Switzerland	17,241	3,276	950,396	177,484	967,637	180,760
U.S.S.R	4,592	844	1,451,109	285,793	1,455,701	286,637
United Kingdom	1,893	369	46,566	9,778	48,459	10,147
Yugoslavia	--	--	38,965	7,084	38,965	7,084
Other	2,687	446	2,356	455	5,043	901
Total	242,747	45,301	4,446,978	857,723	4,689,725	903,024
1979:						
Argentina	3,149	868	2,199	570	5,348	1,438
Australia	3,626	860	134	39	3,760	899
Canada	94,692	31,753	1,694,963	533,391	1,789,655	565,144
Chile	29,044	8,250	41,340	12,846	70,384	21,096
Costa Rica	--	--	1,319	507	1,319	507
Dominican Republic	6,429	1,966	25,543	6,423	31,972	8,389
France	51	20	1,236	398	1,287	418
Germany, Federal Republic of	1,309	305	703	223	2,012	528
Guyana	2,152	626	3,360	1,191	5,512	1,817
Hong Kong	11,505	3,540	1,361	443	12,866	3,983
Ireland	3,267	653	--	--	3,267	653
Israel	2,629	1,124	--	--	2,629	1,124
Italy	165	67	1,926	586	2,091	653
Japan	--	--	94,659	27,649	94,659	27,649
Korea, Republic of	2,534	628	--	--	2,534	628
Malaysia	8,200	2,251	--	--	8,200	2,251
Mexico	9,918	2,874	1,210	337	11,128	3,211
Netherlands	--	--	8,028	2,975	8,028	2,975
Nicaragua	14,548	2,867	7,507	1,757	22,055	4,624
Peru	10,608	3,018	22,421	5,892	33,029	8,910
Philippines	22,815	7,593	--	--	22,815	7,593
Singapore	8,220	2,308	--	--	8,220	2,308
South Africa, Republic of	520	231	9,350	2,347	9,870	2,578
Switzerland	16,166	6,267	739,944	234,577	756,110	240,844
U.S.S.R	1,378	493	1,644,195	548,339	1,645,573	548,832
United Kingdom	656	255	29,018	7,751	29,674	8,006
Yugoslavia	--	--	41,168	11,683	41,168	11,683
Other	2,815	717	2,218	745	4,533	1,462
Total	255,896	79,534	4,373,802	1,400,669	4,629,698	1,480,203

Table 18.—Value of U.S. gold trade

(Thousand dollars)

Year	Exports	Imports[1]
1975	492,932	456,638
1976	375,048	331,018
1977	1,112,711	674,026
1978	1,113,794	903,024
1979	4,907,864	1,480,203

[1]Value of general imports for 1975-77. Value of imports for consumption for 1978-79; values of general imports were $921,504,188 (1978) and $1,506,716,888 (1979).

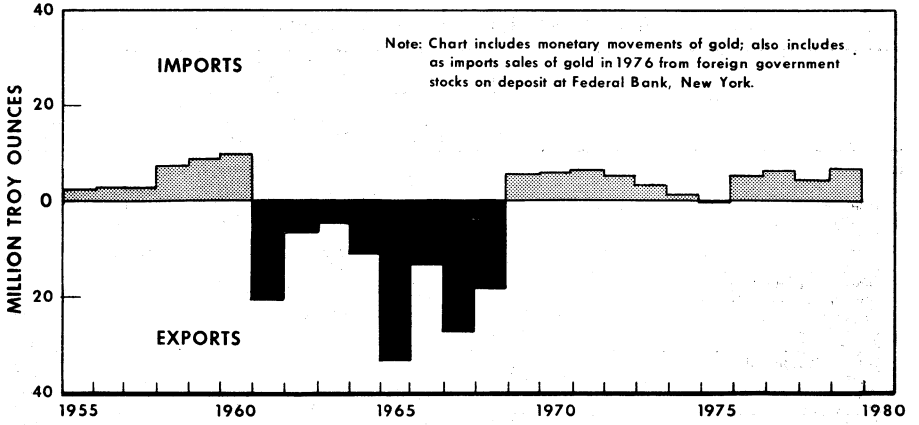

Figure 5.—Net U.S. trade in gold.

WORLD REVIEW

World gold mine production remained at about 39 million ounces in 1978, and again in 1979. Continuing high gold prices stimulated modest increases in production in several countries; on the other hand, production in the United States and a few other countries decreased somewhat because mines were enabled to use leaner ores as the price of gold increased. The pattern of production remained essentially unchanged, with the Republic of South Africa accounting for about 58% of output, the U.S.S.R. for 20%, Canada for 4%, the United States for 2%, and 61 other countries for the remaining 16% (figure 6, table 19).

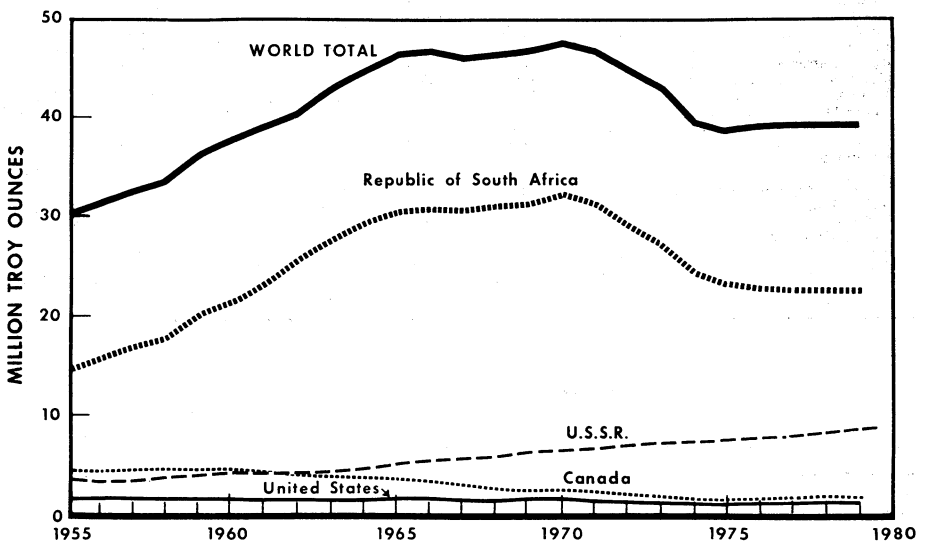

Figure 6.—Gold: World mine production.

Table 19.—Gold: World mine production, by country

(Troy ounces)

Country[1]	1976	1977	1978[p]	1979[e]
North America:				
Canada	1,691,806	1,733,609	1,735,077	[2]1,581,013
Costa Rica[e]	9,600	12,200	15,900	15,000
Dominican Republic	413,788	348,473	336,073	330,000
El Salvador	3,007	2,156	3,619	4,000
Honduras	2,280	2,481	[e]2,500	2,500
Mexico	162,811	212,709	202,003	[2]188,000
Nicaragua	[r]75,841	65,764	[e]65,800	60,000
United States	1,048,037	1,100,347	998,832	[2]919,783
South America:				
Argentina	5,804	5,509	5,514	5,500
Bolivia	41,540	24,277	24,660	[2]30,319
Brazil[3]	239,520	279,520	304,110	340,200
Chile	[r]129,172	116,376	102,416	105,000
Colombia	300,307	263,437	257,632	290,000
Ecuador	[r]11,014	7,649	3,213	3,500
French Guiana	2,797	4,823	[e]5,000	5,000
Guyana	[r]15,656	11,899	15,396	[2]10,593
Peru	[r]79,412	104,393	103,069	[2]122,333
Surinam	39	[r]376	--	--
Venezuela	16,506	17,403	11,960	14,000
Europe:				
Finland	26,299	27,392	29,096	[2]28,325
France	61,022	50,444	59,640	60,000
Germany, Federal Republic of	2,456	2,392	2,119	2,400
Hungary[e]	155,000	115,000	60,000	60,000
Portugal	[r]10,031	8,830	7,765	[2]10,706
Romania[e]	60,000	65,000	65,000	65,000
Spain	148,601	117,800	[e]150,000	155,000
Sweden	62,179	67,934	76,294	[2]70,000
U.S.S.R.[e]	7,700,000	7,850,000	8,000,000	8,160,000
Yugoslavia	157,088	164,226	165,000	140,000
Africa:				
Burundi	426	[e]450	[e]450	450
Cameroon	251	182	200	200
Central African Empire	[e]400	[e]100	965	500
Congo[e]	[r]6,900	[r]7,000	7,000	7,000
Ethiopia	[r]11,253	7,725	[3]8,000	8,100
Gabon	3,086	2,572	965	100
Ghana	532,473	480,884	402,034	[2]482,300
Kenya	37	89	205	200
Madagascar	[e]160	76	125	125
Mali[e]	[r]900	932	965	1,000
Mauritania	22,120	28,000	8,000	--
Rhodesia, Southern[e]	600,000	600,000	640,000	700,000
Rwanda	936	1,814	1,125	1,100
South Africa, Republic of	22,935,988	22,501,886	22,648,558	[2]22,616,656
Tanzania	10	23	12	10
Zaire	91,093	80,418	76,077	75,000
Zambia	10,955	[r e]11,250	8,457	7,941
Asia:				
China, mainland[e]	[r]80,000	[r]100,000	150,000	200,000
Democratic Kampuchea[e]	1,000	1,000	--	--
India[4]	100,696	[r]96,902	87,579	[2]84,749
Indonesia[5]	[r]114,000	[r]82,300	81,600	70,000
Japan	137,669	149,018	145,225	[2]132,879
Korea, North[e]	160,000	[r]160,000	160,000	160,000
Korea, Republic of[4]	18,744	21,380	27,392	[2]23,566
Malaysia:				
Peninsular Malaysia	3,574	4,172	5,805	5,000
Sarawak	[r]964	742	971	1,000
Philippines	501,210	558,235	586,598	[2]546,536
Taiwan	26,952	14,995	13,407	15,000
Oceania:				
Australia	502,741	630,155	647,580	[2]588,359
Solomon Islands	[e]600	372	[e]400	400
Fiji	65,757	49,067	28,065	25,000
New Zealand	3,276	7,168	7,044	7,000
Papua New Guinea	668,014	739,730	751,265	700,000
Total	[r]39,233,798	39,121,056	39,303,757	39,238,343

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

[1]Gold is also produced in Bulgaria, Burma, Czechoslovakia, the German Democratic Republic, Guinea, Norway, Thailand, and several other countries. However, available data are insufficient to make reliable output estimates. The previous edition of this table listed Angola, Liberia, Nigeria, and Sudan as gold producers but output of these countries for 1976-77 has been revised to zero.

[2]Reported figure.

[3]Series revised to include an estimate of unregistered output by small producers.

[4]Refinery output.

[5]Excludes production from so-called "people's mines."

The supply of gold (excluding most secondary gold), available to purchasers in the market economy countries in 1978 (1979 figures are in parentheses) was about 54.0 (56.5) million ounces, of which 30.7 (30.4) million ounces was mined in the market economy countries, 13.2 (7.4) million ounces came from central economy countries, and 10.1 (18.7) million ounces from net "official" sales, mainly the IMF and U.S. Treasury auctions. As in former years, most of the gold from the Republic of South Africa, the U.S.S.R., and several other producing countries was funneled through Switzerland, England, and other Western European countries. Much of the gold flowing from the United States to Europe was bullion sold from IMF and U.S. Treasury stocks.

Demand for gold remained strong in 1978 and most of 1979 in spite of the rising price and the injection of large quantities of monetary bullion into the market. Apparently, private investors, and some governments, bought gold for its traditional functions as a store of value and a hedge against inflation of currency. The distribution of gold in 1978 was reported as follows:[4] 89% of the gold was fabricated (about two-thirds of it in the developed countries), and 11% was purchased as bullion. About 64% of the fabricated gold went into jewelry, 17% into coins, 6% into dental uses, 5% into electronics, 5% into other industrial uses, and 3% into medals, medallions, and unofficial coins.

The Group of Ten (10 leading industrial countries, plus Switzerland) allowed its 2-year old agreement, prohibiting members from buying gold at prices higher than the official IMF price, to expire on January 31, 1978. Subsequently, in March 1978, the IMF amended its articles of agreement, abolishing the official IMF price for gold, and allowing member countries to buy and sell gold on the free market. In June 1978, the IMF reduced the quantity of bullion it offered for sale each month to 470,000 ounces, from 525,000 ounces, and gave member countries the option of buying gold at each monthly auction on a noncompetitive basis at the average price established in the auction. The latter option was continued for 1 year during which 1.5 million ounces was sold to member countries. In June 1979, the IMF again reduced its monthly bullion offering, to 444,000 ounces. The 4-year program of monthly auctions, during which 25 million ounces were sold, was scheduled to end in May 1980.

A brief review, by country follows:

Australia.—Most of the gold mined in Australia in 1978-79 came from four sources. Three of these were in Western Australia; the largest was the Telfer mine, which produced 228,000 ounces in 1978 and 172,000 ounces in 1979. The Mt. Charlotte mine yielded 101,000 ounces in 1978 and 109,000 ounces in 1979. The Central Norseman mine's production was in the range of 85,000 to 90,000 ounces each of the 2 years. The Warrengo and Gecko mines of Peko Wallsend Operations Ltd., near Tennant Creek in the Northern Territory, together yielded in the order of 100,000 ounces each year. Several other Australian gold deposits were being examined and developed. The Ingliston gold mine at Meekathara, Western Australia, was reopened in 1978 after an inactive interval of 60 years. Whim Creek Consolidated Mining Co. was prepared, at the end of 1979, to proceed with heap-leaching of low-grade ore at the Haveluck deposit near Meekathara. North Kalgoorlie Mines, Ltd., in 1979, reconverted its Croesus ore treatment plant to handle gold ores. The Tasmania, Morning Star, and Berringa mines were to be reopened. A tin-gold prospect near Jingellic, New South Wales, was being explored in 1979, while at Roxby Downs, in South Australia, drilling confirmed the existence of a very large copper-uranium-gold deposit.

Brazil.—The figures for Brazilian gold production in 1976-77, shown in table 19, have been revised upward to bring them in line with the Brazilian Government's figure for 1978, which gives considerably more weight than in earlier years to estimated production by individual alluvial miners, or garimpeiros. Garimpeiros, who have been estimated to number 25,000 to 30,000, have been credited with 57% of 1978 gold production. Among the dozens of alluvial deposits being worked, the greatest activity was concentrated along the Tapajos and nearby rivers in the upper Amazon basin in Para Province, but there was also much activity in Roraima, Amapa, Maranhao, Bahia, Minas Gerais, and Mato Grosso Provinces. Virtually all of the lode mine gold, 131,000 ounces in 1978, came from the Morro Velho mine in Minas Gerais, which increased production 10% in 1978.

Docegas, the exploration subsidiary of Companhia Vale do Rio Doce, continued exploration of gold mineralization near Xinguara in southern Para. The Anglo American and Antunes Groups explored a

deposit near Jacobina, Bahia, and announced the development of a mine to be ready for production in 1982.

Canada.—In 1978 (1979), 22 (21) mines produced gold. Of the Provinces, Ontario was the largest producer, yielding 42% (39%) of the national total, followed by Quebec with 27% (28%), British Columbia, with 12% (16%), and the Northwest Territory with 12% (11%). Gold from the Atlantic Provinces, and most of that from British Columbia and the Prairie Provinces was a byproduct of base metal mining. Byproduct gold made up about one-third of total gold produced. Details of the operation of individual mines were published in the Canadian Minerals Yearbook.

Colombia.—More than half of reported Colombian gold production came from placer deposits in northern Colombia, largely from the Nechi River and other streams in Antioquia Department. Much of the placer production was reported by companies operating sizable dredges, but a substantial amount of gold was recovered by individual miners using hand methods.

Dominican Republic.—The output of the Pueblo Viejo mine, the sole gold producer, was 336,073 ounces in 1978. Recovery grade averaged 0.11 ounce gold per ton. Mill capacity was increased 16% during 1978 to 9,300 tons per day, by installation of a new crushing plant and another ball mill circuit, and other major modifications to the mill. Exploration and metallurgical research continued on the sulfide ores underlying the oxide ore body. In October 1979, the Dominican Government bought the remaining 54% interest in the mine that was held in equal shares by two U.S. companies, Rosario Resources Corp. and Simplot Industries, Inc.

Ghana.—Gold production declined in 1978 for the second year, and then stabilized at about the same level in 1979. Ashanti Goldfields Corp., Ghana's main producer, announced plans to sink a new shaft to increase output of ore by 75,000 tons per year. The shaft was expected to be completed in about 4 years.

Papua New Guinea.—After increasing slightly in 1978, production fell 7% in 1979 as the grade of mined ore dropped. Virtually all of the gold was a byproduct of copper mined by Bougainville Copper Ltd. The international consortium exploring the Ok Tedi copper deposit estimated that the gold-enriched cap covering the primary ore body contains about 3.5 million ounces of gold. It was planned to mine the gold cap first, starting in 1984, over a 3 to 4 year period. Gold was being explored for in at least 10 other locations in Papua New Guinea.

Philippines.—Gold production increased in 1978, but then dropped back again in 1979. Three-fourths of the gold was a byproduct of copper mining, and revenues from gold became very important to the economics of several copper mines. High gold prices during 1978-79 stimulated plans for development of several gold deposits. Benguet Consolidated Inc., developed its large Dizon copper-gold deposit in Zambales Province and started production in January 1980. At the design production rate of 100,000 ounces of gold per year, about 12 years' reserves had been located. Benguet also undertook the expansion and operation of Atok - Big Wedge Mining Co's. mine at Itogon; ore production was to be increased from 100 tons per day to 600 tons per day by late 1980. Atlas Consolidated Mining & Development Corp. reopened its Masbate mine in 1979. It was expected to attain a production level of 90,000 ounces of gold per year. Manila Mining Corp.'s placer gold property near Surigao on northern Mindanao was expected to be in production by the end of 1979. Metals Exploration Asia Inc., was arranging financing for its Longos gold project in Camarines Norte, aiming for production in 1980.

The Philippines Central Bank's new gold refinery at Quezon City became fully operational in 1978, at a capacity of 600,000 ounces per year, and all Philippines gold producers were required to sell their gold to it.

South Africa, Republic of.—Production stabilized in 1978-79 at 22.6 million ounces per year, or 58% of world gold mine production. The 35 mines and two metallurgical recovery operations that were members of the Chamber of Mines accounted for essentially all of South African production. Data published by the chamber show that member mines in 1978 (1979) milled 86.1 (92.0) million short tons of ore, averaging 0.31 (0.29) ounce of gold per ton. Working costs averaged (in U.S. dollars) $102.92 ($127.14) per ounce, and ranged from $46.72 ($56.26) at East Driefontein to $233.00 ($308.41) at Free State Saaiplass (Loraine). Production by the seven major mining groups was as follows, in million ounces: Anglo American Corp. of South Africa, Ltd., 8.4 (8.6); Gold Fields of South Africa, Ltd., 5.3 (5.2); Rand Mines, Ltd., 2.2 (2.2); Union Corp. 2.0 (1.9); General Mining & Finance Corp., 1.6 (1.5);

Anglo Transvaal Consolidated Investment Co. Ltd., 1.2 (1.2); and Johanesburg Consolidated Investment Corp., Ltd., 1.4 (1.5). The largest producing mines were, in million ounces, Vaal Reefs, 2.17 (2.16), West Driefontein 1.84 (1.68); East Driefontein 1.57 (1.56), Western Deep Levels 1.47 (1.54), and Free State Geduld 1.37 (1.21). Nine mines, and two metallurgical recovery operations, also produced uranium in 1978. South African demonstrated gold reserves at the end of the third quarter in 1979 were 530 million ounces, of which 78 million ounces were proven reserves grading 0.39 ounce per ton.

Several mines were expanding production or being readied for operation. At Gold Fields' Deelkraal mine, located south of Carletonville, on the Far West Rand, all major surface installations were essentially complete by yearend 1978. Initial stoping and trial milling were conducted in 1979. Development of the Elandsrand mine was 31 months ahead of schedule when production began in December 1978. Ore production in 1979 averaged nearly 50,000 tons per month, and was expected to reach 150,000 tons per month by early 1981, and ultimately 225,000 tons per month. At the Unisel mine, in the Orange Free State, underground development began in mid-1978 and production commenced in March 1979. Ore production was expected to build to a rate of 75,000 tons per month by the end of 1979.

U.S.S.R.—Gold production was estimated to have risen about 3% over the 2-year period. The export of gold by central economy countries to market economy countries was estimated[5] to amount to 13.2 million ounces in 1978 and 7.4 million ounces in 1979. Virtually all of that gold came from the U.S.S.R. Direct exports of gold by the U.S.S.R. to the United States made up 30% of U.S. gold imports in 1978, and 36% in 1979.

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[1]Physical scientist, Section of Nonferrous Metals.
[2]Ounce means troy ounce.
[3]Federal Register. V. 43, No. 137, July 17, 1978, p. 30538.
[4]Gold 1979. Published by Consolidated Gold Fields, Ltd.
[5]Gold 1980. Published by Consolidated Gold Fields, Ltd.