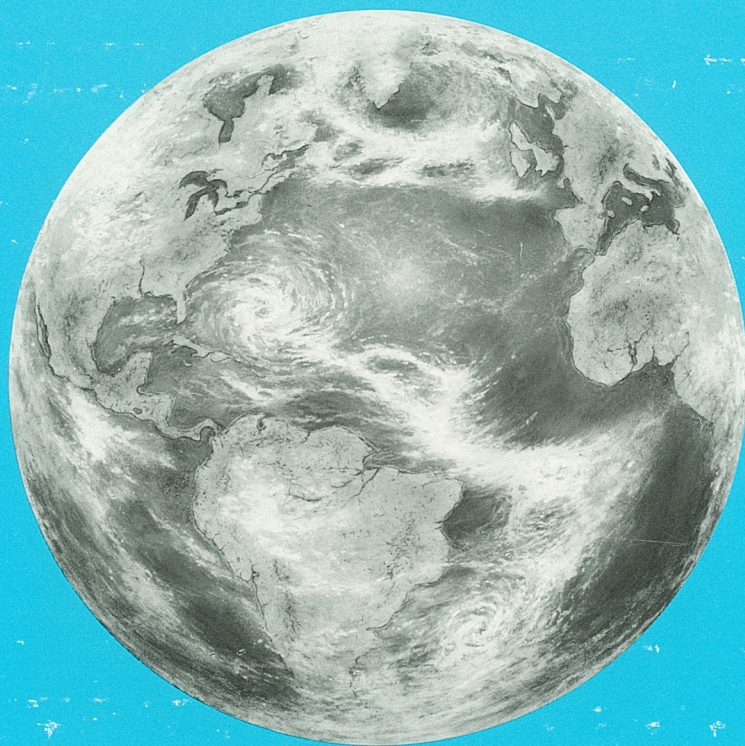

WORLD SILVER SURVEY

1992



THE SILVER INSTITUTE

WORLD SILVER SURVEY 1992

THE SILVER INSTITUTE

A WORLDWIDE ASSOCIATION OF
MINERS, REFINERS, FABRICATORS AND MANUFACTURERS

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PREFACE

The Silver Institute is pleased to release the 1992 edition of its *WORLD SILVER SURVEY*. This series of annual silver market reports, begun in 1990, quickly has moved to fill the shortfall of reliable statistics on silver supply and demand.

The Silver Institute has two objectives in this program. First, to provide for a wider distribution of accurate, reliable information on the production of silver at mines, its recovery from scrapped materials, and its use in a wide range of applications.

Second, The Silver Institute's *WORLD SILVER SURVEY* program is designed to improve the quality of the silver market statistics that are available.

Again this year, as in the 1991 report, the CPM Group, which produces the body of the annual reviews for the Institute, has included in the report a detailed discussion of silver use in the United States, including data and information on the importation of silver-bearing jewelry and sterlingware into the country that are manufactured elsewhere. Efforts continue to improve the statistics on silver use in Europe, Asia and other regions as well.

The annual survey is divided into two sections. The first section presents the basic review of 1991 and outlook for supply and demand in 1992. Summary tables and charts are included in this section, along with detailed discussion of conditions in individual market sectors last year. The second section includes numerous detailed statistical tables and charts.

In addition to the annual survey, this report includes: The Silver Institute's annual *World Mine Survey of Silver*; a special section *Silver-Based Photography - Today and Tomorrow*, by photographic expert Peter Krause; and a review of silver market conditions in India and Southeast Asia by Timothy S. Green, who travels extensively in that region each year.

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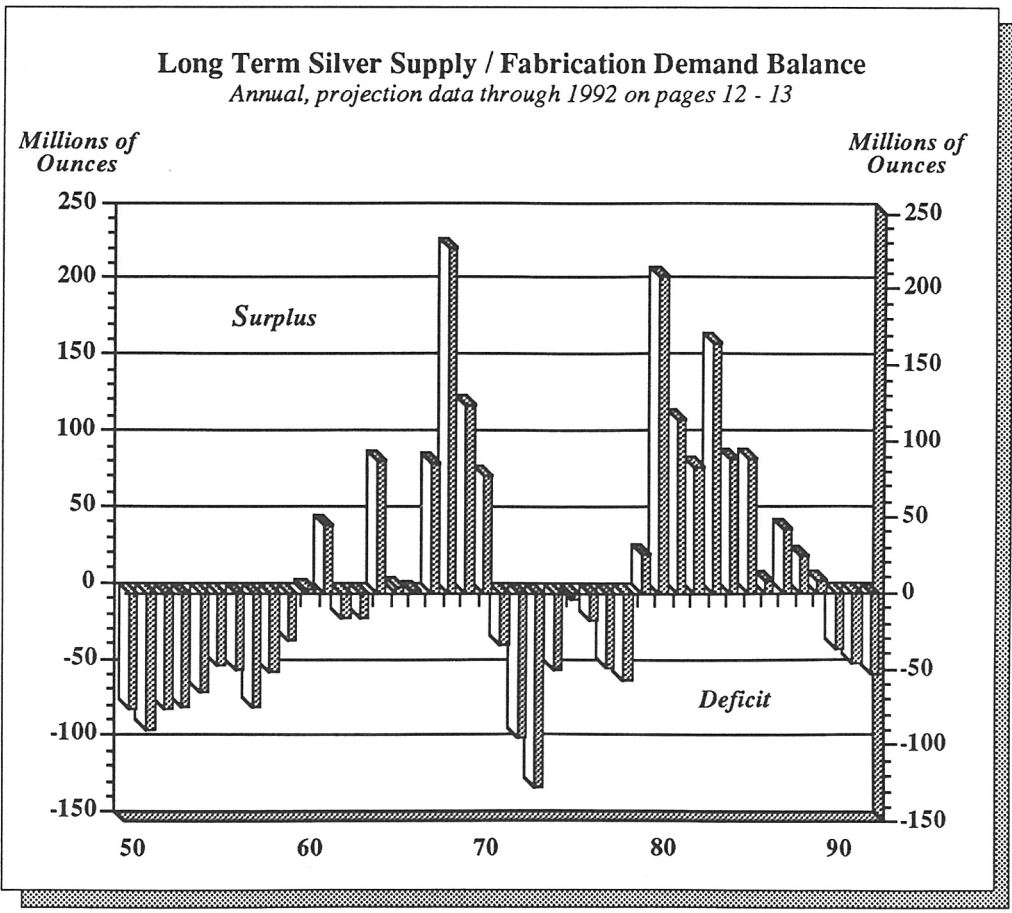
SUMMARY

Market balance

1. Fabrication demand for silver has exceeded total new supply for two years, and appears set to be higher than new supplies again in 1992. The shortfall of new silver supplies relative to fabrication demand rose to 46.2 million troy ounces in 1991, up from 37.0 million ounces in 1990. Demand could exceed supply by 53.0 million ounces in 1992.

Supply

- 2. Total silver supply is estimated to have declined 2% in 1991, to 495.1 million ounces from 505.1 million ounces in 1990. Both mine production and secondary supply fell.
- 3. In 1992 total supply is expected to be only marginally higher, at 495.6 million ounces.



4. Mine production fell by nearly 1% in 1991, to 366.6 million ounces, with primary producers' output lower in the face of reduced prices. Output is expected to rise less than one percent in 1992, to 369.0 million ounces.
5. Recovery of silver from secondary sources declined 5.8% in 1991, to 111.2 million ounces. The largest decline was in scrapped industrial items and jewelry, which fell 7.1% to 104.0 million ounces. Supply from this area could rise to 108.0 million ounces this year. Total secondary supply may be marginally lower this year, around 111.0 million ounces.
6. The recovery of silver from scrapped decorative items and jewelry in India resurfaced last year, drawn into the market by a spike in Indian silver prices and a surge in fabrication demand late in the year. An estimated 3.2 million ounces was sold in 1991. Illegal imports fell from 1990's record level of 42.1 million ounces, and totaled 34.0 million ounces.
7. Supply from government sales, and exports from the transitional economies rose slightly from 17.0 million ounces in 1990 to 17.3 million ounces in 1991. These supplies are projected to drop to 15.6 million ounces in 1992.

Fabrication Demand

8. Total silver fabrication demand fell 0.1% in 1991, from 542.1 million ounces in 1990 to 541.3 million ounces largely due to the Gulf War and the recession in major markets. Higher photographic demand offset much of a sharp decline in electronics and electrical products. Silver use in jewelry and sterlingware rose 5.4% in 1991.
9. Demand is projected to rise to 548.6 million ounces in 1992. Fabricators' use of silver possibly could be even higher, depending on the strength of the worldwide economic recovery. Demand in photography, jewelry, sterlingware, and some smaller applications has shown a great deal of resilience during the recession, which could presage strong increases in silver demand in these sectors as the major industrialized economies recover.
10. The softness in fabrication demand last year was unevenly distributed. Demand in United States was extremely weak in some sectors. Use in Western Europe remained relatively strong, and Japan expanded its use of silver.

Investment Demand

11. Investors continued to be net sellers of silver bullion last year, but there were renewed signs of interest as prices showed signs of base-building.

12. Small investors pulled back from the market, after a spurt of coin purchases in the first quarter of 1991. Coin demand rose 100,000 ounces last year, to 29.9 million ounces. In 1992, investor demand for coins is expected to be roughly unchanged from 1991 levels.

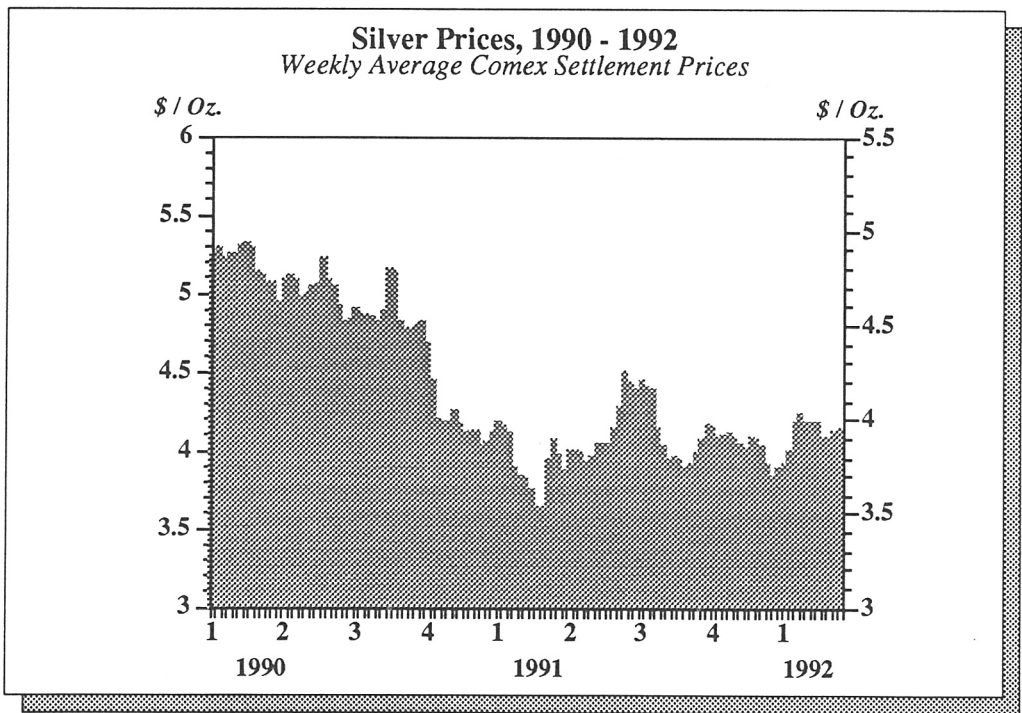
13. Reported market stocks rose slightly last year. Silver in New York banks totaled 270.7 million ounces at the end of 1991, up 5.4 million ounces from a year earlier. By mid-March of 1992, these stocks had risen to 282.9 million ounces. However, at least one-quarter of this silver appeared to be in the hands of longer-term investors, possibly positioning themselves for higher silver prices.

Prices

14. Silver prices fell as low as \$3.51 per ounce in March 1991. They reached a high for the year of \$4.55 in June. Comex spot settlement prices averaged \$4.03 in 1991, a decline of 16% from 1990. This was the lowest annual average price for silver since 1974.

15. Prices traded between \$4.00 and \$4.40 through mid-March of 1992. The monthly average price through February was \$4.13, 6.7% higher than in the same period of 1991.

16. Silver prices in early 1992 remained at their lowest inflation-adjusted levels in decades.



Silver Statistical Position

Million Troy Ounces

	1977	1978	1979	1980	1981	1982	1983	1984
Mine Production								
Mexico	47.0	50.8	49.4	47.3	53.2	49.8	55.0	63.9
United States	38.2	39.4	37.9	32.3	40.7	40.2	43.4	44.6
Peru	39.1	37.0	41.9	44.8	42.6	54.4	55.6	53.3
Canada	42.2	40.7	36.9	34.4	36.3	42.2	38.7	42.0
Other	96.8	98.9	105.9	107.6	110.4	111.5	120.9	120.8
Total	263.3	266.8	272.0	266.5	283.2	298.0	313.6	324.5
<i>% Change Year Ago</i>	—	1.3	1.9	-2.0	6.3	5.2	5.2	3.5
Secondary and Other Supply								
	182.0	168.0	233.0	320.0	196.0	158.0	217.5	153.6
<i>% Change Year Ago</i>	—	-7.7	38.7	37.3	-38.8	-19.4	37.7	-29.4
Total Supply	445.3	434.8	505.0	586.5	479.2	456.0	531.1	478.1
<i>% Change Year Ago</i>	—	-2.4	16.1	16.1	-18.3	-4.8	16.5	-10.0
Fabrication Demand								
Photography	129.6	142.9	146.1	123.8	128.1	133.3	138.3	144.2
Jewelry & Silverware	91.0	91.9	79.1	47.9	43.5	50.2	42.1	41.3
Electronics	78.7	79.3	80.4	71.2	62.2	61.7	60.4	62.3
Other Uses	87.5	84.0	82.5	66.6	61.8	58.1	57.4	65.3
Other Countries, Total	73.1	54.3	60.1	54.8	59.8	58.1	58.3	63.6
Coinage	34.5	39.5	31.0	15.0	9.5	12.0	10.2	13.7
Total	494.4	491.9	479.2	379.3	364.9	373.4	366.7	390.4
<i>% Change Year Ago</i>	—	-0.5	-2.6	-20.8	-3.8	2.3	-1.8	6.5
Net Surplus/Deficit	-49.1	-57.1	25.8	207.2	114.3	82.6	164.4	87.7
Additional Statistics								
Changes in Reported Stocks	10.5	-15.3	-7.8	2.8	-15.7	12.7	52.2	-8.0

Notes: Totals may not equal the sum of categories due to rounding. Excludes transitional economies, except for net exports into the market. Photography, jewelry and silverware, electronics, and 'other' industrial use includes U.S., European, and Japanese demand.

p — projections.

NM — Not meaningful.

Source: CPM Group

1985	1986	1987	1988	1989	1990	1991	1992p	
								Mine Production
69.2	69.4	69.8	70.0	70.0	67.9	62.7	65.0	Mexico
39.2	34.2	39.8	53.4	60.8	66.5	61.0	65.0	United States
54.9	59.9	63.6	47.7	56.8	55.6	56.9	50.0	Peru
38.5	35.0	38.1	44.1	41.3	44.4	41.0	42.0	Canada
128.0	121.8	126.9	128.8	129.4	135.8	145.0	147.0	Other
329.9	320.3	338.2	344.0	358.4	370.1	366.6	369.0	Total
1.7	-2.9	5.6	1.7	4.2	3.3	-0.1	0.7	% Change Year Ago
								Secondary and Other Supply
152.9	124.9	164.0	158.1	153.2	135.0	128.5	126.6	
-0.5	-18.3	31.3	-3.6	-3.1	-11.9	-4.8	-1.5	% Change Year Ago
482.8	445.2	502.2	502.1	511.6	505.1	495.1	495.6	Total Supply
1.4	-7.8	12.8	0.0	1.9	-1.9	-2.0	0.1	% Change Year Ago
								Industrial Demand
148.2	153.3	164.1	176.3	177.1	186.0	187.0	192.0	Photography
47.5	61.3	66.0	69.3	75.8	81.0	85.4	87.0	Jewelry & Silverware
64.7	66.4	61.1	65.3	70.6	70.6	65.2	65.0	Electronics
63.8	61.7	68.8	69.8	75.3	79.2	81.0	81.5	Other Uses
63.8	67.1	70.6	72.5	78.7	95.5	92.8	93.1	Other Countries, Total
13.4	26.8	30.4	25.3	26.3	29.8	29.9	30.0	Coinage
401.4	436.8	461.0	478.5	503.8	542.1	541.3	548.6	Total
2.8	8.8	5.5	3.8	5.3	7.6	-0.1	1.3	% Change Year Ago
81.4	8.4	41.2	23.6	7.8	-37.0	-46.2	-53.0	Net Surplus/Deficit
								Additional Statistics
37.8	-38.6	2.9	16.2	51.1	33.1	0.4		Changes in Reported Stocks

World Silver Supply and Fabrication Demand
Million Troy Ounces

Year	Supply				Demand		
	Mine Output	Secondary	Other	Total	Industrial	Coinage	Total
1950	169.5	—	—	169.5	158.8	44.1	202.9
1951	165.5	—	—	165.5	164.6	90.5	255.1
1952	180.6	—	—	180.6	142.1	114.3	256.4
1953	184.7	—	—	184.7	168.3	90.8	259.1
1954	178.6	—	—	178.6	160.8	83.4	244.2
1955	187.7	—	10.3	198.0	192.8	52.6	245.4
1956	189.8	30.5	3.7	224.0	218.1	56.6	274.7
1957	195.6	25.0	3.8	224.4	214.8	84.2	299.0
1958	202.3	17.0	1.3	220.6	193.0	79.5	272.5
1959	195.6	33.4	42.0	271.0	216.0	86.4	302.4
1960	201.8	52.0	90.0	343.8	237.8	103.9	341.7
1961	203.9	65.0	181.0	449.9	269.6	136.0	405.6
1962	210.8	69.0	107.0	386.8	275.5	127.6	403.1
1963	214.0	68.0	147.0	429.0	278.9	166.4	445.3
1964	211.5	86.0	374.0	671.5	318.2	267.1	585.3
1965	218.4	103.0	426.0	747.4	358.5	385.1	743.6
1966	225.2	105.0	217.0	547.2	417.1	129.5	546.6
1967	214.7	126.0	252.0	592.7	401.9	105.3	507.2
1968	230.2	227.0	232.0	689.2	373.9	89.3	463.2
1969	248.7	174.0	119.0	541.7	386.3	32.7	419.0
1970	258.5	127.0	91.0	476.5	376.0	23.4	399.4
1971	247.3	127.0	9.0	383.3	389.5	27.8	417.3
1972	248.9	112.0	14.0	374.9	431.4	38.1	469.5
1973	254.0	122.0	47.0	423.0	522.5	28.5	551.0
1974	236.6	192.0	22.0	450.6	470.0	31.6	501.6
1975	239.0	177.0	21.0	437.0	407.7	33.4	441.1
1976	242.9	235.0	19.0	496.9	484.7	30.0	514.7
1977	263.3	169.0	13.0	445.3	459.9	34.5	494.4
1978	266.8	152.0	16.0	434.8	452.4	39.5	491.9
1979	272.0	216.0	17.0	505.0	448.2	31.0	479.2
1980	266.5	302.0	18.0	586.5	364.3	15.0	379.3
1981	283.2	184.0	12.0	479.2	355.4	9.5	364.9
1982	298.0	155.0	3.0	456.0	361.4	12.0	373.4
1983	313.6	197.5	20.0	531.1	356.4	10.2	366.6
1984	324.5	165.6	-12.0	478.1	376.7	13.7	390.4
1985	329.9	140.9	12.0	482.8	388.0	13.4	401.4
1986	320.3	129.3	-4.4	445.2	410.0	26.8	436.8
1987	338.2	137.9	26.1	502.2	430.6	30.4	461.0
1988	344.0	143.9	14.2	502.1	453.2	25.3	478.5
1989	358.4	136.2	17.0	511.6	477.5	26.3	503.8
1990	370.1	118.0	17.0	505.1	512.3	29.8	542.1
1991	366.6	111.2	17.3	495.1	511.4	29.9	541.3
1992p	369.0	111.0	15.6	495.6	518.6	30.0	548.6

Notes: Excludes transitional economies, except for net exports into the market. Base year for real prices is 1950.

Surplus(+) or Deficit(-)	Annual Prices Dollars per Ounce		Year
	Real (Base=1950)	Nominal	
-33.4	0.74	0.74	1950
-89.6	0.83	0.89	1951
-75.8	0.77	0.85	1952
-74.4	0.77	0.85	1953
-65.6	0.76	0.85	1954
-47.4	0.80	0.89	1955
-50.7	0.80	0.91	1956
-74.6	0.78	0.91	1957
-51.9	0.74	0.89	1958
-31.4	0.75	0.91	1959
2.1	0.74	0.91	1960
44.3	0.74	0.92	1961
-16.3	0.86	1.08	1962
-16.3	1.00	1.28	1963
86.2	1.00	1.29	1964
3.8	0.99	1.29	1965
0.6	0.96	1.29	1966
85.5	1.12	1.55	1967
226.0	1.48	2.15	1968
122.7	1.40	2.14	1969
77.1	1.10	1.77	1970
-34.0	0.92	1.55	1971
-94.6	0.97	1.68	1972
-128.0	1.39	2.56	1973
-51.0	2.30	4.71	1974
-4.1	1.97	4.42	1975
-17.8	1.84	4.35	1976
-49.1	1.84	4.62	1977
-57.1	1.99	5.40	1978
25.8	3.68	11.09	1979
207.2	6.02	20.63	1980
114.3	2.78	10.52	1981
82.6	1.98	7.95	1982
164.5	2.76	11.44	1983
87.7	1.89	8.13	1984
88.2	1.37	6.14	1985
8.4	1.20	5.47	1986
41.2	1.48	7.01	1987
23.6	1.33	6.53	1988
7.8	1.07	5.50	1989
-37.0	0.90	4.82	1990
-46.2	0.75	4.03	1991
-53.0	—	—	1992p

p — projections.

Sources: CPM Group, industry sources

SUPPLY

Total new silver supply continued its downward trend in 1991, decreasing 2%, to 495.1 million ounces from 505.1 million ounces in 1990. Reduced secondary recovery was largely responsible for this decline.

Mine production also was slightly lower, with output in the United States falling more sharply than seemed likely in early 1991.

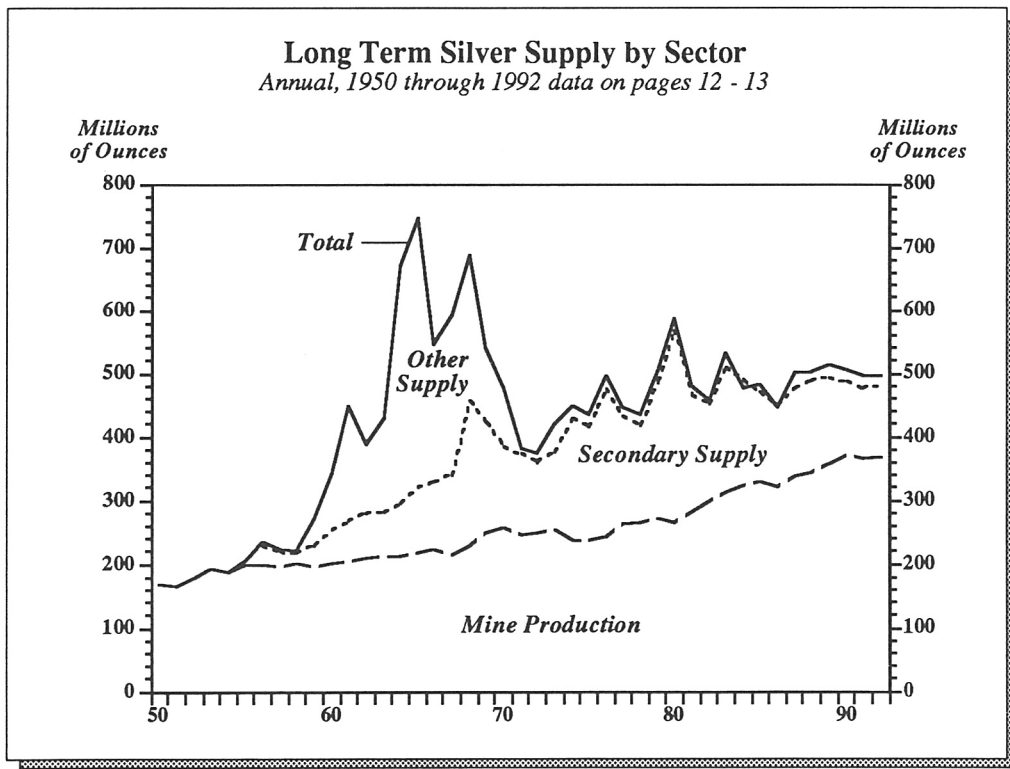
Supply could be flat to slightly higher in 1992, with mine production and the flow of silver from secondary sources about level with last year. Silver from government disposals and the transitional economies, which account for only a modest amount of

total supply in volume, could decline nearly 10% this year.

Mine Production

Market economy mine output declined nearly 1% last year, to 366.6 million ounces from 370.1 million ounces in 1990. Production was off in the United States, Mexico, and Canada, and essentially flat in Australia. Production rose in Peru and in other countries. Mine supply could rise 0.7% in 1992, to 369.0 million ounces.

Mexico remains the largest silver producing nation in the world. Mexican mine output fell 7.7% in 1991, to 62.7

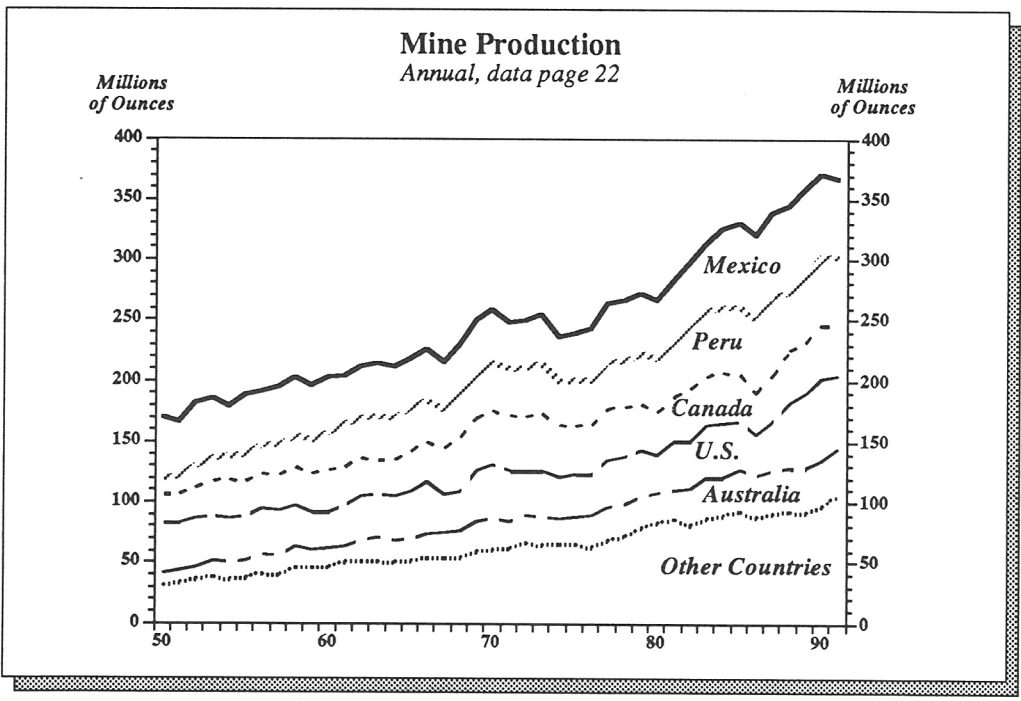


million ounces from 67.9 million ounces the previous year. This decline largely resulted from the idling of the Frisco operation for most of the year, as well as the closure of several small mines because of cash flow problems. Output is projected to climb back to 65 million ounces in 1992. It should be noted that estimates of Mexican production vary. Banco de Mexico's figures are used here, because a wide range of Mexican industry sources regard its numbers as the most accurate depiction of output. Other government offices also maintain monthly production statistics, showing higher output levels.

Mine production in the United States fell to 61 million ounces in 1991 from 66.5 million ounces in 1990. The decline might have been greater, as copper producers in the southwest experienced unusual

flooding conditions in the first quarter of last year. However, much of this production was made up during the remainder of the year, and by-product silver output actually may have exceeded that seen in 1990. Higher production at some gold mines contributed to this trend.

The lower U.S. mine output largely resulted from cutbacks by primary silver producers hurt by the lowest real silver prices in decades. Sunshine Mining reduced its production by half, to around 2.6 million ounces; Nerco cut its output by 1.3 million ounces, to 5 million ounces; and, Hecla Mining reduced its output by around 300,000 ounces to 5.3 million ounces. Asarco, which has a dual role as a by-product and primary producer, cut back production by 1.1 million ounces to 11.1 million ounces.



On the by-product side, Cominco showed the largest drop, with silver output declining 46% to 1.1 million ounces. However, this decrease was unrelated to economics. Rather, the company's lead-zinc mine in Alaska encountered unexpected problems in ore variation, leading to serious processing problems.

Several U.S. gold producers meanwhile reported significantly higher by-product silver output. Battle Mountain Gold's silver output rose 132% last year to 959,000 ounces, while Echo Bay Mines produced nearly twice as much silver as it had the year before, at 5.6 million ounces.

By-product silver output in the United States is expected to trend upward in 1992, and total U.S. mine production could rise to 65 million ounces this year.

Mine production in Peru rose 2.3% in 1991, to 56.9 million ounces from 55.6 million ounces in 1990, despite continuing political and economic disequilibria, and the constant threat of terrorism.

There are conflicting reports of how steeply Peruvian production may fall in light of the deteriorating economic and political environment. Many small and medium sized mines faced cash flow problems of the magnitude that already would have forced shutdowns elsewhere in market economies. In 1991, mine operators with a production capacity of 9 million ounces either closed or requested government approval to curtail their mining activity. To date, much of this capacity remains in production.

Production could decline 12% in 1992, to 50 million ounces, as some mining entities simply run out of equipment, supplies, and cash to pay for labor. Already this year state owned Centromin threatened to close its La Oroya metallurgical complex, which also refines silver from small and medium sized mines, unless the government provided a massive cash infusion. Even though the government could not meet Centromin's cash requirements, the company received enough aid to stave off closure.

Peru represents the weakest link in the mining sector, and sharp fluctuations must be anticipated, possibly for the rest of the century. It is doubtful that the full 45% of production considered uneconomic by the industry will be closed, but today's production levels appear unsustainable at current prices. The political turmoil seen in early April underlines the fragility of Peruvian supply.

Mine production in Canada declined 7.6% in 1991, to 41 million ounces from 44.4 million ounces in 1990, as reserves at the Equity mine continued to fall, and lead and zinc by-product output dropped. Canadian production may rise slightly in 1992, with an increase in by-product silver from gold operations. Australian mine production is expected to remain around the 38 million ounce level seen last year.

Production from other market economies rose to 107 million ounces last year from 97.9 million ounces in 1990, an increase of 9.3%, primarily because of higher

production in Papua New Guinea and Chile. Mine output from this sector is seen rising less than 2% in 1992.

The projections used here would result in 58.9 million ounce deficit of new supply over fabrication demand (including coins) for 1992.

The mine production projections for 1992 shown here differ in some cases from those contained in The Silver Institute's *Mine Survey*, which appears at the end of this report, due to varying methods of estimating. If The Silver Institute's projection is used, the deficit of new supply over demand would be somewhat different.

Secondary Supply

The flow of silver from secondary sources fell 5.8% in 1991, to 111.2 million ounces. Refiners, particularly in the United States, used less old scrap.

Secondary recovery has reacted sharply to the decline in silver prices over the past few years. Between 1989 and 1991, scrap use fell by 16.8%, from 125 million ounces to 104 million ounces. This drop in scrap recovery largely resulted from the lower silver content of electronics scrap, which has made much of this scrap uneconomic to recover.

There have been signs that total scrap use, which is predominantly sourced from photographic materials, as well as chemical catalysts and other industrial products, might be stabilizing. Scrap recovery in the United States appeared to rebound modestly as silver prices moved back over \$4.00, after having fallen to \$3.51 in February of 1991. The flow of old scrap could rise 4 million ounces this year. This increase is expected to come from the recycling of silver from spent photographic products. As the use of photographic films and papers rises, so does the recovery of silver from the processing of these products.

Coin recovery continued to sag, falling one-third to 4 million ounces from 6 million ounces in 1990. This trend is expected to persist, and coin melt could slide 25% in 1992, to 3 million ounces.

South Asian dishoarding — the sale of

decorative items and jewelry in India — resurfaced in the last few months of 1991.

Through much of last year the flow of domestic scrap was virtually nil. Late in 1991 an increase in demand for silver in India boosted the domestic price, which induced some Indians to sell silver-bearing items for scrap. A total of 3.2 million ounces of silver was recovered from scrap in India in 1991. This year, little if any silver is expected to be recovered from Indian scrap.

Most of India's fabrication requirements continue to be met by silver smuggled into the country. However, illegal imports declined to 34 million ounces in 1991, from 42.1 million ounces in 1990.

Other Supply

Silver supplied from government disposals and net exports from the transitional economies increased 300,000 ounces last year, to 17.3 million ounces. This figure is expected to fall 9.8% in 1992, to 15.6 million ounces because of the absence of U.S. Treasury sales.

There has been renewed speculation that the U.S. government might reinstitute direct sales of silver bullion from the National Defense Stockpile. In reality, the U.S. Dept. of Defense remains committed to disposing of stockpile silver through the U.S. Mint's coinage programs.

In July, the U.S. government completed its three-year program to sell 7.5 million ounces of Treasury silver by selling 2.5

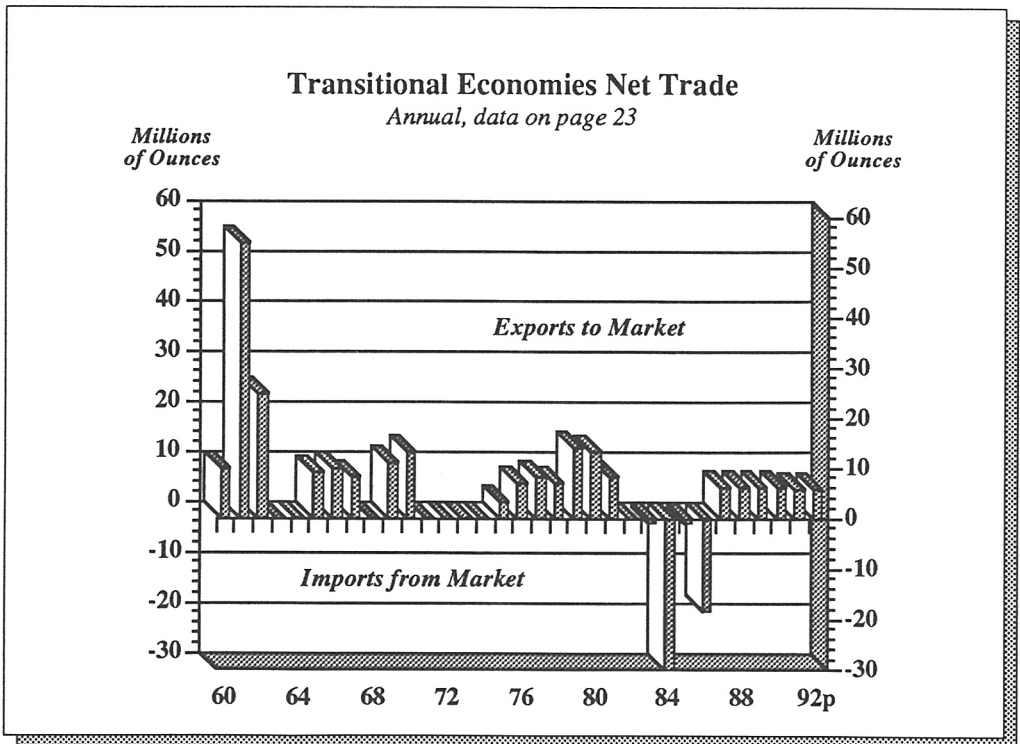
million ounces in 1991. The program was not renewed.

Downward adjustments have been made in 1990 and 1991 mine production for several transitional economy countries of Eastern Europe, but the lower output has not been translated fully into lower net exports to the industrialized countries.

Silver production statistics in the Commonwealth of Independent States, the former Soviet Union, have been lowered from 52 million ounces to 51.3 million ounces for 1990, based on better information now forthcoming from these countries. Production further is estimated to have declined 5% last year, to 48.7 million ounces, and could decline a further

5% in 1992. About 90% of C.I.S. silver output is by-product of nonferrous mining operations, mostly from polymetallic ore containing nickel, cobalt, and other metals, but also from copper deposits. Kazakhstan appears to be the top silver producer in the C.I.S. Production there was hurt by labor unrest in 1990 and 1991. Still, workers already may be receiving hard currency incentives to increase production levels. Russia also is a major producer of by-product silver, while Armenia and Uzbekistan produce smaller amounts.

Production in Eastern Europe, particularly Poland, has declined even more sharply, driven by unrelenting economic rationalizations and closures forced by environmental concerns. Polish silver



output, almost exclusively a by-product at copper mines, fell to 26.8 million ounces in 1990, 12 million ounces lower than previous estimates. Much of the streamlining in the copper industry appears completed, but Polish output still fell 5% last year, to 25.4 million ounces. Output in Romania, Czechoslovakia, and Bulgaria also declined 5% in 1991, to 760,000 ounces, 580,000 ounces, and 570,000 ounces, respectively. A similar decline is possible this year as well.

The decline in Eastern European mine production did not fully translate into lower net exports to the industrialized countries because the economic changes in the region have been broad based. Those industries using large amounts of silver in the past often were highly inefficient, and have been significantly curtailed, reducing domestic silver requirements. This has allowed for the amount of silver available to be exported for hard currency earnings to remain relatively high, limiting the impact of lower mine supply on the amount of metal being exported from these countries into the world silver market.

Net transitional economy exports of silver fell 3% in 1991, to 5.8 million ounces from 6.0 million ounces, and could fall a further 3% this year, to 5.6 million ounces.

Mine Production of Silver, 1950-1991

Million Troy Ounces

	Australia	Canada	Mexico	Peru	United States	Other Market Economies	Total Market Economies	Soviet Union	Other Transitional Economies	Total
1950	10.7	23.2	49.1	13.4	42.5	30.6	169.5	24.0	10.0	203.5
1951	10.8	23.1	43.8	15.0	39.8	33.0	165.5	24.0	10.0	199.5
1952	11.1	25.2	50.4	18.4	39.8	35.7	180.6	24.0	11.0	215.6
1953	12.4	28.3	47.9	19.7	37.6	38.8	184.7	25.0	12.0	221.7
1954	13.8	31.1	39.9	20.4	36.9	36.5	178.6	25.0	12.0	215.6
1955	14.6	28.0	48.0	22.9	37.2	37.0	187.7	25.0	12.0	224.7
1956	14.6	28.4	43.1	23.0	38.9	41.8	189.8	25.0	11.0	225.8
1957	15.7	28.8	47.1	24.8	38.2	40.0	195.6	25.0	10.0	230.6
1958	16.3	31.2	47.6	25.9	34.1	47.2	202.3	25.0	9.0	236.3
1959	15.2	31.9	44.1	27.2	31.2	46.0	195.6	25.0	9.0	229.6
1960	15.2	34.0	44.5	30.8	30.8	46.5	201.8	25.0	8.5	235.3
1961	13.1	31.4	40.3	34.2	34.8	50.1	203.9	25.0	8.0	236.9
1962	17.6	30.7	41.2	33.1	36.8	51.4	210.8	27.0	8.0	245.8
1963	19.6	29.8	42.8	35.2	35.2	51.4	214.0	28.0	8.0	250.0
1964	18.4	29.9	41.7	34.4	36.3	50.8	211.5	29.0	8.0	248.5
1965	17.3	32.3	40.3	36.5	39.8	52.2	218.4	31.0	8.0	257.4
1966	18.9	32.8	42.0	32.8	43.7	55.0	225.2	33.0	8.5	266.7
1967	19.8	37.2	38.3	32.1	32.3	55.0	214.7	35.0	8.5	258.2
1968	21.3	45.0	40.0	36.4	32.7	54.8	230.2	35.0	9.5	274.7
1969	24.5	43.5	42.9	35.9	41.9	60.0	248.7	37.0	10.0	295.7
1970	26.0	44.3	42.8	39.8	45.0	60.6	258.5	41.8	12.1	312.4
1971	21.8	46.0	36.7	38.4	41.6	62.8	247.3	43.3	13.1	303.7
1972	21.9	44.8	37.5	40.2	37.2	67.3	248.9	44.8	16.3	310.0
1973	22.7	47.5	38.8	42.0	37.8	65.2	254.0	46.4	17.2	317.6
1974	21.5	42.8	37.5	34.9	33.8	66.1	236.6	48.0	19.1	303.7
1975	23.3	39.7	38.0	37.5	34.9	65.6	239.0	49.8	21.1	309.9
1976	25.0	41.2	42.6	35.6	34.3	64.2	242.9	49.8	25.3	318.0
1977	27.5	42.2	47.0	39.1	38.2	69.3	263.3	49.8	28.0	341.1
1978	26.1	40.7	50.8	37.0	39.4	72.8	266.8	49.8	31.4	348.0
1979	26.7	36.9	49.4	41.9	37.9	79.2	272.0	49.8	30.5	352.4
1980	25.0	34.4	47.3	44.8	32.3	82.6	266.5	49.8	32.3	348.6
1981	23.9	36.3	53.2	42.6	40.7	86.5	283.2	50.5	28.1	361.8
1982	29.2	42.2	49.8	54.4	40.2	82.3	298.0	51.0	28.4	377.4
1983	33.2	38.7	55.0	55.6	43.4	87.7	313.6	51.4	29.2	394.3
1984	31.3	42.0	63.9	53.3	44.6	89.5	324.5	51.4	32.1	408.0
1985	34.9	38.5	69.2	54.9	39.4	93.1	329.9	52.1	35.1	417.1
1986	32.9	35.0	69.4	59.9	34.2	88.9	320.3	52.4	35.5	408.2
1987	35.9	38.1	69.8	63.6	39.8	91.0	338.2	52.5	35.4	426.1
1988	35.8	44.1	70.0	47.7	53.4	93.0	344.0	53.0	43.2	440.2
1989	37.3	41.3	70.0	56.8	60.8	92.2	358.4	54.0	43.5	455.9
1990	37.8	44.4	67.9	55.6	66.5	98.0	370.1	51.3	38.9	457.3
1991	38.0	41.0	62.7	56.9	61.0	107.0	366.6	48.7	34.9	450.2

Notes: Totals may not equal the sums of countries due to rounding.

Sources: CPM Group, industry sources

Secondary and Other Supplies
 Million Troy Ounces

	Secondary				Other		Total Secondary and Other	U.S. Treasury Sale	U.S. Treasury Coinage	Total
	Old Scrap	Demon- tized Coin	Indian Scrap used Domestically	South Asian Exports	Gov't. Disposals	Net Exports from T.E.				
1960	40	10	2	0	12	10	74	22	46	142
1961	43	20	2	0	7	55	127	63	56	246
1962	47	20	2	0	4	25	98	1	77	176
1963	50	15	3	0	10	0	78	25	112	215
1964	54	20	12	0	20	0	106	151	203	460
1965	57	30	16	0	17	9	129	80	320	529
1966	61	28	16	0	10	10	125	143	54	322
1967	59	35	15	17	5	8	139	195	44	378
1968	75	50	16	86	15	0	242	180	37	459
1969	80	50	16	28	0	11	185	89	19	293
1970	55	25	16	31	10	13	150	67	1	218
1971	68	20	16	23	7	0	134	—	—	134
1972	73	15	13	11	12	0	124	—	—	124
1973	72	15	13	22	46	0	168	—	—	168
1974	82	35	15	60	21	0	213	—	—	213
1975	90	20	13	54	15	3	195	—	—	195
1976	92	72	18	53	11	7	253	—	—	253
1977	93	33	18	25	5	8	182	—	—	182
1978	82	21	21	28	9	7	168	—	—	168
1979	130	45	23	18	3	14	233	—	—	233
1980	164	94	23	21	5	13	320	—	—	320
1981	125	18	27	14	4	8	196	—	—	196
1982	111	7	23	14	3	0	158	—	—	158
1983	133	20	23	21	21	-1	217	—	—	217
1984	124	20	21	1	18	-30	154	—	—	154
1985	102	18	21	0	13	-1	153	—	—	153
1986	103	10	16	0	14	-18	125	—	—	125
1987	113	10	15	0	20	6	164	—	—	164
1988	122	9	13	0	8	6	158	—	—	158
1989	125	6	5	0	11	6	153	—	—	153
1990	112	6	0	0	11	6	135	—	—	135
1991	104	4	3	0	12	6	129	—	—	129
1992p	108	3	0	0	10	6	127	—	—	127

Note: Government Disposals includes silver used in coins from stocks and bullion sales from governments other than the United States for the years through 1970. The U.S. Treasury bullion sales and the use of silver from the U.S. Treasury stocks in coins during the 1960s are separated. After 1970, U.S. government bullion sales and use of government stocks in coinage are included in the Government Disposals category.
 p — projections.

Sources: U.S. Bureau of Mines; Handy & Harman; Samuel Montagu; The Silver Institute; trade sources; CPM Group

FABRICATION DEMAND

Total fabrication demand, including coins, fell 0.1% last year, the first decline since 1983.

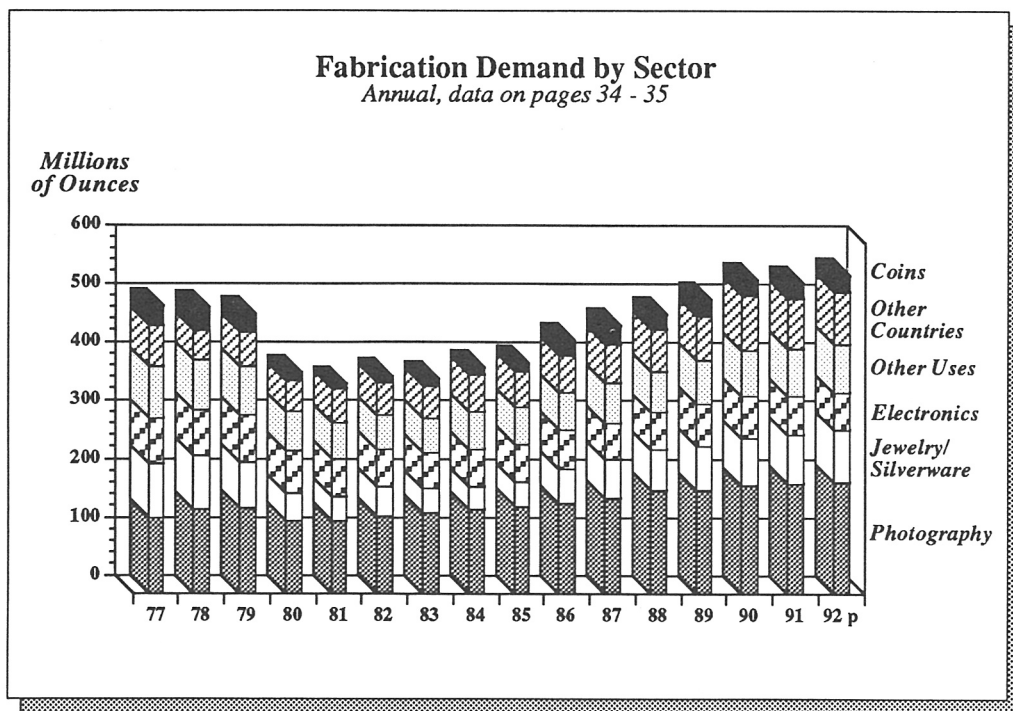
Total fabrication demand worldwide is estimated to have been 541.3 million ounces in 1991, down from 542.1 million ounces the year before. Demand rose in photography, jewelry and sterlingware, miscellaneous uses, and coinage. Silver use in electronics fell more sharply, however, offsetting the increases in these other sectors.

Total Japanese fabrication demand fell 5.6% in 1991, to 111.1 million ounces

from 117.7 million ounces in 1990. The decline was due to the absence of any coin program in 1991. In 1990, 8.9 million ounces of coins commemorating the installation of the new emperor were sold.

Silver use in Japan in industrial applications rose 2.1% last year, from 108.8 million ounces in 1990 to 111.1 million ounces. Most of this growth was in silver use in photography, which rose to 61 million ounces from 59 million ounces. (See table, page 54 for details).

Fabrication demand in Italy soared 10.6% in 1991, to 53 million ounces from 47.9



Photography, electronics, jewelry/silverware and other uses include demand in the United States, Western Europe and Japan. Demand elsewhere is shown in the "Other Countries" category.

million ounces, led by a 4.8 million ounce rise in sterlingware. *(See table, page 57).*

German fabrication demand rose 15.4% last year, to 59.2 million ounces, with increased use reported in jewelry, silverware, photography, and coinage. *(See table, page 56).*

Indian use could not sustain the remarkable level seen in 1990, but it nonetheless held up rather well, totaling 38.6 million ounces in 1991. Demand surged in the final quarter of 1991. *(See table, page 60).*

Demand in the United States fell 5% last year, to 127.7 million ounces. The largest decline was in the electronics sector, although photographic demand also softened. *(See table, pages 43-44).* French fabrication demand also declined, falling 2.5% to 24.1 million ounces, because of weaker demand in jewelry, silverware, and photography. *(See table, page 58).*

Photography

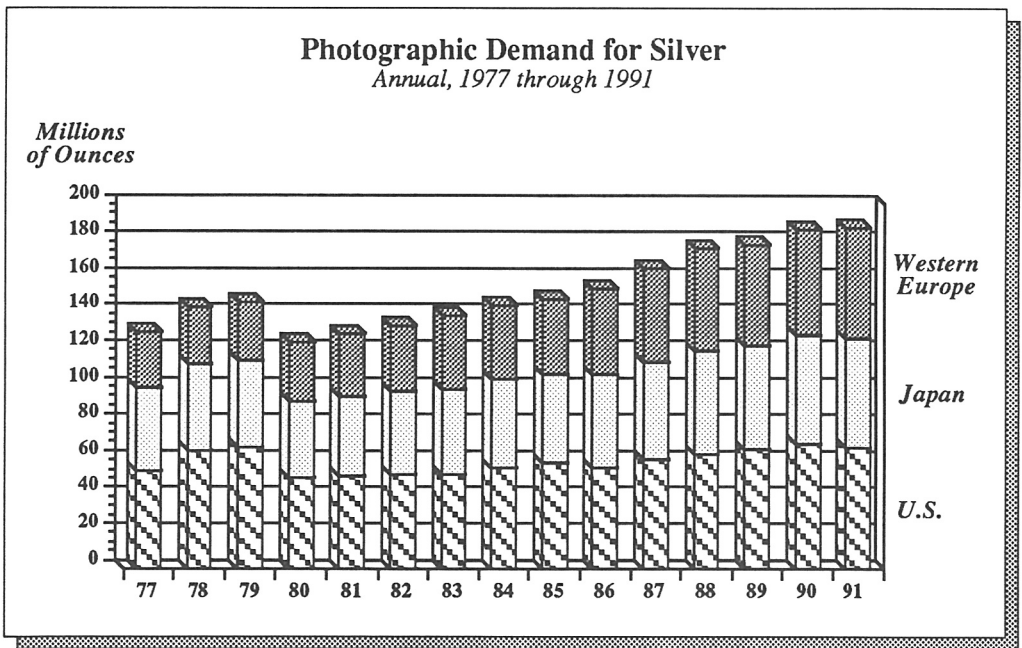
Despite a bad first quarter due to the impact of the Gulf War on vacation and travel plans, the use of silver in photographic applications rose 0.5% to 187 million ounces in 1991, from 186 million ounces in 1990. This year photographic use of silver could increase a further 2.8%, despite sluggish economic conditions worldwide, a reflection of the photographic sector's resilience.

Historical figures for photographic use in this report have been lowered. Previous studies have included total Japanese caustic silver demand in total photo use. Some of these silver-based chemicals are used in other applications, however. Starting with this report, the non-photographic uses of such silver chemicals in Japan have been subtracted from the

Japanese photographic number and now are included in 'other' uses.

Photographic demand in Japan rose 3.4% in 1991, to 61 million ounces. In Europe, photographic use of silver rose by a smaller 1.7%, to 60 million ounces. Demand in the United States fell 3%, to 66 million ounces. Photo use in other countries seemed stable. In India, for example, such offtake was steady around 5.6 million ounces.

The photography market is not monolithic, and the performance of its various sectors was uneven last year. The increased popularity of disposable cameras more than compensated for a decline in film sales in some markets. Sales of these cameras soared in Japan, and also rose in the United States and Europe. There



appeared to be a geographic shift, with the low yen price of silver helping Japanese film manufacturers take some market share away from their U.S. competitors.

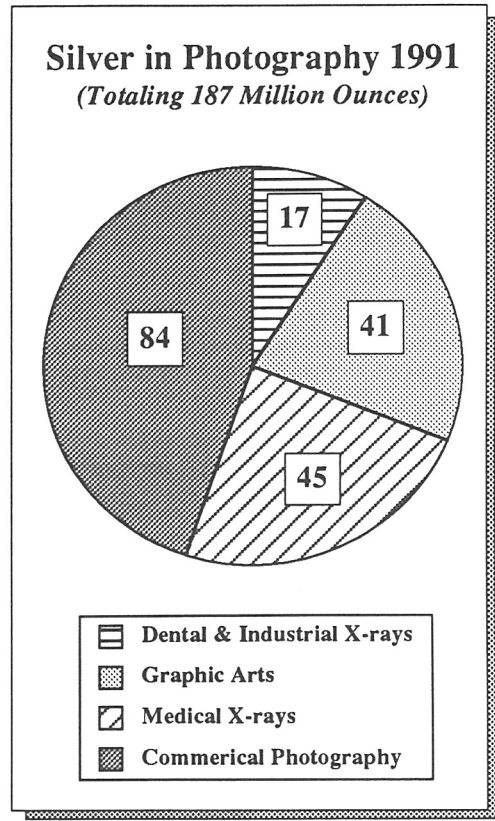
The photographic industry worldwide is somewhat closed-mouthed concerning its silver usage, for reasons related to competitive advantages and technologies. Even so, some information is available. CPM Group has kept its own series of estimates on silver use by country, company, and type of film for years. These figures, used in this section, differ from those appearing in the special study by Peter Krause. The differences are not very great, however; furthermore, understanding the nuances in the different accounting methods employed by CPM Group and Mr. Krause explains some of the apparent deviations. For example, CPM Group uses a category called commercial photography, which incorporates Mr. Krause's amateur and professional photography, microfilm, motion pictures, and miscellaneous. These four categories in his data account for 44.3% of the total photographic market for silver. In CPM Group's analysis, commercial photography is estimated to have accounted for around 45% of this market last year.

It is clear that the market share that amateur and professional photography, or commercial photography, accounted for fell in 1991. These uses were limited by a reduction in travel, which reduced amateur picture taking. In early 1991 vacation travel was limited by the Gulf War, while later in the year recessionary economic conditions kept travel low. As a result,

commercial photography's share of total photographic silver use fell from around 49% in 1990 to around 45%, or 84.2 million ounces, last year.

Medical x-ray technologies continued to grow in volume terms and in market share. In 1991 medical x-rays are estimated to have used around 24% of the silver used in photography, or 44.9 million ounces. This was up from 21%, or 40.7 million ounces, in 1990.

Dental and industrial x-rays took 9% of the total photographic market, or 16.8 million ounces. The use of silver in graphic arts is estimated at 41.1 million ounces, or about 23% of the market.



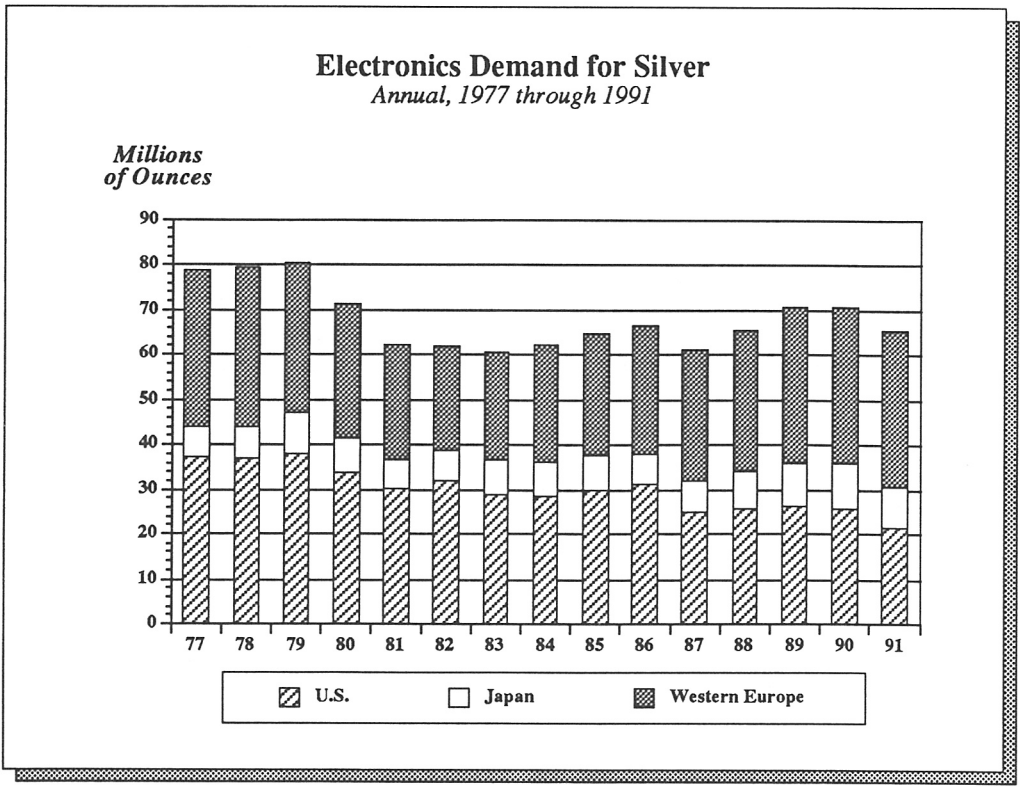
Electronics and Electrical Equipment

This sector was battered by weak economic conditions in 1991, a trend expected to continue this year. Use of silver in electronics and batteries declined 7.6% last year, to 65.2 million ounces from 70.6 million ounces in 1990. Demand could be level to marginally lower in 1992.

The decline was primarily rooted in a steep decline in U.S. demand. Because of the recession silver use in electrical contacts and connectors in the United States dropped 20% last year, to 18.3 million ounces from 22.8 million ounces in 1990. Demand in these applications is expected to be flat or slightly lower this year. Use of silver in batteries in the U.S. increased

100,000 ounces to 3.1 million ounces. French electronics use of silver slipped 200,000 ounces to 6.3 million ounces, while German use fell by a similar amount, to 14.2 million ounces.

Japanese electronics use fell 1.1 million ounces to 9 million ounces, a trend that could reverse this year. Electronics use in Italy rose 100,000 ounces to 4.1 million ounces in 1991. There are indications that electronics use may have risen in other countries not included in this report's total electronics figures. India, for example, used 4.2 million ounces in electronics and electrical products last year, up 5% from 1990.



Jewelry and Silverware

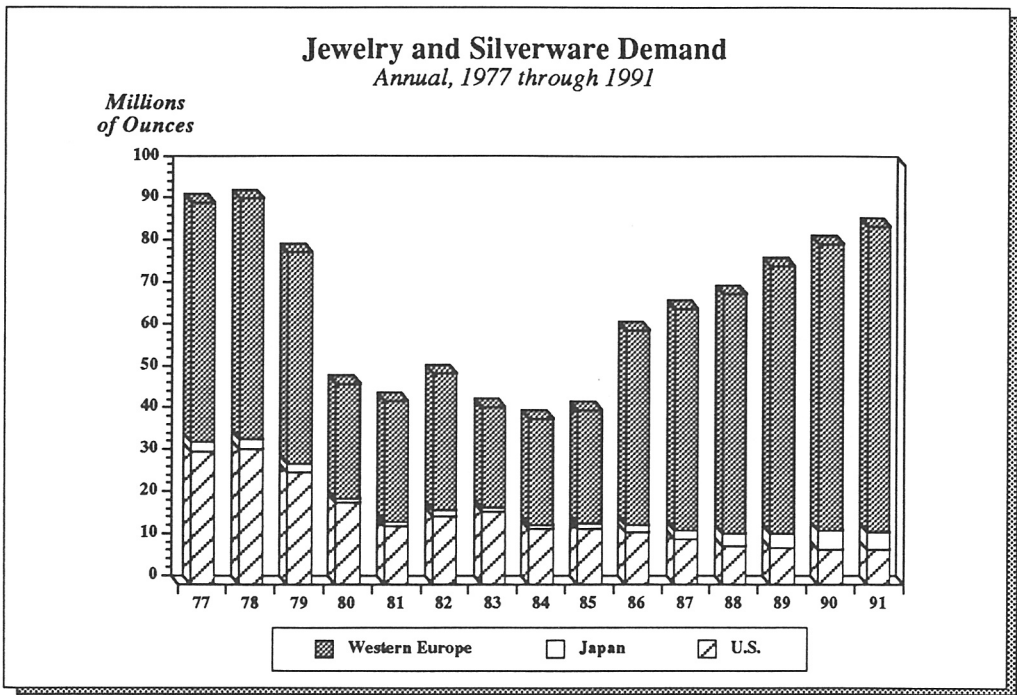
Use of silver in jewelry and silverware jumped 5.4% in 1991, to 85.4 million ounces from 81 million ounces in 1990. Silver use in these applications is projected to rise 1.9% to 87 million ounces in 1992. It must be noted that this sector, particularly silver use in Italy, repeatedly surprised the silver market with its buoyancy. Given the strength of demand in this area in 1991, in the face of recessionary economic conditions and reduced consumer spending on most discretionary products, it may well be that this silver use will exceed the 1.9% growth rate projected for 1992.

Italy's sterlingware industry has long been the engine driving growth in this sector of the market, a condition which again was evident in 1991. Italian silver use in

sterlingware increased 4.8 million ounces in 1991, to 37 million ounces from 32.2 million ounces in 1990. Another 5.5 million ounces of silver were used in jewelry in Italy last year, unchanged from the year before. Additionally, Italian silver electroplaters have used around 600,000 ounces per year over the past two years.

Germany increased its use 1.9 million ounces to 15.1 million ounces. Japanese demand rose 400,000 ounces to 4 million ounces.

U.S. demand was level last year, at 3.5 million ounces for sterlingware, 2.8 million ounces for silverplate, and 2 million ounces for jewelry. French demand fell 300,000 ounces in 1991, to 2.5 million ounces.



Other Uses and Other Countries

The break-out by sector of fabrication demand includes only figures for photography, jewelry and silverware, and electronics and batteries for the United States, Japan, and Western Europe.

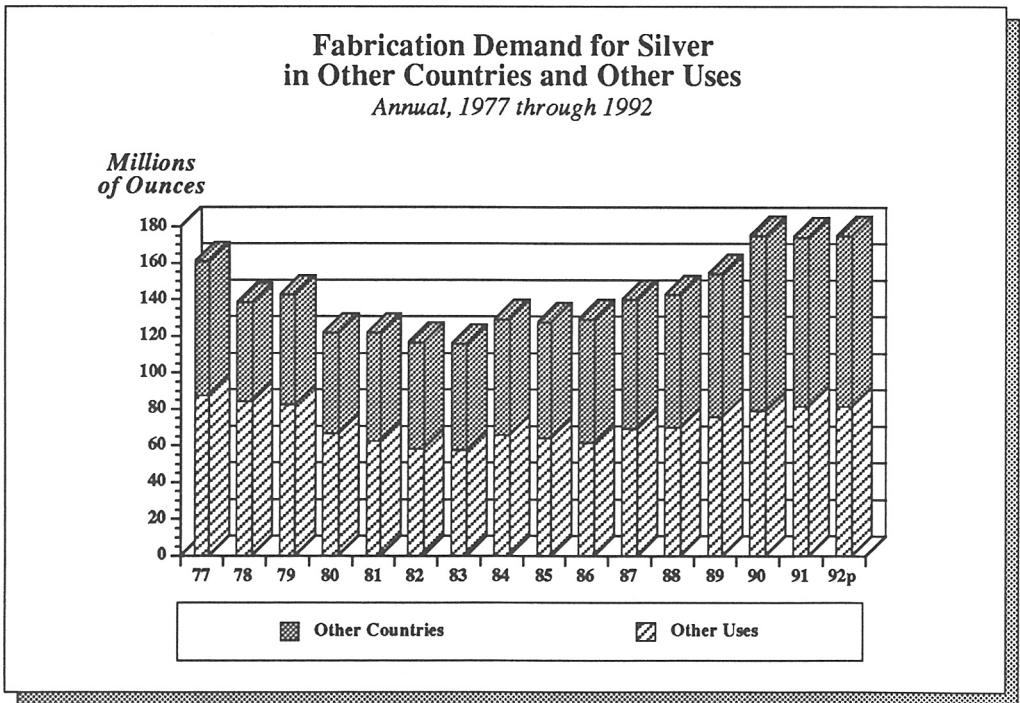
Historical data is not sufficient to provide a more detailed analysis of fabrication demand in these countries. As a result, the use of silver in such industries as electroplating, brazing alloys and solders, dental and medical applications, catalysts, mirrors, and caustic silver, are included in the "other uses" category. Demand for other uses totaled 81 million ounces in 1991.

Data for countries outside the United States, Japan, and Western Europe, also

are incomplete. Statistics for these countries and regions are incorporated in the "Other Countries" category in this report. Demand from other countries in 1991 fell 2.8%, to 92.8 million ounces from 95.5 million ounces in 1990.

These reports will continue to expand statistics for specific countries as accurate data can be established.

This survey, for example, extends Indian demand through 1991, with more detailed information available from 1987. Fabrication demand in India fell 7.7% in 1991, to 38.6 million ounces from 41.8 million ounces in 1990. Demand for silver in "household items" declined one-third last year, to 12.9 million ounces.



This category includes silverware and jewelry. Electroplating use in India rose 16.7%, to 5.6 million ounces. Demand for brazing alloys totaled 3.2 million ounces, compared with 2.4 million ounces the previous year; and use in jari woven into cloth climbed 25% to more than 4 million ounces. Miscellaneous use rose 44.4%, to 2.1 million ounces. India used 4% more silver in electrical and electronics applications in 1991, at 4.2 million ounces, while photography and foils remain flat, at 5.6 million ounces and 964,521 ounces, respectively.

Mexican silver use meanwhile may be higher than the 5 - 10 million ounces per year typically reported. Officially, silver use in Mexico was put at 4.6 million ounces in 1990 and 4.7 million ounces in 1991. Mexican market participants say that in reality silver use in Mexico could be as high as 20 or even 30 million ounces. The additional material comes from unreported scrap recovery. There are several small processing plants within Mexico that re-melt old jewelry and decorative items to supply the 1,200 small jewelers and countless artisans throughout the country. Were an accurate accounting available of this market, it is clear that the estimates for both fabrication demand and secondary supply of silver would be increased significantly. Since one adjustment would offset the other, the better statistics would have no material effect on the world supply/demand balance for silver.

To reflect higher demand in the market for new silver, the statistics for fabrication

demand for silver in Mexico in this report have been adjusted upward. Silver use now is estimated at 7.7 million ounces last year, up from 7.2 million ounces in 1990. Coinage declined to 1.5 million ounces from 1.7 million ounces.

A special study by Timothy S. Green at the end of this report discusses silver use in several Asian countries.

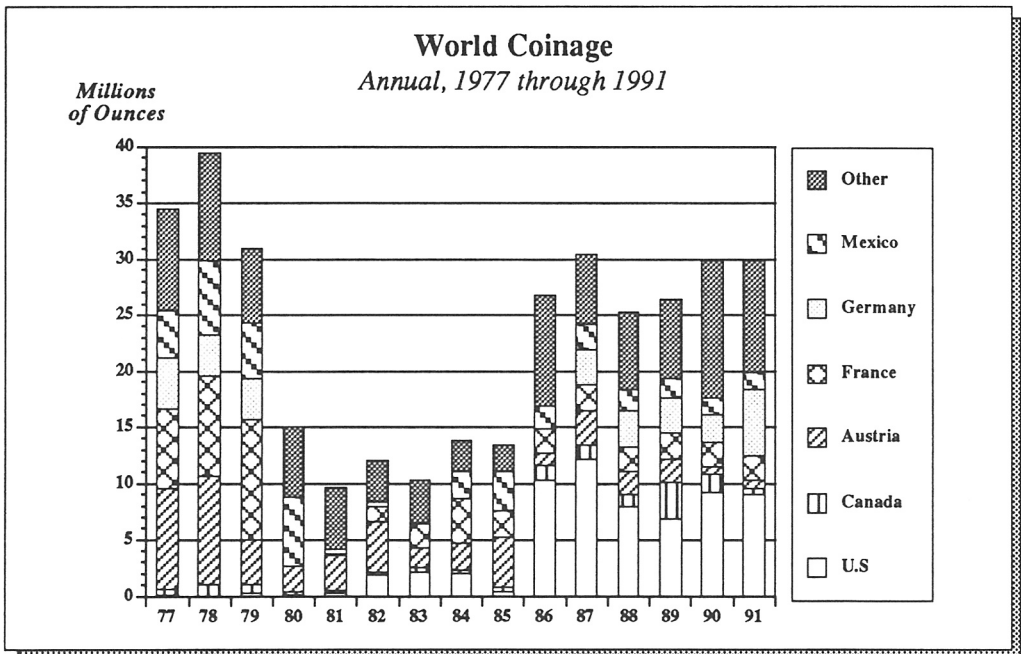
Coinage

Silver coinage in 1991 was even with 1990, according to preliminary figures. After surging in the first two months of last year, coin sales declined sharply. Total sales amounted to 29.9 million ounces compared with 29.8 million ounces in 1990. (See table, page 61).

Demand for American Eagle bullion coins declined 6% last year, to 7.4 million ounces from 7.9 million ounces in 1990. Small investors showed increased interest in the U.S. Mint's commemorative series, including the Mount Rushmore, the USO, the Korean War, and the Eisenhower. Sales of these coins rose 40% to more than 1.6 million ounces. In total, small investors bought 9 million ounces in coins, off 100,000 ounces from the previous year.

Mexican coins sales were flat last year, at 1.5 million ounces. However, almost all of the demand came in the first half of January, as investors responded to the crisis in the Persian Gulf. Coin demand in Mexico was virtually nil for the rest of 1991.

Sales of Royal Canadian Mint's silver Maple Leaf declined 1.1 million ounces to 600,000 ounces last year. Coin demand in Germany rose 150%, to nearly 6 million ounces with two major new silver coins. Coinage in France and Austria remained stable, at 600,000 ounces and 2.2 million ounces, respectively. Coin sales in other market economies fell to 8.6 million ounces from 10.9 million ounces in 1990. Coinage demand in the transitional economies appears to have been unchanged, at 1.4 million ounces.



"Other" includes transitional economies for 1990 and 1991.

Annual Fabrication Demand
Million Troy Ounces

	1977	1978	1979	1980	1981	1982
Photography						
United States	53.7	64.3	66.0	49.8	51.0	51.8
Japan	31.2	31.4	32.2	32.6	33.9	36.6
Western Europe	44.7	47.2	47.9	41.4	43.2	44.9
<i>Subtotal</i>	<i>129.6</i>	<i>142.9</i>	<i>146.1</i>	<i>123.8</i>	<i>128.1</i>	<i>133.3</i>
% of Total	26.2	29.1	30.5	32.6	35.1	35.7
% Change Year Ago	—	10.3	2.2	-15.3	3.5	4.1
Jewelry & Silverware						
United States	31.6	32.0	26.6	19.4	13.7	16.2
Japan	2.2	2.5	2.2	1.0	1.1	1.3
Western Europe	57.2	57.4	50.3	27.5	28.7	32.7
<i>Subtotal</i>	<i>91.0</i>	<i>91.9</i>	<i>79.1</i>	<i>47.9</i>	<i>43.5</i>	<i>50.2</i>
% of Total	18.4	18.7	16.5	12.6	11.9	13.4
% Change Year Ago	—	1.0	-13.9	-39.4	-9.2	15.4
Electronics & Batteries						
United States	37.1	36.8	38.1	33.8	30.2	31.9
Japan	6.9	7.0	8.9	7.6	6.4	6.6
Western Europe	34.7	35.5	33.4	29.8	25.6	23.2
<i>Subtotal</i>	<i>78.7</i>	<i>79.3</i>	<i>80.4</i>	<i>71.2</i>	<i>62.2</i>	<i>61.7</i>
% of Total	15.9	16.1	16.8	18.8	17.0	16.5
% Change Year Ago	—	0.8	1.4	-11.4	-12.6	-0.8
Other Uses						
United States	31.2	27.1	26.6	21.8	21.8	19.1
Japan	22.9	24.0	25.5	20.3	18.2	18.7
Western Europe	33.4	32.9	30.4	24.5	21.8	20.3
<i>Subtotal</i>	<i>87.5</i>	<i>84.0</i>	<i>82.5</i>	<i>66.6</i>	<i>61.8</i>	<i>58.1</i>
% of Total	17.7	17.1	17.2	17.6	16.9	15.6
% Change Year Ago	—	-4.0	-1.8	-19.3	-7.2	-6.0
Coinage	34.5	39.5	31.0	15.0	9.5	12.0
% of Total	7.0	8.0	6.5	4.0	2.6	3.2
% Change Year Ago	—	14.5	-21.5	-51.6	-36.7	26.3
Other Countries	73.1	54.3	60.1	54.8	59.8	58.1
% of Total	14.8	11.0	12.5	14.4	16.4	15.6
% Change Year Ago	—	-25.7	10.7	-8.8	9.1	-2.8
TOTAL	494.4	491.9	479.2	379.3	364.9	373.4
% Change Year Ago	—	-0.5	-2.6	-20.8	-3.8	2.3

Notes: Totals may not equal the sums of the categories due to rounding. Excludes transitional economies.

p — projections.

Source: CPM Group

1983	1984	1985	1986	1987	1988	1989	1990	1991
51.8	55.3	57.9	55.4	60.2	62.5	65.2	68.0	66.0
40.9	41.3	42.2	47.0	51.3	56.8	54.8	59.0	61.0
45.6	47.6	48.1	51.1	52.6	57.0	57.1	59.0	60.0
<u>138.3</u>	<u>144.2</u>	<u>148.2</u>	<u>153.5</u>	<u>164.1</u>	<u>176.3</u>	<u>177.1</u>	<u>186.0</u>	<u>187.0</u>
37.7	36.9	36.9	35.1	37.7	36.8	35.2	34.3	34.5
3.8	4.3	2.8	3.6	6.9	7.4	0.5	5.0	0.5
17.1	13.0	13.0	12.3	10.5	9.0	8.5	8.3	8.3
1.1	1.0	1.4	1.7	2.2	3.0	3.5	4.4	4.0
23.9	27.3	33.1	47.3	53.3	57.3	63.8	68.3	73.1
<u>42.1</u>	<u>41.3</u>	<u>47.5</u>	<u>61.3</u>	<u>66.0</u>	<u>69.3</u>	<u>75.8</u>	<u>81.0</u>	<u>85.4</u>
11.5	10.6	11.8	14.0	15.1	14.5	15.0	14.9	15.8
-16.1	-1.9	15.0	29.1	7.7	5.0	9.4	6.9	5.4
28.9	28.3	30.0	31.1	25.2	25.5	26.3	25.8	21.4
7.7	7.8	7.5	6.8	7.0	8.4	9.5	10.1	9.0
23.8	26.2	27.2	28.5	28.9	31.5	34.8	34.7	34.8
<u>60.4</u>	<u>62.3</u>	<u>64.7</u>	<u>66.4</u>	<u>61.1</u>	<u>65.4</u>	<u>70.6</u>	<u>70.6</u>	<u>65.2</u>
16.5	16.0	16.1	15.2	14.0	13.7	14.0	13.0	12.0
-2.1	3.1	3.9	2.6	-8.0	82.1	8.0	0.0	-7.6
18.5	18.3	17.7	20.1	19.4	15.0	20.0	23.2	23.0
22.4	28.7	28.3	23.1	31.7	35.7	34.4	35.3	37.1
16.5	18.3	17.8	18.5	17.7	19.1	20.9	20.7	20.9
<u>57.4</u>	<u>65.3</u>	<u>63.8</u>	<u>61.7</u>	<u>68.8</u>	<u>69.8</u>	<u>75.3</u>	<u>79.2</u>	<u>81.0</u>
15.7	16.7	15.9	14.1	15.8	14.6	14.9	14.6	15.0
-1.2	13.8	-2.3	-3.3	11.4	1.5	7.9	5.2	2.3
10.2	13.7	13.4	26.8	30.4	25.3	26.3	29.8	29.9
2.8	3.5	3.3	6.1	7.0	5.3	5.2	5.5	5.5
-15.0	34.3	-2.2	100.0	13.4	-16.8	4.0	13.3	0.3
58.3	63.6	63.8	67.1	70.6	72.5	78.7	95.5	92.8
15.9	16.3	15.9	15.4	16.2	15.2	15.6	17.6	17.1
0.3	9.1	0.3	5.2	5.2	2.7	8.6	21.3	-2.8
<u>366.7</u>	<u>390.4</u>	<u>401.4</u>	<u>436.8</u>	<u>435.8</u>	<u>478.5</u>	<u>503.8</u>	<u>542.1</u>	<u>541.3</u>
-1.8	6.5	2.8	8.8	-0.2	9.8	5.3	7.6	-0.1

INVESTMENT DEMAND

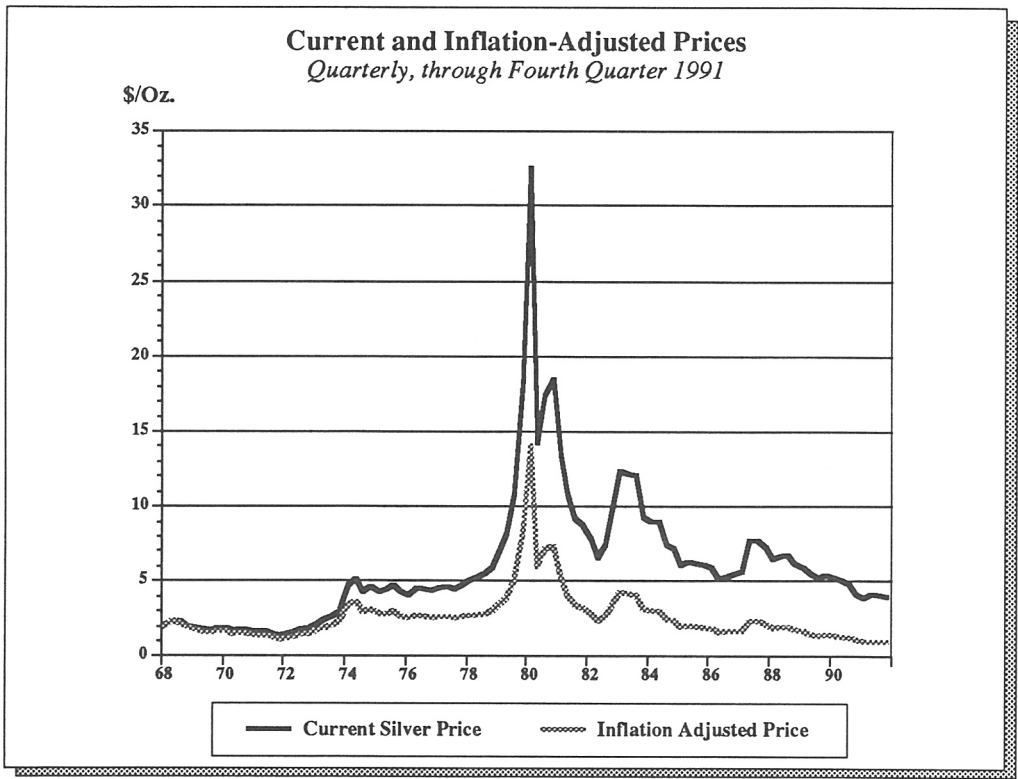
Investors pulled back from the silver market last year after an early spurt in buying coins. Investors as a group may have been net sellers of 20.3 million ounces of silver last year, following sales of 40.3 million ounces in 1990. Even as the net balance was one of disposals, there continued to be some large purchases of silver as a long term asset by some investors.

Additionally, investor sentiment slowly appears to be moving toward a more favorable view of silver. Investors seem to agree that silver prices have entered a period of base-building, the precursor to higher prices. While investors

increasingly view silver as being at low prices, they are not yet convinced that this means an increase in silver prices is imminent. Until the consensus view accepts that second premise, investors are likely to remain wary observers of silver.

In addition to such longer term investment considerations, over the course of 1991 there were a number of shorter term investors, traders, speculators, and investment funds that were active in buying and selling silver within a narrow range of \$4.00 to \$4.24.

Beneath the surface, however, is the undercurrent of a major cyclical price



change. The gap between new supply and fabrication demand continues to widen. Fabricators have not been able to meet their silver requirements for the past two years without turning to investors, and investors have been willing to bridge this gap by selling bullion into the market. This trend is expected to continue this year.

While investors have been net sellers of bullion over the past several years, coinage demand edged a bit higher last year, to 29.9 million ounces from 29.8 million ounces in 1990. Coins sales jumped sharply in the first quarter of 1991, then dwindled. Coinage in this report is included in fabrication demand and so it does not appear as a separate investment category.

Coins have virtually replaced both small bars and medallions as investment vehicles for smaller investors.

Mints appear to be increasing their focus on numismatic investors. These investors are interested less in the intrinsic silver value of a coin than its value as a collectible. This trend, seen in Australia, Japan, and various European countries over the years, now has taken hold in the United States. The emphasis on numismatic investors could be problematic for the silver market, in that, by definition, numismatic coin series are of limited mintage, and can go out of fashion relatively quickly.

Futures and Options

In addition to physical silver bullion and coins, investors are active in futures and

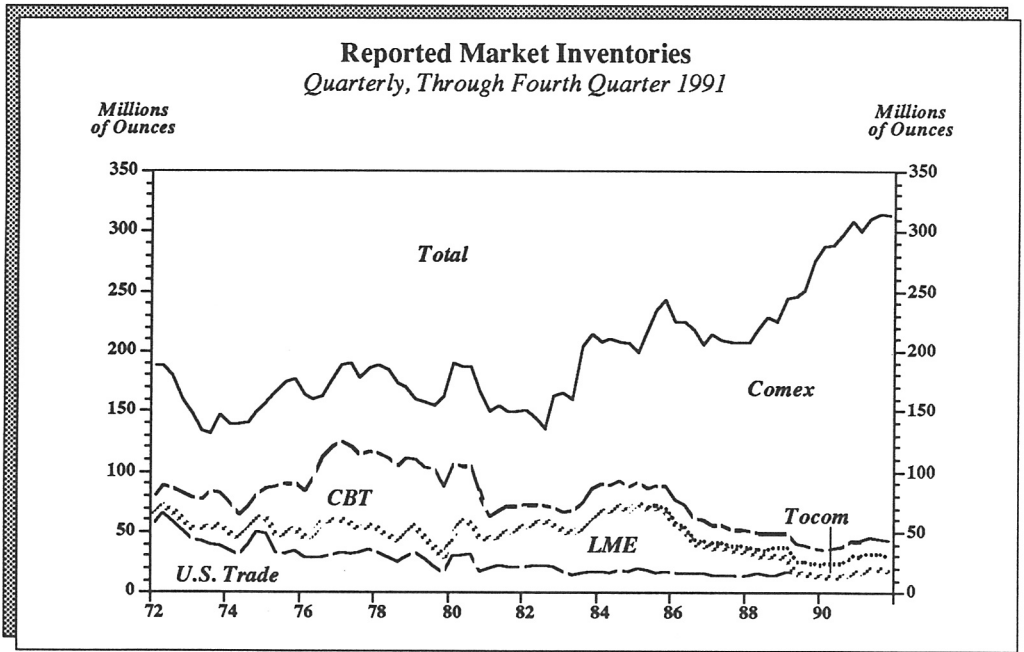
options traded on the organized commodity exchanges. The largest market by far is the New York Commodity Exchange (Comex), where both silver futures and options are traded alongside other metals contracts. Trading volume on Comex was 20,773 million ounces last year, up 6% from the level of activity in 1990. This may surprise some market observers, given the dominant view that silver is dead as an investment. The fact is, silver trading volume rose last year, even as total trading volume on all U.S. futures contracts declined for the first time in many years. (*See table, page 63*).

Comex open interest — the number of contracts outstanding at any given time — stood at 488.8 million ounces at the end of 1991.

How much of this futures activity is investor oriented cannot be pinpointed.

However, a good deal of Comex activity originates from commodity and mutual funds, and large individual investors. These investors remain attracted to silver. (For example, one investor may have purchased more than 45 million ounces of physical metal in the past two and half years, and has been trading on the futures and options markets using this metal as collateral.)

One measure of investor activity in the futures market can be found in the Commitments of Traders statistics collected by the Commodity Futures Trading Commission, the U.S. regulatory body responsible for monitoring futures



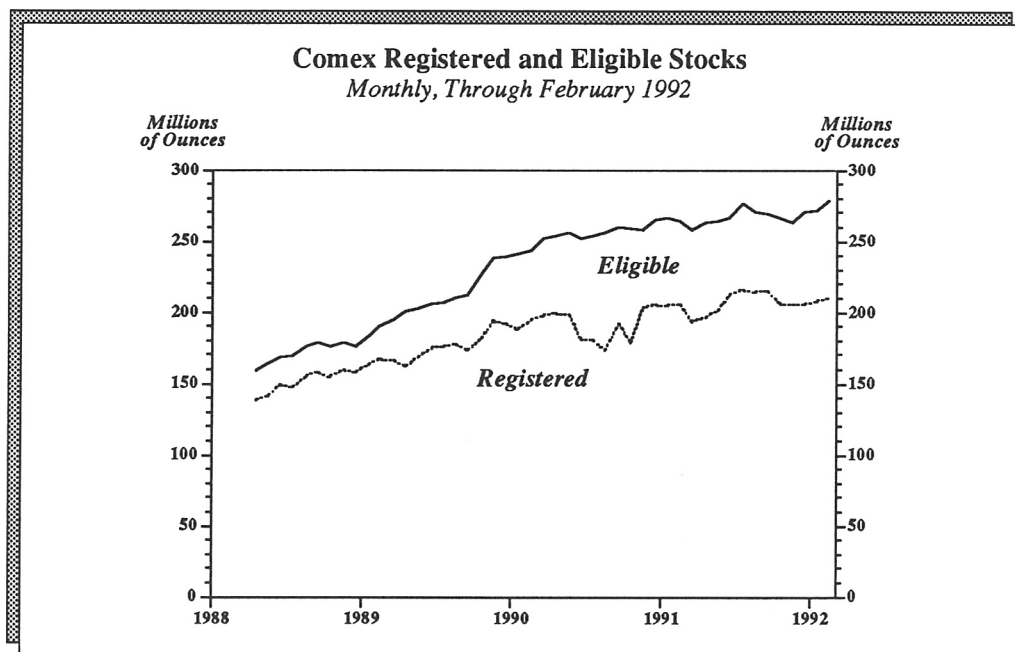
and options markets. At the end of February, small traders, as the CFTC nomenclature defines them, held a net long position equivalent to 21% of the open contracts in the Comex silver futures contract. Large speculators, again using the CFTC's categories, held a net long position equivalent to 22% of the open interest in Comex silver futures. That is a net long position equivalent to 188 million ounces of silver.

Silver futures also are traded on the Chicago Board of Trade (CBOT) and the Tokyo Commodity Exchange (Tocom). These are relatively smaller markets. For 1991 CBOT trading volume totaled 117.5 million ounces, while Tocom trading volume amounted to 1,020 million ounces. Year-end open interest stood at 6.1 million ounces for CBOT and 38 million ounces

for Tocom. Tocom only began trading silver futures in 1985, and has witnessed a rapid expansion in its trading activity. The one billion ounce trading volume on Tocom in 1991 was more than double the volume in each of the previous two years. The London Metals Exchange also traded silver at one time. The London contract was designed as a hedge instrument for producers, refiners, and hedgers. Its 10,000-ounce size and other characteristics made it unattractive to investors. The contract was not popular with industrial concerns either, and was suspended in June of 1989.

Reported Inventories

Much attention is paid in the trade press to the amount of silver held in New York bank vaults. These stocks are reported



regularly, and are divided into two categories: those stocks held in New York banks and registered for use as collateral against Comex futures positions, and those stocks held in New York banks and New York but *not* registered with the Comex.

At the end of 1990, registered stocks stood at 205.7 million ounces, stocks eligible but not registered stood at 61.1 million ounces, for a total 266.2 million ounces. At the end of last year registered stocks had risen to 205.9 million ounces, and eligible stocks to 64.8 million ounces, bringing New York stocks to 270.7 million ounces. As of March 6, 1992, silver in New York bank vaults had increased to 282.9 million ounces, with registered stocks amounting to 210.4 million ounces, and eligible stocks rising to 72.5 million ounces.

These stocks figures are followed in the

market, with some participants viewing their level relative to fabrication demand as being indicative of overall silver market conditions. While these stocks are important, too much significance clearly is placed on them, for several reasons.

First, it should be noted that one does not need to hold silver in New York bank vaults, where its presence is reported on a weekly basis. There are large stocks of silver in Wilmington, Delaware; Zurich, London; and other market centers. Even if an investor or other entity wished to hold physical silver and use that metal as collateral against Comex positions, banks will make the necessary financial arrangements to allow for such silver stocks to be held outside of New York.

Another reason why reported market inventories are not as important as they

seem, as indicators of possibly bearish fundamentals in the market, is that different individuals and companies hold silver in New York for different reasons. One must be aware of the differing rationales for holding these stocks.

Of the total of 270.7 million ounces held in New York at the end of 1991, 64.8 million ounces were not registered with the Comex. These holdings represent long-term investor stocks.

The vast majority of the metal registered with the Comex appears to be held by trading companies that serve as silver market makers. That is, they are committed to buying silver from and selling silver to any qualified counterpart. During the 1980s, when new silver supplies exceeded fabrication demand, these trading companies found themselves buying large volumes of silver which remained on their own accounts. Because they were market makers, they were duty-bound to buy physical silver. They were unable to find physical outlets for all of the metal they were buying, so they hedged these physical market purchases by selling futures contracts on the Comex futures market.

Traders can afford to remain market makers because the spread between spot silver prices and forward, or future, silver prices offers them a profit. By hedging their spot physical silver purchases with sales in forward futures contracts, they are able to earn this spread. This covers their costs and affords them a small profit, allowing them to remain in business.

These spot purchases matched to futures sales sometimes are referred to as "cash and carry" operations.

It is important to understand that much of the silver registered with the Comex is held in such cash and carry positions. Holders of such silver are less responsive to changes in actual silver price levels than they are to changes in the spread between spot and forward silver prices (also called the contango). This is because the profitability of their holding this silver is based on the premise that the contango remains greater than the cost of money that they use to finance this operation. As long as this is true, they can hold the metal. If, however, the contango were to contract sharply to a point where it no longer covered the financing charges, these traders would have to sell their silver and liquidate their positions.

In addition to such futures trading strategies, traders, commodity funds, and individual investors undertake a variety of trading strategies using both futures and options. One such strategy is sometimes called a "buy and write" position. In this, an investor will buy physical silver, presumably under the assumption the price will rise at some point. Whilewaiting for such a price increase, the investor may use this silver as collateral for options. For example, it might be believed silver prices are going to rise in the long-term, but will remain stable or even fall in the short term. If this is the case, options might be sold to other investors and speculators, giving them the option to buy the silver should prices rise sufficiently. By setting the

exercise price at a high enough level, the investor can earn the premium by selling this option while preserving up-side exposure to silver prices. The risk faced is that silver prices rise to the exercise price of the option, at which point the buyer of the options would buy the metal. This is a limited risk to the investor, however: Should prices rise to the exercise price, the investor may well be glad to receive that price and to sell his metal at that level.

There are many other options strategies employed regularly by traders, institutional investors, and individual investors. Another popular strategy is sometimes called a "min-max," in that the investor will buy one option and sell another in such a way as to guarantee the ability to buy or sell silver within a predetermined range.

It is sometimes said that one can look at the number of put or call options outstanding on the Comex and reach conclusions on the tone of the market based on these statistics. In fact, this is not so. First, because of the multitude of complex options strategies used by investors and traders alike. Second, because these market statistics are further clouded by the fact that trading companies will use Comex options to offset their own, "dealer" options that they are selling to producers, users, and institutional investors.

COUNTRY SURVEY: THE UNITED STATES

Fabrication demand in the United States declined sharply in 1991, with electronics offtake particularly hard hit. Total U.S. silver use declined 5% to 127.7 million ounces in 1991, down from 134.4 million ounces in 1990.

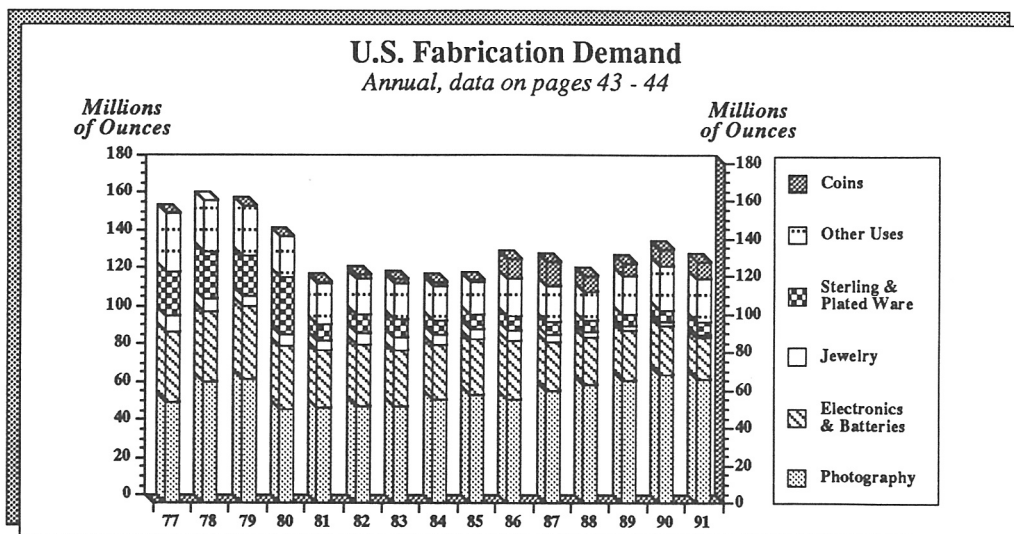
Photography continues to be the largest user of silver in the United States. Photographic use slipped around 3% in 1991, to 66 million ounces from 68 million ounces in 1990. Medical x-rays grew at a healthy pace, as did some graphics and industrial applications, but this was more than offset by a decline in silver use in commercial films and papers for use by amateur and professional photographers. This sector of the photographic market suffered in general last year, and U.S. film manufacturers also appeared to have lost market share.

Use of silver in electrical contacts and conductors fell 20% in the United States

last year, to 18.3 million ounces from 22.8 million ounces in 1990. Demand from this sector could be flat to slightly lower in 1992.

There was some demand growth in other areas. Use in batteries was up 3.3%, at 3.1 million ounces. Demand for silver for use in batteries may rise at a healthy pace over the next several years, as overall use of silver batteries appears set to increase sharply while U.S. manufacturers are expected to gain market share.

Silver use in chemical process catalysts rose 10% from 3 million ounces to 3.3 million ounces. Fabrication of sterlingware, jewelry, and silverplate, were flat at 3.5 million ounces, 2 million ounces, 2.8 million ounces respectively. Use in mirrors fell to 1.1 million ounces from 1.2 million ounces.



Annual U.S. Fabrication Demand, 1977 - 1986

Million Troy Ounces

	1977	1978	1979	1980	1981
Photography	53.7	64.3	66.0	49.8	51.0
Electrical Contacts & Conductors	31.3	30.8	33.5	27.8	26.4
Batteries	5.8	6.0	4.6	6.0	3.8
Sterling Ware	16.7	17.9	13.1	9.1	4.4
Jewelry	8.1	6.8	5.4	5.9	5.4
Silverplate	6.8	7.3	8.1	4.4	3.9
Brazing Alloys & Solders	12.4	11.0	10.9	8.5	7.7
Catalysts	8.9	8.2	5.6	3.0	3.8
Medallions & Commemorative Objects	4.3	2.7	4.7	4.7	2.6
Dental & Medical Supplies	2.2	2.0	2.3	2.2	1.7
Mirrors	2.1	1.9	1.9	0.7	0.6
Bearings	0.5	0.4	0.3	0.6	0.3
Miscellaneous	0.9	1.0	1.0	2.0	5.0
Total Industrial	153.6	160.2	157.3	124.7	116.7
<i>% Change Year Ago</i>		4.3	-1.8	-20.7	-6.4
Coinage	0.1	0.0	0.2	0.1	0.2
Total Fabrication	153.7	160.2	157.4	124.8	116.8
<i>% Change Year Ago</i>		4.2	-1.7	-20.7	-6.3
	1982	1983	1984	1985	1986
Photography	51.8	51.8	55.3	57.9	55.4
Electrical Contacts & Conductors	27.7	26.3	25.6	27.5	27.4
Batteries	4.2	2.6	2.7	2.5	3.7
Sterling Ware	6.6	7.0	3.6	3.5	3.9
Jewelry	6.3	6.9	5.8	5.8	4.6
Silverplate	83.3	3.2	3.5	3.7	3.7
Brazing Alloys & Solders	7.4	5.8	5.9	5.6	6.4
Catalysts	2.4	2.4	2.4	2.4	2.3
Medallions & Commemorative Objects	1.8	3.0	2.6	2.5	4.0
Dental & Medical Supplies	1.7	1.5	1.6	1.5	1.5
Mirrors	1.0	1.0	1.0	1.0	1.0
Bearings	0.2	0.2	0.3	0.2	0.4
Miscellaneous	4.6	4.6	4.6	4.6	4.6
Total Industrial	118.8	116.3	114.8	118.6	118.9
<i>% Change Year Ago</i>	1.9	-2.1	-1.2	3.2	0.3
Coinage	1.8	2.1	2.7	0.4	10.3
Total Fabrication	120.7	118.4	117.5	118.9	129.2
<i>% Change Year Ago</i>	3.3	-1.9	-0.8	1.2	8.7

Notes: Totals may not equal the sums of components due to rounding.

Sources: U.S. Bureau of Mines, trade sources, CPM Group

Annual U.S. Fabrication Demand, 1987 - 1991

Million Troy Ounces

	1987	1988	1989	1990	1991
Photography	60.2	62.5	65.2	68.0	66.0
Electrical Contacts & Conductors	22.7	23.0	23.5	22.8	18.3
Batteries	2.4	2.5	2.8	3.0	3.1
Sterling Ware	3.8	3.5	3.4	3.5	3.5
Jewelry	4.2	2.9	2.4	2.0	2.0
Silverplate	2.5	2.6	2.7	2.8	2.8
Brazing Alloys & Solders	5.6	—	—	—	—
Catalysts	2.4	2.6	2.8	3.0	3.3
Medallions & Commemorative Objects	4.2	—	—	—	—
Dental & Medical Supplies	1.3	1.4	1.7	1.8	—
Mirrors	1.0	1.1	1.1	1.2	1.1
Bearings	0.3	—	—	—	—
Miscellaneous	4.5	12.5	14.4	17.2	18.6
Total Industrial	115.3	112.0	120.0	125.1	118.7
% Change Year Ago	-3.1	-2.8	7.1	4.2	-5.3
Coinage	12.2	7.9	6.8	9.1	9.0
Total Fabrication	127.5	119.9	126.8	134.4	127.7
% Change Year Ago	-1.4	-5.9	5.8	5.8	-5.0

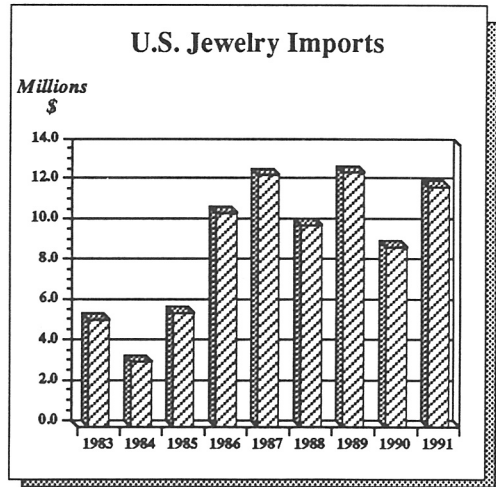
Notes: Totals may not equal the sums of components due to rounding. Categories marked with dashes are included in miscellaneous.

Sources: U.S. Bureau of Mines, trade sources, CPM Group

Imports of Sterlingware and Jewelry into the United States

A significant amount of silver jewelry, sterlingware, and decorative objects sold in the United States each year is fabricated elsewhere and exported to the United States.

Imports of silver jewelry into the United States rose 5.2% on a value basis in 1991, to \$190.7 million from \$181.2 million in 1990. (Statistics are not available on the volume of such imports or on the amount of silver contained in these items.)



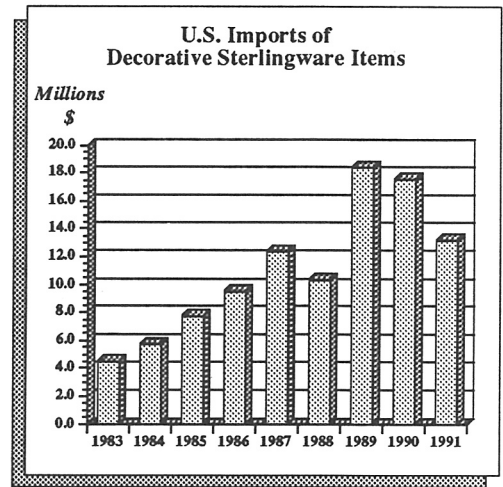
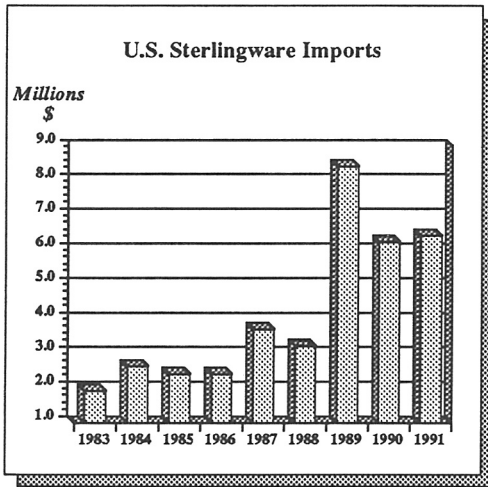
Silver jewelry imports are divided into three classifications by the U.S. Customs Office. The largest category is jewelry, the value of which is greater than \$18 per dozen pieces. Last year U.S. imports of these higher priced silver jewelry pieces totaled \$177.1 million, up from \$170.5 million in 1990. Italy, at \$65.8 million, was the largest source of these items, which came from a total of 59 countries last year. Thailand, which has been gaining in terms of its world precious metals jewelry manufacturing trade, was a close second, at \$61.7 million. The third largest source was Mexico, at \$16.1 million in imports last year.

Imports of finished jewelry pieces valued at less than \$18 per dozen pieces also rose last year, to \$11.9 million from \$8.9 million in 1990. Thailand accounted for more than half of this market, at \$6.1 million. Italy was second, at \$2.3 million, and Mexico, at \$2.1 million, was third. A total of 25 countries supplied lower cost

silver jewelry to the United States in 1991, but these top three countries provided 88% of the total.

The third category of silver jewelry is chains and semi-manufactured jewelry. These imports fell slightly in 1991, to \$1.7 million from \$1.9 million in 1990. Canada was the largest source in this category, at \$769,000, with a total of 26 countries supplying these products. Financial difficulties as some Canadian findings manufacturers may lead to a decline in these imports from Canada in 1992.

Sterlingware imports rose on a value basis. The increase in value was 3.2%, to \$6.4 million in 1991 from \$6.2 million the year before. The volume of imports of full place settings was not available from the government for 1990. In 1991 the number of place settings imported totaled 502,000 sets, which was down sharply from the 1.4 million sets imported in 1989, when data were available.



Italy accounted for 61% of U.S. place setting imports last year. Germany, the United Kingdom, and France also are significant exporters of sterlingware to the United States.

The United Kingdom was the largest exporter to the United States of silver art objects in 1991, followed by Italy, Israel, and Mexico.

Finally, the United States each year imports a variety of household and decorative items made of silver. These include various kitchen items, bowls, vases, and decanters, desktop accessories, and cosmetic accessories. Last year U.S. imports of these items fell to \$8.9 million from \$10.3 million on a value basis. (Again, statistics on the number of items and silver content simply are not available.) Silver artistic and religious figures also are imported into the United States. Last year U.S. imports of these items totaled \$4.3 million, down from \$7.3 million in 1990.

It should be noted that all of these import categories may include newly manufactured items and antiques. Antique sterlingware and jewelry can be imported under these classifications, or classified as antiques, so that the flow of these materials into the United States is impossible to monitor from U.S. Customs Office statistics.

Israel was the largest exporter to the United States of decorative silver items in 1991.

U.S. Jewelry Imports
Annual Data

Jewelry, valued at less than \$18 per dozen pieces.

	Quantity	US\$Mil.
1983	824,630	5.3
1984	NA	3.2
1985	844,598	5.6
1986	1,390,985	10.6
1987	1,554,202	12.5
1988	1,328,929	10.0
1989	NA	12.6
1990	NA	8.9
1991	NA	11.9

More extensive trade data, available since 1989.

	Quantity	US\$Mil.
1989		
Chains & Semi-fab	NA	2.9
Jewelry, <\$18/Dzn.	NA	12.6
Jewelry, >\$18/Dzn.	NA	163.3
<i>Total</i>	<i>NA</i>	<i>178.8</i>
1990		
Chains & Semi-fab	NA	1.9
Jewelry, <\$18/Dzn.	NA	8.9
Jewelry, >\$18/Dzn.	NA	170.5
<i>Total</i>	<i>NA</i>	<i>181.2</i>
1991		
Chains & Semi-fab	NA	1.7
Jewelry, <\$18/Dzn.	NA	11.9
Jewelry, >\$18/Dzn.	NA	177.1
<i>Total</i>	<i>NA</i>	<i>190.7</i>

Note: From 1983 through 1988, the annual figure represents only imports of silver jewelry valued at less than \$18 per dozen pieces.

Sources: U.S. Census Bureau, CPM Group, March 17, 1992

U.S. Sterlingware Imports
Annual Data

	Quantity	US\$Mil.
1983	NA	1.9
1984	NA	2.6
1985	2,803,852	2.4
1986	NA	2.4
1987	NA	3.7
1988	NA	3.2
1989	NA	8.4
1990	NA	6.2
1991	NA	6.4

More extensive trade data, available since 1989.

1989

Knives	27,651	0.8
Forks	28,442	1.1
Spoons & Ladle	47,008	1.1
Sets	1,372,903	1.3
Miscellaneous	NA	4.1

Total 8.4

1990

Knives	19,008	0.7
Forks	32,629	0.7
Spoons & Ladle	36,283	0.7
Sets	NA	0.7
Miscellaneous	NA	3.5

Total 6.2

1991

Knives	41,355	0.7
Forks	50,930	0.8
Spoons & Ladle	31,881	0.7
Sets	501,838	1.0
Miscellaneous	NA	3.2

Total 6.4

Notes: From 1983 through 1988, only total sterling silver tableware imports were reported, with no breakdown by category.

Sources: U.S. Census Bureau, CPM Group, March 17, 1992

U.S. Imports
of Decorative Items

	US\$Mil.
<i>Sterling items</i>	
1983	4.5
1984	5.7
1985	7.7
1986	9.5
1987	12.4
1988	10.3
1989	18.4
1990	17.6
1991	13.2

Silverplated items

1983	26.5
1984	36.2
1985	35.2
1986	38.6
1987	47.0
1988	56.8

Notes: Quantities of items not provided for these series. After 1988, data for silverplated items no longer was available, having been replaced by 'precious metals plated' statistics, which included gold and other precious metals plated objects.

Sources: U.S. Census Bureau, CPM Group, March 17, 1992

APPENDIX

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Mine Production By Country
Thousand Troy Ounces

	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Africa													
Algeria	100	100	110	110	120	120	120	120	120	120	120	100	100
Ghana	20	18	17	17	14	14	14	20	2525	25	25	25	50
Morocco	3,283	3,154	2,120	2,640	2,850	2,409	2,733	566	4,300	7,273	8,300	12,100	12,000
Namibia	3,617	3,365	3,456	3,150	3,532	3,255	3,400	3,981	3,331	3,472	4,437	2,900	2,900
South Africa	3,238	7,458	7,569	6,943	6,513	6,997	6,721	7,143	7,201	5,760	5,720	5,700	5,500
Tunisia	231	233	85	117	90	85	26	30	30	30	30	30	25
Zaire	3,420	2,535	2,575	1,905	1,288	1,499	1,520	1,499	1,400	1,400	1,499	2,700	1,890
Zambia	914	764	715	887	933	794	625	842	962	942	890	640	595
Zimbabwe	978	948	858	919	938	892	800	843	817	895	774	710	700
Total	15,801	18,575	17,505	16,688	16,278	16,065	15,959	16,044	18,186	19,917	21,795	24,905	23,760
Asia													
Burma	340	430	450	526	558	575	569	443	400	378	321	230	230
India	370	366	556	466	508	933	822	1,135	1,221	1,318	1,286	868	900
Indonesia	793	700	828	1,032	1,047	1,122	1,175	1,371	1,986	1,986	2,012	1,700	2,000
Japan	8,932	8,195	9,279	9,042	9,877	10,403	10,914	11,307	9,032	8,102	5,008	4,800	5,000
Malaysia	433	437	473	522	481	470	522	452	497	641	641	410	500
Philippines	1,838	1,951	2,021	1,983	1,823	1,574	1,743	1,689	1,638	1,759	1,852	1,500	1,200
South Korea	2,823	2,293	3,147	3,523	3,366	3,759	3,990	2,584	2,823	1,571	2,762	1,700	2,250
Taiwan	84	96	216	505	344	364	366	405	373	268	268	210	250
Turkey	250	200	200	220	219	219	224	286	283	513	513	640	600
Total	15,863	14,668	17,170	17,819	18,223	19,419	20,325	19,672	17,798	16,536	14,663	12,058	12,930
Europe													
Finland	1,028	1,430	1,215	1,190	980	1,123	1,566	1,193	1,415	997	997	920	950
France	2,409	2,374	1,706	986	688	769	866	825	831	678	627	620	600
Germany	1,042	1,213	1,263	1,286	1,167	1,225	1,102	884	994	642	700	260	50
Greece	1,752	1,671	1,945	1,581	1,797	1,799	1,630	1,726	1,668	1,977	1,668	1,700	1,700
Greenland	763	771	720	758	607	335	425	385	402	458	470	300	300
Ireland	1,058	773	595	352	318	280	277	262	232	177	231	230	230
Italy	1,065	1,365	1,779	1,791	2,362	1,560	513	577	449	513	510	360	200
Portugal	35	29	23	23	32	29	108	175	120	120	120	620	650
Spain	3,168	5,711	6,186	3,789	5,938	5,000	6,405	5,562	6,880	7,298	7,088	7,400	7,500
Sweden	5,650	5,337	5,171	5,396	5,491	7,677	8,038	7,554	8,520	7,201	6,099	7,000	6,500
Yugoslavia	5,214	4,789	4,422	3,342	3,987	4,051	5,017	5,702	4,859	4,468	4,276	4,300	4,000
Total	23,184	25,463	25,025	20,494	23,367	23,848	25,947	24,845	26,370	24,529	22,786	23,710	22,680

Mine Production By Country, continued

Thousand Troy Ounces	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
North & Central America													
Canada	36,874	34,390	36,311	42,234	38,692	42,001	38,485	34,980	38,118	44,100	41,310	44,374	40,941
Costa Rica	2	2	2	2	2	2	2	2	2	2	2	2	2
Dom. Rep.	2,268	1,642	2,062	2,112	1,270	1,222	1,609	1,318	1,149	1,400	700	700	700
El Salvador	152	146	137	86	23	22	20	17	17	17	17	17	17
Guatemala	10	10	8	8	3	0	0	0	0	0	0	0	0
Honduras	2,186	1,721	1,665	2,050	2,587	2,698	2,765	1,747	741	796	796	1,000	1,000
Mexico	49,408	47,344	53,204	49,841	55,000	63,900	69,200	69,400	69,800	70,000	70,000	67,900	62,700
Nicaragua	388	163	82	76	63	50	52	26	29	23	23	40	50
United States	37,896	32,329	40,683	40,248	43,431	44,592	39,357	34,221	39,790	53,402	60,797	66,488	60,984
Total	129,184	117,747	134,154	136,657	141,071	154,487	151,490	141,711	149,646	169,740	173,645	180,521	166,394
Oceania													
Australia	26,749	24,981	23,920	29,161	33,212	31,250	34,916	32,890	35,912	35,815	37,295	37,800	38,000
Fiji	9	9	9	19	12	13	15	15	0	0	0	0	0
New Zealand	2	1	1	1	0	0	41	41	0	59	156	160	200
Papua New Guinea	1,434	1,187	1,365	1,394	1,531	1,426	1,487	1,802	2,004	2,100	1,966	2,600	3,215
Total	28,194	26,178	25,295	30,575	34,755	32,689	36,459	34,748	37,916	37,974	39,417	40,560	41,415
South America													
Argentina	2,209	2,357	2,518	2,684	2,502	1,983	2,170	2,135	1,899	1,608	1,547	2,200	2,200
Bolivia	5,742	6,099	6,394	5,472	6,024	4,559	3,614	3,057	4,565	7,234	7,718	8,900	9,400
Brazil	1,065	737	765	748	750	2,275	2,301	1,913	1,966	2,252	2,056	1,100	1,000
Chile	8,740	9,596	11,608	12,288	14,955	15,776	16,642	16,080	16,068	16,301	17,701	20,416	29,740
Colombia	99	146	134	137	134	128	155	187	167	211	220	210	200
Ecuador	70	70	32	9	3	3	2	2	2	2	2	2	0
Peru	41,900	44,815	42,553	54,379	55,565	53,257	54,854	59,924	63,576	47,657	56,830	55,548	56,882
Total	59,825	63,820	64,004	75,717	79,933	77,981	79,738	83,298	88,243	75,265	86,074	88,374	99,422
Subtotal	272,051	266,451	283,153	297,950	313,627	324,489	329,918	320,318	338,159	343,961	358,380	370,128	366,601
Transitional Economies													
Bulgaria	805	773	741	805	805	837	837	837	837	799	799	600	570
China	1,928	1,928	2,091	2,252	2,300	2,600	2,800	3,214	3,214	3,500	4,000	5,500	6,000
Czechoslovakia	1,126	1,126	1,126	1,062	964	1,029	1,030	1,062	1,100	1,126	1,100	600	580
East Germany	1,543	1,511	1,447	1,447	1,382	1,286	1,318	1,318	1,318	1,286	1,298	0	0
Hungary	34	34	31	30	30	25	25	25	25	25	25	25	25
North Korea	1,543	1,447	1,286	965	1,100	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600
Poland	22,569	24,628	20,577	21,058	21,800	23,900	26,717	26,652	26,717	34,176	34,000	26,750	25,400
Romania	965	901	805	805	805	773	805	741	642	691	671	800	760
Soviet Union	49,834	49,834	50,500	51,000	51,441	51,441	52,084	52,400	52,500	53,000	54,000	51,300	48,700
Total	80,347	82,182	78,604	79,424	80,627	83,491	87,216	87,850	87,953	96,203	97,493	87,175	83,635
WORLD TOTAL	352,398	348,633	361,757	377,374	394,254	407,980	417,134	408,167	426,112	440,164	455,873	457,303	450,236

Sources: U.S. Bureau of Mines; American Bureau of Metals Statistics; Statistics Canada; Chamber of Mines of South Africa; The Silver Institute; Central Intelligence Agency, other government and industry sources; CPM Group

Fabrication Demand by Country, 1950-1991

Million Troy Ounces

	Europe					Subtotal
	Germany	Italy	U.K.	France	Other Europe	
1950	7.6	-i	12.4	1.3	-i	21.3
1951	10.0	-i	16.6	10.0	-i	36.6
1952	10.4	-i	9.1	10.5	-i	30.0
1953	11.9	-i	11.9	14.5	-i	38.3
1954	24.2	-i	12.6	15.0	-i	51.8
1955	28.1	-i	14.2	15.7	-i	58.0
1956	33.1	-i	13.8	15.9	-i	62.8
1957	31.5	-i	14.7	17.9	-i	64.1
1958	31.1	-i	14.8	14.1	-i	60.0
1959	33.3	-i	17.5	10.6	-i	61.4
1960	40.2	-i	16.5	25.2	-i	81.9
1961	43.5	20.0	20.0	37.8	-i	121.3
1962	41.8	22.0	20.0	27.2	-i	111.0
1963	40.5	25.0	20.0	26.1	-i	111.6
1964	46.3	25.0	23.0	25.5	-i	119.8
1965	57.3	25.0	25.0	21.2	-i	128.5
1966	51.1	30.0	25.0	23.4	-i	129.5
1967	51.3	28.2	24.0	24.3	-i	127.8
1968	54.2	22.5	23.0	20.9	-i	120.6
1969	52.9	29.0	24.5	20.0	-i	126.4
1970	51.7	32.0	25.0	19.0	-i	127.7
1971	79.1	30.5	25.0	16.0	-i	150.6
1972	82.6	32.0	27.0	16.8	-i	158.4
1973	67.0	33.5	31.5	22.6	-i	154.6
1974	62.6	30.0	33.0	24.6	-i	150.2
1975	44.3	28.9	28.0	22.8	-i	124.0
1976	54.7	38.5	27.6	38.0	-i	158.8
1977	52.7	36.3	29.4	39.7	-i	158.1
1978	45.6	31.0	29.0	33.6	-i	139.2
1979	43.5	33.3	27.6	34.7	45.5	184.6
1980	31.9	21.8	19.5	19.9	35.9	129.0
1981	29.8	21.5	18.4	19.0	37.6	126.3
1982	33.0	20.8	18.1	18.5	39.2	129.6
1983	30.3	15.0	17.7	18.7	33.9	115.6
1984	32.2	19.4	19.2	21.0	35.4	127.2
1985	34.6	24.0	19.1	19.1	37.5	134.3
1986	36.8	33.5	19.1	19.2	42.1	150.7
1987	42.3	38.6	21.1	19.8	41.7	163.5
1988	47.8	43.0	22.7	23.4	38.1	175.1
1989	50.5	45.7	24.5	24.3	40.5	185.5
1990	51.3	47.9	24.4	24.6	34.5	182.7
1991	59.2	53.0	21.7	24.1	30.8	188.8

Notes: Includes coinage where available, 1960 onward. Coinage prior to 1960 is included in "Other". Small amounts of Italian and U.K. coinage also are included in "Other". "Other Europe" prior to 1979 is included in "Other". Prior to 1965, U.S. silver coinage was circulating coinage. Excludes transitional economies. Totals may not equal the sums of countries due to rounding.

U.S.	Japan	India	Canada	Mexico	Other	Total	
120.0	-i-	-i-	5.2	3.8	52.6	202.9	1950
110.0	3.5	-i-	4.4	-i-	100.6	255.1	1951
95.0	3.5	-i-	3.8	-i-	124.1	256.4	1952
105.0	5.6	4.0	4.7	-i-	101.5	259.1	1953
85.0	5.8	3.0	3.9	-i-	94.7	244.2	1954
100.0	6.2	3.0	4.6	-i-	73.6	245.4	1955
100.0	7.9	17.5	3.8	6.1	76.6	274.7	1956
95.0	8.8	15.0	5.8	6.1	104.2	299.0	1957
85.0	8.2	3.3	4.6	6.9	104.5	272.5	1958
103.0	13.6	2.0	4.5	8.5	109.4	302.4	1959
56.0	21.6	1.5	11.8	6.8	162.1	341.7	1960
161.5	19.1	1.5	8.5	5.3	88.4	405.6	1961
188.4	19.6	1.5	14.2	5.2	63.2	403.1	1962
222.0	20.0	2.5	16.2	5.0	68.0	445.3	1963
326.0	20.0	12.0	17.8	6.4	83.3	585.3	1964
457.3	25.8	16.0	30.1	7.4	78.5	743.6	1965
237.3	31.5	16.0	21.3	6.1	104.9	546.6	1966
214.8	33.2	15.0	14.6	7.9	93.9	507.2	1967
182.1	35.0	16.0	13.6	7.9	88.0	463.2	1968
161.1	41.5	16.0	5.7	6.9	61.4	419.0	1969
129.1	46.0	16.0	6.0	8.5	66.1	399.4	1970
131.6	46.5	16.0	7.0	8.0	57.6	417.3	1971
154.0	54.3	13.0	8.4	11.0	70.4	469.5	1972
197.3	69.0	13.0	17.0	16.5	83.6	551.0	1973
177.0	57.7	14.0	19.3	10.2	73.2	501.6	1974
160.4	46.4	13.0	20.7	8.8	67.8	441.1	1975
171.9	60.8	18.0	17.7	10.2	77.3	514.7	1976
153.7	63.2	17.6	9.6	12.8	79.4	494.4	1977
160.2	64.9	21.0	10.6	15.7	80.3	491.9	1978
157.5	68.8	22.5	8.1	13.6	24.1	479.2	1979
124.8	61.5	22.5	8.9	11.0	21.6	379.3	1980
116.9	59.6	26.5	8.8	5.0	21.8	364.9	1981
120.6	63.2	23.0	9.3	5.7	22.0	373.4	1982
118.4	72.1	22.5	9.3	3.5	25.2	366.6	1983
116.8	78.8	20.9	9.3	8.0	29.4	390.4	1984
119.0	72.6	21.0	9.4	11.5	26.8	394.6	1985
129.2	78.6	19.3	10.9	9.7	38.4	436.8	1986
127.5	92.2	20.1	11.6	9.2	36.9	461.0	1987
119.9	103.9	22.5	12.1	9.1	35.9	478.5	1988
126.8	102.2	27.0	15.3	8.8	38.2	503.8	1989
134.4	108.8	41.8	14.2	8.7	51.3	542.1	1990
127.7	111.1	38.6	13.1	9.2	61.7	541.3	1991

i — included in "Other"

Sources: CPM Group, industry sources

Japanese Fabrication Demand

Million Troy Ounces

	1977	1978	1979	1980	1982
Photography	31.2	31.4	32.2	32.6	33.9
Electrical Contacts	6.9	7.0	8.9	7.6	6.4
Caustic Silver	5.8	6.5	6.6	5.6	5.6
Brazing Alloys & Solders	4.3	4.7	5.3	3.5	3.1
Tube, Sheet & Bar	5.6	5.1	4.9	3.2	3.0
Electroplating	2.8	2.9	2.8	2.5	2.4
Jewelry & Silverware	2.2	2.5	2.2	1.0	1.1
Miscellaneous	4.4	4.8	5.9	5.5	4.1
Total	63.2	64.9	68.8	61.5	59.6
% Change Year Ago	—	2.7	6.0	-10.6	-3.1
	1982	1983	1984	1985	1986
Photography	36.6	40.9	41.3	42.2	47.0
Electrical Contacts	6.6	7.7	7.8	7.5	6.8
Caustic Silver	5.5	6.7	7.6	6.8	7.6
Brazing Alloys & Solders	3.3	3.2	3.9	3.7	3.7
Tube, Sheet & Bar	3.6	3.2	3.9	3.6	4.1
Electroplating	2.3	2.8	3.7	3.2	3.2
Jewelry & Silverware	1.3	1.1	1.0	1.4	1.7
Miscellaneous	4.0	6.5	9.6	4.2	4.4
Total	63.2	72.1	78.8	72.6	78.6
% Change Year Ago	6.0	14.1	9.3	-7.8	8.2
Coinage	—	—	—	—	6.4
Total Including Coinage	63.2	72.1	78.8	72.6	85.0
% Change Year Ago	-6.0	14.1	9.3	-7.8	17.0
	1987	1988	1989	1990	1991
Photography	51.3	56.8	54.8	59.0	61.0
Electrical Contacts	7.0	8.4	9.5	10.1	9.0
Caustic Silver	8.3	9.5	8.9	9.0	9.0
Brazing Alloys & Solders	3.7	4.3	4.5	4.6	4.8
Tube, Sheet & Bar	5.3	5.6	6.7	6.7	7.3
Electroplating	4.9	5.6	3.8	4.5	4.0
Jewelry & Silverware	2.2	3.0	3.5	4.4	4.0
Miscellaneous	9.4	10.6	10.5	10.5	12.0
Total	92.2	103.9	102.2	108.8	111.1
% Change Year Ago	17.4	12.6	-1.6	6.5	2.1
Coinage	—	—	—	8.9	--
Total Including Coinage	92.2	103.9	102.2	117.7	111.1
% Change Year Ago	8.5	12.6	-1.6	15.2	-5.6

Notes: Totals may not equal the sums of components due to rounding. There was no silver use in coinage in Japan prior to 1986.

Sources: Japanese trade sources, CPM Group

European Fabrication Demand
Million Troy Ounces

	1979	1980	1981	1982	1983	1984	1985
Jewelry & Silverware	50.3	27.5	28.7	32.7	23.9	27.3	33.1
Photography	47.9	41.4	43.2	44.9	45.6	47.6	48.1
Electronics	33.4	29.8	25.6	23.2	23.8	26.2	27.2
Brazing Alloy & Solders	20.8	15.2	13.0	12.0	9.9	10.5	10.4
Dental	1.3	1.6	1.3	1.2	1.1	1.1	1.1
Mirrors	2.3	2.5	2.6	2.2	1.9	1.9	1.8
Miscellaneous	6.6	5.3	4.8	4.9	3.6	4.8	4.4
Total	162.0	123.2	119.3	121.1	109.8	119.4	126.2
<i>% Change Year Ago</i>	—	-24.0	-3.2	1.5	-9.3	8.7	5.7
Coinage	22.6	5.8	7.0	8.5	5.8	7.8	8.1
Total Including Coinage	184.6	129.0	126.3	129.6	115.6	127.2	134.3
<i>% Change Year Ago</i>	—	-30.1	-2.1	2.6	-10.8	10.1	5.6
	1986	1987	1988	1989	1990	1991	
Jewelry & Silverware	47.3	53.3	57.3	63.8	68.3	73.1	
Photography	51.1	52.6	57.0	57.1	59.0	60.0	
Electronics	28.5	29.0	31.5	34.8	34.7	34.8	
Brazing Alloys & Solders	10.9	11.0	11.4	13.0	13.3	--	
Dental	1.1	1.1	1.2	1.1	1.0	--	
Mirrors	1.8	1.4	1.5	1.5	1.5	--	
Miscellaneous	4.7	4.0	5.1	5.3	4.9	20.9	
Total	145.4	152.5	164.8	176.6	182.7	188.8	
<i>% Change Year Ago</i>	15.2	4.9	8.1	7.1	3.5	3.3	
Coinage	5.3	11.1	10.2	9.0	NA	NA	
Total Including Coinage	150.7	163.5	175.1	185.5	NA	NA	
<i>% Change Year Ago</i>	12.2	8.6	7.0	6.0	NA	NA	

Notes: Totals may not equal the sums of categories due to rounding. Miscellaneous for 1991 includes brazing alloys and solders, dental, and mirrors.

Sources: *European trade sources, CPM Group*

German Fabrication Demand

Million Troy Ounces

	1979	1980	1981	1982	1983	1984
Jewelry & Silverware	11.8	7.6	6.9	8.7	6.1	5.9
Photography	8.7	7.3	7.8	8.9	9.2	9.2
Electronics	9.6	8.7	7.4	6.7	8.6	9.7
Brazing Alloys & Solders	6.7	5.3	4.5	4.7	3.9	4.0
Dental	0.5	0.7	0.5	0.5	0.4	0.3
Mirrors	0.5	0.5	0.5	0.5	0.5	0.5
Miscellaneous	2.0	1.8	1.8	2.9	1.9	2.6
Total	39.8	31.9	29.3	32.7	30.3	32.2
% Change Year Ago	—	-19.8	-8.2	11.6	-7.3	6.2
Coinage	3.7	—	0.5	0.3	—	—
Total Including Coinage	43.5	31.9	29.8	33.0	30.3	32.2
% Change Year Ago	—	-26.7	-6.6	10.7	-8.2	6.2

	1985	1986	1987	1988	1989	1990	1991
Jewelry & Silverware	6.4	8.5	11.2	12.7	12.7	13.2	15.1
Photography	10.6	10.4	10.5	12.1	12.5	12.9	15.1
Electronics	10.1	10.6	10.9	12.3	13.8	14.3	14.1
Brazing Alloys & Solders	4.2	4.0	4.1	4.2	4.8	5.0	5.1
Dental	0.3	0.4	0.3	0.3	0.3	0.4	0.5
Mirrors	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Miscellaneous	2.5	2.4	1.6	2.4	2.6	2.6	2.7
Total	34.6	36.8	39.1	44.6	47.3	48.9	53.2
% Change Year Ago	7.5	6.3	6.3	14.1	6.1	3.3	8.7
Coinage	—	—	3.2	3.2	3.2	2.4	6.0
Total Including Coinage	34.6	36.8	42.3	47.8	50.5	51.3	59.2
% Change Year Ago	7.5	6.3	15.1	13.0	15.6	1.6	15.4

Notes: Totals may not equal the sums of categories due to rounding.

Sources: *European trade sources, CPM Group*

Italian Fabrication Demand
Million Troy Ounces

	1979	1980	1981	1982	1983	1984	1985
Sterlingware	12.0	4.7	6.4	8.4	5.5	8.2	12.3
Silverplate	0.6	0.7	0.7	0.6	0.5	0.5	0.5
Jewelry	3.9	2.6	2.6	1.6	1.3	1.6	2.0
Photography	4.2	4.0	3.5	3.2	2.6	3.2	3.2
Electronics	8.0	6.4	5.5	4.5	3.2	3.7	3.7
Brazing Alloys & Solders	2.7	2.3	1.5	1.2	1.0	1.0	1.0
Mirrors	0.6	0.6	0.5	0.5	0.3	0.3	0.3
Miscellaneous	1.3	0.5	0.8	0.8	0.6	0.9	0.9
Total	33.3	21.8	21.5	20.8	15.0	19.4	24.0
<i>% Change Year Ago</i>	—	-34.5	-1.4	-3.3	-27.9	29.5	23.4
Coinage	1.6	0.3	0.3	0.4	0.6	0.2	0.5
Total Including Coinage	34.9	22.1	21.8	21.2	15.6	19.6	24.5
<i>% Change Year Ago</i>	—	-36.7	-1.4	-2.8	-26.4	25.6	24.6
	1986	1987	1988	1989	1990	1991	
Sterlingware	18.5	23.2	23.2	28.9	32.2	37.0	
Silverplate	0.4	0.4	0.4	0.4	0.6	0.6	
Jewelry	4.1	5.0	5.4	5.0	5.5	5.5	
Photography	4.2	3.5	1.9	1.6	2.3	2.3	
Electronics	4.2	4.2	4.5	4.5	4.0	4.1	
Brazing Alloys & Solders	1.1	1.1	1.2	1.3	1.6	1.8	
Mirrors	0.3	0.3	0.3	0.3	0.8	0.8	
Miscellaneous	0.9	0.9	1.0	1.1	1.0	1.0	
Total	33.5	38.6	37.9	43.0	47.9	53.0	
<i>% Change Year Ago</i>	39.9	15.2	-2.0	13.7	11.3	10.6	
Coinage	0.2	0.2	0.2	0.2	NA	NA	
Total Including Coinage	33.7	38.8	38.0	43.3	NA	NA	
<i>% Change Year Ago</i>	37.9	15.1	-2.0	13.8	NA	NA	

Notes: Totals may not equal the sums of categories due to rounding. Consumption of silver in semi-fabricated form is excluded.

Sources: *European trade sources, CPM Group*

French Fabrication Demand
Million Troy Ounces

	1979	1980	1981	1982	1983	1984
Jewelry & Silverware	4.7	3.2	3.0	2.8	2.4	2.6
Photography	8.5	7.9	7.7	7.5	7.9	8.1
Electronics	5.6	5.3	4.9	4.1	3.9	3.9
Brazing Alloys & Solders	3.4	2.0	2.0	1.8	1.5	1.8
Dental	*	*	*	*	0.1	0.1
Mirrors	0.4	0.4	0.4	0.4	0.3	0.3
Miscellaneous	1.4	1.0	0.8	0.5	0.4	0.3
Total	24.1	19.8	18.9	17.1	16.5	17.1
<i>% Change Year Ago</i>	—	-17.8	-4.5	-9.5	-3.5	3.7
Coinage	10.6	0.1	0.1	1.4	2.2	3.9
Total Including Coinage	34.7	19.9	19.0	18.5	18.7	21.0
<i>% Change Year Ago</i>	—	-42.7	-4.5	-2.6	1.1	12.3

	1985	1986	1987	1988	1989	1990	1991
Jewelry & Silverware	2.8	2.8	2.3	2.5	2.7	2.8	2.5
Photography	7.6	7.7	8.4	11.2	10.8	10.9	10.9
Electronics	4.4	4.4	4.8	5.5	6.4	6.5	6.3
Brazing Alloys & Solders	1.6	1.6	1.5	1.5	1.6	1.6	1.6
Dental	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Mirrors	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Miscellaneous	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Total	16.9	17.0	17.6	21.3	22.1	22.4	21.9
<i>% Change Year Ago</i>	-0.9	0.4	3.4	20.9	3.9	1.4	-2.2
Coinage	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Total Including Coinage	19.1	19.2	19.8	23.4	24.3	24.6	24.1
<i>% Change Year Ago</i>	-8.9	0.3	3.0	18.5	3.6	1.2	-2.0

Notes: Totals may not equal the sums of categories due to rounding. Asterisks indicate that consumption in individual industries totaled less than 100,000 ounces.

Sources: *European trade sources, CPM Group*

United Kingdom Fabrication Demand

Million Troy Ounces

	1979	1980	1981	1982	1983	1984
Jewelry & Silverware	4.9	2.1	2.3	2.2	1.5	1.4
Photography	10.2	6.7	6.9	6.8	7.7	8.6
Electronics	7.3	6.4	5.4	5.5	5.3	5.9
Brazing Alloys & Solders	3.9	3.0	2.6	2.6	2.0	2.2
Dental	0.3	0.4	0.4	0.4	0.3	0.3
Mirrors	0.5	0.4	0.4	0.4	0.4	0.4
Miscellaneous	0.5	0.5	0.4	0.3	0.3	0.3
Total	27.6	19.5	18.4	18.1	17.7	19.2
% Change Year Ago	—	-29.3	-5.6	-1.6	-2.2	8.3
Coinage	2.0	2.1	2.2	0.9	0.6	0.3
Total Including Coinage	29.6	21.6	20.6	19.1	18.3	19.5
% Change Year Ago	—	-27.0	-4.6	-7.3	-4.2	6.4

	1985	1986	1987	1988	1989	1990	1991
Jewelry & Silverware	1.8	1.7	2.0	2.0	2.2	2.1	1.5
Photography	8.3	8.1	10.4	12.3	13.0	13.4	12.5
Electronics	5.9	5.8	5.5	5.4	5.9	5.6	4.5
Brazing Alloys & Solders	2.1	2.3	2.0	1.9	2.3	2.1	2.0
Dental	0.3	0.4	0.5	0.5	0.5	0.5	0.5
Mirrors	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Miscellaneous	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Total	19.1	19.1	21.1	22.7	24.5	24.4	21.7
% Change Year Ago	-0.5	0.2	10.5	7.7	7.9	-0.5	-11.1
Coinage	0.4	0.8	1.3	1.6	1.6	NA	NA
Total Including Coinage	19.5	19.8	22.4	24.3	26.1	NA	NA
% Change Year Ago	-0.1	1.8	13.1	8.7	7.4	NA	NA

Notes: Totals may not equal the sums of categories due to rounding.

Sources: European trade sources, CPM Group

The Silver Market in India
Troy Ounces

	1987	1988	1989	1990	1991
Mine Production	1,221,727	1,318,179	1,286,028	868,069	900,220
Secondary Supply	14,467,815	13,181,787	4,822,605	0	3,215,070
Imports	4,404,646	8,037,675	20,897,955	42,052,910	33,983,290
<i>Total Supply</i>	<i>20,094,188</i>	<i>22,537,641</i>	<i>27,006,588</i>	<i>42,920,979</i>	<i>38,098,580</i>
Industrial Use	13,824,801	16,701,501	—	—	--
Photography	—	—	4,822,605	5,626,373	5,626,373
Electroplating	—	—	3,215,070	4,822,605	5,626,373
Electrical & Electronics	—	—	3,215,070	4,018,838	4,179,591
Brazing Alloys	—	—	2,411,303	2,411,303	3,215,070
Jari	—	—	1,607,535	3,215,070	4,018,848
Foils	—	—	--	964,521	964,521
Other	—	—	803,768	1,446,782	2,089,796
"Household items"	6,269,387	6,430,140	10,931,238	19,290,420	12,860,280
<i>Total</i>					
<i>Fabrication Demand</i>	<i>20,094,188</i>	<i>22,537,641</i>	<i>27,006,588</i>	<i>41,795,910</i>	<i>38,580,852</i>

Notes: Industrial use includes photography, electroplating, electronics and brazing alloys. "Household items" includes silverware and jewelry. Imports in 1990 and 1991 include silver imports seized by the Indian government and refined in India. The government of India seized 6,365,839 ounces of illegally imported silver during 1991; only the amount refined and sold into the market is included in this table.

Source: CPM Group

Silver Coinage
Million Troy Ounces

	United States	Canada	Austria	France	Germany	Mexico	Other	Transitional Economies	Total
1960	46.0	7.5	-i-	12.2	-i-	-i-	38.2	—	103.9
1961	56.0	5.1	-i-	23.8	-i-	-i-	51.1	—	136.0
1962	78.0	10.9	-i-	13.7	-i-	-i-	25.0	—	127.6
1963	112.0	13.0	-i-	12.2	-i-	-i-	29.2	—	166.4
1964	203.0	13.7	-i-	10.7	-i-	-i-	39.7	—	267.1
1965	320.3	24.4	2.7	7.2	2.7	-i-	27.8	—	385.1
1966	53.6	15.5	3.3	8.7	2.9	-i-	45.5	—	129.5
1967	43.8	8.8	3.2	9.6	3.1	-i-	36.8	—	105.3
1968	36.8	7.4	2.2	2.9	4.2	-i-	35.8	—	89.3
1969	19.6	0.0	1.9	0.7	2.9	-i-	7.6	—	32.7
1970	0.7	0.0	4.0	3.5	7.4	-i-	7.8	—	23.4
1971	2.5	0.2	3.2	0.4	19.2	-i-	2.3	—	27.8
1972	2.3	0.1	5.8	0.3	22.6	-i-	7.0	—	38.1
1973	0.9	6.6	6.3	0.1	7.0	-i-	7.6	—	28.5
1974	1.0	9.0	5.7	3.6	7.6	-i-	4.7	—	31.6
1975	2.7	10.4	9.1	1.8	5.4	-i-	4.0	—	33.4
1976	1.3	8.4	6.9	6.2	1.8	-i-	5.4	—	30.0
1977	0.1	0.5	8.9	7.1	4.6	4.2	9.1	—	34.5
1978	0.0	1.0	9.6	9.0	3.6	6.6	9.7	—	39.5
1979	0.2	0.8	4.0	10.6	3.7	5.0	6.7	—	31.0
1980	0.1	0.2	2.3	0.1	0.0	6.1	6.2	—	15.0
1981	0.2	0.3	3.1	0.1	0.5	0.0	5.3	—	9.5
1982	1.8	0.3	4.5	1.4	0.3	0.0	3.7	—	12.0
1983	2.1	0.4	1.8	2.2	0.0	0.0	3.7	—	10.2
1984	2.0	0.3	2.4	3.9	0.0	2.5	2.6	—	13.7
1985	0.4	0.3	4.6	2.2	0.0	3.5	2.4	—	13.4
1986	10.3	1.3	1.1	2.2	0.0	2.0	9.9	—	26.8
1987	12.2	1.2	3.1	2.2	3.2	2.3	6.2	—	30.4
1988	7.9	1.1	2.0	2.2	3.2	2.0	6.9	—	25.3
1989	6.8	3.3	2.1	2.2	3.2	1.7	7.0	—	26.3
1990	9.1	1.7	0.6	2.3	2.4	1.5	10.9	1.4	29.8
1991	9.0	0.6	0.6	2.2	6.0	1.5	8.6	1.4	29.9

Notes: Excludes transitional economies prior to 1990.
i — included in Other.

Sources: U.S. Bureau of Mines; Energy, Mines, and Resources Canada; The Silver Institute; Handy & Harman; Bank of Mexico; trade sources; CPM Group

Reported and Inferred Silver Holdings

Million Troy Ounces

	Reported Stock Levels				Year-to-Year Changes		
	Gov't.	Market Exchange	Dealer	Total	In Market Stocks	In Inferred Stocks	Total
1970	357.7	135.0	82.2	574.9	NA	NA	NA
1971	311.9	135.7	57.1	504.7	-24.4	-9.6	-34.0
1972	333.6	107.9	51.9	493.4	-33.0	-61.6	-94.6
1973	277.2	108.0	38.4	423.6	-13.4	-114.6	-128.0
1974	319.2	99.5	49.3	468.0	2.4	-53.4	-51.0
1975	250.8	142.0	34.6	427.4	27.8	-31.9	-4.1
1976	257.0	144.3	30.6	431.9	-1.7	-16.1	-17.8
1977	319.0	149.8	35.6	504.4	10.5	-59.6	-49.1
1978	318.8	141.1	29.0	488.9	-15.3	-41.8	-57.1
1979	314.6	146.2	16.1	476.9	-7.8	33.6	25.8
1980	326.5	148.1	17.0	491.6	2.8	204.4	207.2
1981	322.5	128.7	20.7	471.9	-15.7	130.0	114.3
1982	321.5	141.4	20.7	483.6	12.7	69.9	82.6
1983	302.5	196.6	17.7	516.8	52.2	112.3	57.1
1984	286.5	189.2	17.1	492.8	-8.0	95.7	25.8
1985	273.5	227.0	17.1	517.6	37.8	50.4	88.2
1986	259.5	189.2	16.3	465.0	-38.6	47.0	8.4
1987	239.5	193.3	15.0	447.8	2.8	38.4	41.2
1988	231.6	209.4	15.2	456.2	16.3	7.3	23.6
1989	220.6	261.1	14.6	496.3	51.1	-43.3	7.8
1990	209.6	291.9	17.1	518.6	33.3	-70.3	-37.0
1991	198.1	294.3	18.7	511.1	4.0	-50.2	-46.2

Notes: Changes in total stocks represents the change in the supply/demand balance of new metal. Market stocks include reported U.S. dealer inventories and exchange registered stocks. New York Commodity Exchange inventories also include eligible stocks. Changes in inferred stocks is the change in the supply and demand balance of new metal, adjusted for changes in reported inventories. End of year data.

Sources: *U.S. Bureau of the Mint; U.S. Bureau of Mines; New York Commodity Exchange; London Metal Exchange; Chicago Board of Trade; Tokyo Commodity Exchange; CPM Group*

Silver Futures Exchange Activity
 Million Troy Ounces

	Trading Volume				Open Interest			
	Comex	Annual Totals		Total	Comex	Year-end		Total
		CBT	Tocom			CBT	Tocom	
1970	3,468.5	1,813.1	—	5,281.6	230.9	191.2	—	422.1
1971	3,081.2	2,520.5	—	5,601.7	245.5	366.7	—	612.2
1972	4,074.5	3,770.2	—	7,844.7	327.8	544.7	—	872.5
1973	6,189.3	8,153.0	—	14,342.3	428.0	981.6	—	1,409.6
1974	6,829.6	7,314.0	—	14,143.6	658.4	623.5	—	1,281.9
1975	14,511.6	9,763.5	—	24,275.1	1,276.4	864.5	—	2,140.9
1976	18,709.5	10,055.2	—	28,764.7	2,138.7	680.3	—	2,819.0
1977	17,700.2	11,285.3	—	28,985.5	1,404.9	1,409.8	—	2,814.7
1978	19,110.4	13,289.2	—	32,399.6	1,549.0	1,343.9	—	2,892.9
1979	20,403.1	13,602.9	—	34,006.0	636.8	468.7	—	1,105.5
1980	5,293.7	1,705.2	—	6,998.9	166.2	143.1	—	309.3
1981	6,203.6	1,257.3	—	7,460.9	140.0	56.3	—	196.3
1982	14,188.1	1,163.6	—	15,351.7	169.0	34.8	—	203.8
1983	32,619.9	2,750.5	—	35,370.4	301.7	32.4	—	334.1
1984	33,712.5	1,887.3	—	35,599.8	401.5	26.8	—	428.3
1985	24,106.0	1,034.8	591.1	25,731.9	430.7	18.5	17.6	466.8
1986	19,248.4	511.2	227.1	19,986.7	449.1	12.7	12.3	474.1
1987	25,278.3	597.0	473.2	26,348.5	371.2	11.2	24.8	407.2
1988	23,323.3	502.4	740.2	24,565.8	470.0	13.5	47.2	530.7
1989	21,833.1	266.7	420.8	22,520.6	474.2	9.7	80.2	564.1
1990	19,568.5	192.0	486.4	20,246.9	421.7	10.9	49.8	482.3
1991	20,773.5	117.5	1,020.1	21,911.1	488.8	6.1	38.0	532.9

Notes: Trading volume is the total for the year. Open interest is end-December.

Sources: New York Commodity Exchange, Chicago Board of Trade, Tokyo Commodity Exchange

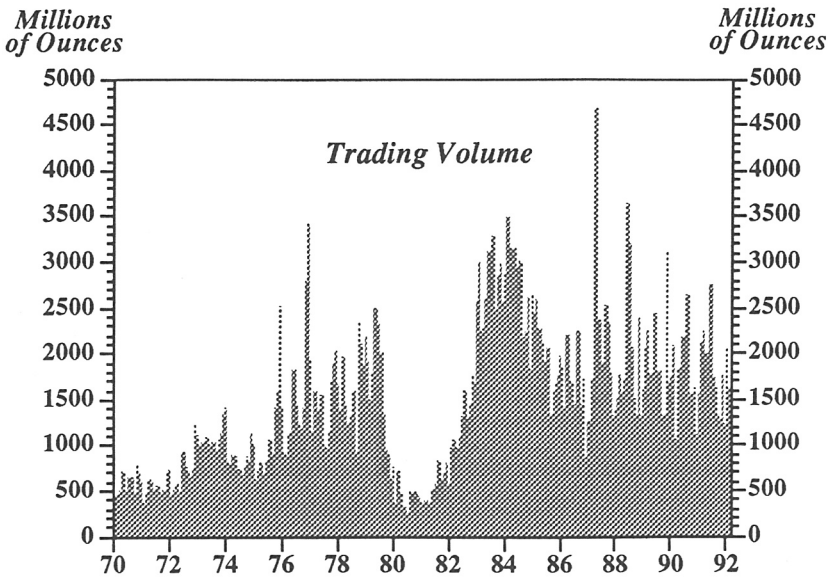
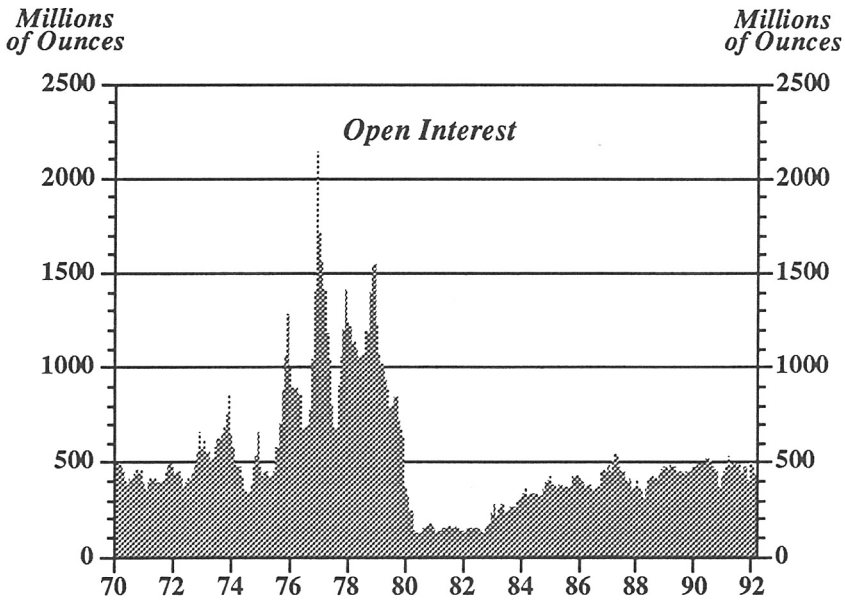
Monthly Average Silver Prices
Comex Spot Settlement Price

	1977	1978	1979	1980	1981	
January	\$4.41	\$4.94	\$6.25	\$38.28	\$14.78	
February	4.54	4.94	7.43	35.28	12.97	
March	4.85	5.28	7.42	23.95	12.35	
April	4.78	5.11	7.49	14.45	11.48	
May	4.69	5.13	8.40	12.69	10.90	
June	4.44	5.31	8.54	15.82	9.96	
July	4.50	5.35	9.18	16.15	8.63	
August	4.45	5.49	9.40	16.00	8.99	
September	4.54	5.57	14.02	20.20	10.05	
October	4.77	5.19	16.85	20.18	9.27	
November	4.83	5.88	16.59	18.61	8.54	
December	4.71	5.93	22.81	16.28	8.47	
Annual	\$4.63	\$5.34	\$11.20	\$20.65	\$10.53	
<i>% Change Year Ago</i>		15.5	109.6	84.4	-49.0	
	1982	1983	1984	1985	1986	
January	\$8.03	\$12.51	\$8.20	\$6.11	\$6.07	
February	8.29	13.83	9.17	6.07	5.86	
March	7.23	10.66	9.69	6.03	5.64	
April	7.28	11.76	9.24	6.46	5.22	
May	6.66	13.02	8.97	6.27	5.11	
June	5.61	11.73	8.73	6.18	5.15	
July	6.20	12.13	7.41	6.11	5.05	
August	7.15	12.14	7.65	6.26	5.21	
September	8.74	11.89	7.28	6.20	5.69	
October	9.51	9.85	7.30	6.20	5.67	
November	9.82	8.88	7.50	6.13	5.57	
December	10.62	9.14	6.65	5.88	5.37	
Annual	\$7.93	\$11.46	\$8.15	\$6.15	\$5.47	
<i>% Change Year Ago</i>	-24.7	44.6	-28.9	-24.6	-11.1	
	1987	1988	1989	1990	1991	1992
January	\$5.54	\$6.73	\$5.98	\$5.24	\$4.03	\$4.13
February	5.49	6.33	5.87	5.27	3.72	4.13
March	5.43	6.43	5.94	5.06	3.96	
April	7.36	6.46	5.78	5.05	3.97	
May	8.44	6.55	5.44	5.08	4.04	
June	7.43	7.03	5.28	4.90	4.39	
July	7.72	7.12	5.23	4.85	4.29	
August	7.81	6.70	5.18	4.97	3.93	
September	7.61	6.35	5.14	4.78	4.04	
October	7.56	6.29	5.14	4.34	4.10	
November	6.71	6.29	5.49	4.16	4.05	
December	6.79	6.13	5.52	4.08	3.91	
Annual	\$6.99	\$6.53	\$5.50	\$4.82	\$4.03	\$4.13
<i>% Change Year Ago</i>	27.8	-6.5	-15.8	-12.4	-16.2	6.7

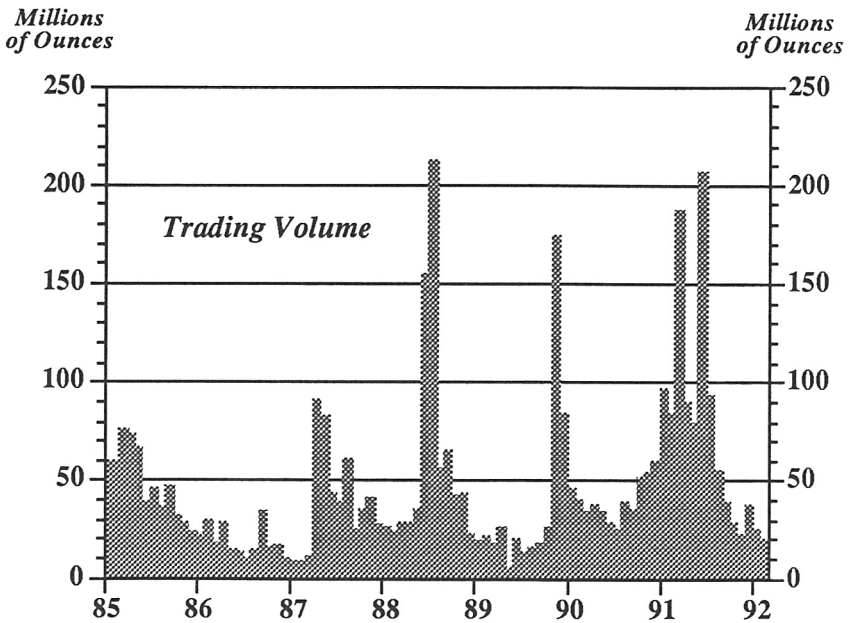
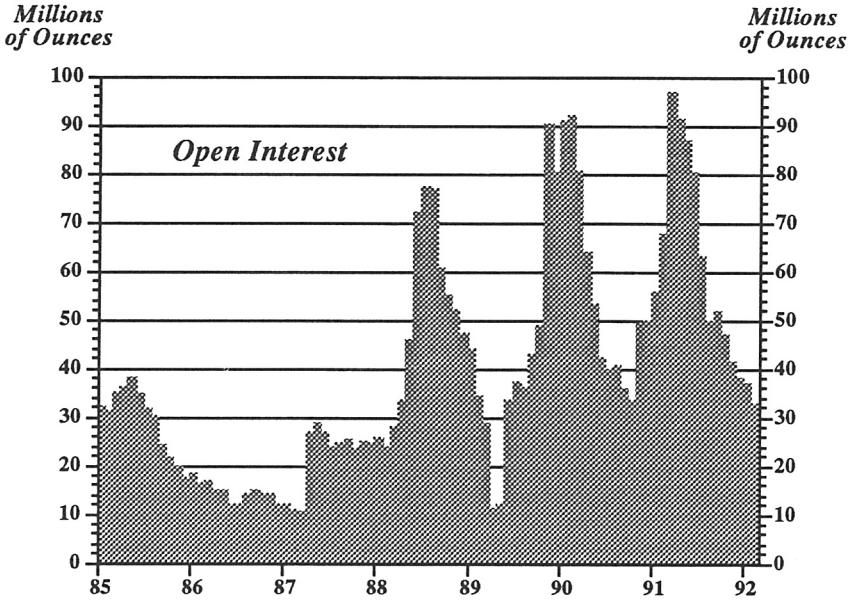
Notes: Percent change for 1992 is percent change through February from same 1991 period.

Source: *New York Commodity Exchange, Metals Week*

New York Commodity Exchange Activity Through February 1992



Tokyo Commodity Exchange Activity Through February 1992



**WORLD MINE PRODUCTION OF SILVER
IN 1991**

**WITH PROJECTIONS FOR
1992
1993
1994
1995**

THE SILVER INSTITUTE

A WORLDWIDE ASSOCIATION OF
MINERS, REFINERS, FABRICATORS AND MANUFACTURERS

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THE SILVER INSTITUTE

WORLD MINE PRODUCTION OF SILVER 1991 - 1995

This report presents the mine production of silver in all of the 58 countries of the world which are mining or expect to mine silver during the 1991 to 1995 period. Countries are separated into Market Economies and Transitional Economies, which are now participating more in the international silver markets.

The Market Economies are divided into three sections: those which produced more than twenty million troy ounces of silver in 1991; those which produced one million to twenty million troy ounces; and those which produced less than one million troy ounces. In all sections, figures for the countries are arranged in the order of size of mine production of silver in 1991. For each country, actual production is given, as well as projected production for each of the years 1992, 1993, 1994 and 1995. Amounts are shown in millions of troy ounces for each country and group of countries, with metric ton (1,000 kilograms) equivalents for each group of countries.

The figures presented here refer to mine production of silver on an "accountable" basis, indicating the amount of silver which is credited to the mining enterprise. This study was made with the participation of over 100 mining entities, who supplied The Silver Institute with their reports and projections.

The projections are the totals of many individual companies' plans for their mine production of silver in each of the four ensuing years. Increases and decreases from these plans in individual mines and countries often balance each other. However, there is the fact that earthquakes, floods, accidents, strikes, or unexpected declines in market prices will cause the actual production to be less than the projections.

The world mine production of silver in 1991 was **7%** less than had been projected one year ago; **12%** less than projected two years ago; and **13%** less than projected three years ago.

An additional analysis shows the production and the percent of world total for each of the ten largest producing countries, indicating the changes in their shares of production over the years 1991 to 1995.

Appreciation is expressed for the extraordinary cooperation of the mining and related enterprises who provided the information and projections used in this report. Their names are listed alphabetically by country following the statistical data.

April 1992

MINE PRODUCTION OF SILVER

On Accountable Basis
In Millions of Troy Ounces

MARKET ECONOMIES

Countries Producing More Than 20 Million Troy Ounces in 1991:	Actual	Projected			
	1991	1992	1993	1994	1995
Mexico	62.7	67.3	70.0	72.5	75.8
United States	61.0	63.0	65.3	63.4	65.3
Peru	56.6	56.6	56.6	56.6	56.6
Canada	39.9	36.7	29.9	30.2	30.5
Australia	37.0	37.3	37.3	38.7	42.0
Chile	21.7	22.7	27.2	30.2	30.2
Subtotal	278.9	283.6	286.3	291.6	300.4
<i>Equivalent Metric Tons</i>	8,675.0	8,821.2	8,905.1	9,070.0	9,343.7
Change from Previous Year	-3%	2%	1%	2%	3%

Countries Producing 1 to 20 Million Troy Ounces in 1991:	Actual	Projected			
	1991	1992	1993	1994	1995
Morocco	11.5	11.5	11.5	11.5	11.5
Bolivia	9.4	14.5	15.0	15.6	16.4
Sweden	8.1	8.2	8.3	7.8	8.0
Spain	6.1	6.6	6.6	6.3	5.8
South Africa	5.5	5.5	5.5	5.5	5.5
Japan	5.5	5.5	5.5	5.5	5.5
Namibia	2.9	2.9	2.9	2.9	2.9
Papua New Guinea	2.6	1.9	1.6	1.1	0.6
Argentina	2.2	2.2	2.2	2.2	2.2
Zaire	1.9	1.9	1.9	1.9	1.9
Greece	1.7	1.7	1.7	1.7	1.7
Indonesia	1.6	1.6	1.3	1.2	1.0
Philippines	1.2	1.8	1.9	1.9	1.9
Honduras	1.2	1.4	1.5	1.5	1.5
Brazil	1.0	1.1	1.1	1.1	1.1
Iran	1.0	1.0	1.0	1.0	1.0
Subtotal	63.4	69.3	69.5	68.7	68.5
<i>Equivalent Metric Tons</i>	1,972.0	2,155.5	2,161.7	2,136.9	2,130.0
Change from Previous Year	-4%	9%	0%	-1%	0%

Countries Producing Less Than 1 Million Troy Ounces in 1991:	Actual	Projected			
	1991	1992	1993	1994	1995
India	.90	.90	.90	.90	.90
Zimbabwe	.70	.70	.70	.70	.70
Dominican Republic	.67	.70	.93	.93	.45
Portugal	.65	.65	.65	.65	.65
France	.62	.62	.62	.62	.62
Turkey	.60	.60	.60	.60	.60
Zambia	.60	.60	.60	.60	.60
Malaysia	.50	.50	.50	.50	.50
South Korea	.47	.51	.66	.66	.66
Thailand	.40	.40	.40	.40	.40
Finland	.38	.33	.33	.33	.33
New Zealand	.35	.55	.60	.62	.70
Colombia	.26	.28	.28	.28	.28
Burma	.23	.23	.23	.23	.23
Ireland	.23	.23	.23	.23	.23
Taiwan	.21	.21	.21	.21	.21
Italy	.20	.20	.20	.20	.20
Norway	.17	.16	.16	.16	.16
Algeria	.10	.10	.10	.10	.10
Saudi Arabia	.09	.09	.09	.09	.09
German Federal Republic	.05	.00	.00	.00	.00
Nicaragua	.04	.04	.04	.04	.04
Denmark (Greenland)	.03	.03	.03	.03	.03
Oman	.03	.03	.03	.03	.03
Ghana	.03	.03	.03	.03	.03
Tunisia	.03	.03	.03	.03	.03
Ecuador	.00	.00	.55	.57	.57
Subtotal	7.64	7.82	8.80	8.84	8.44
<i>Equivalent Metric Tons</i>	237.64	243.23	273.72	274.96	262.52
Change from Previous Year	-10%	2%	13%	0%	-5%
MARKET ECONOMIES					
TOTAL	349.9	360.7	364.6	369.1	377.3
<i>Equivalent Metric Tons</i>	10,884.6	11,219.9	11,340.6	11,481.8	11,736.2
Change from Previous Year	-4%	3%	1%	1%	2%
TRANSITIONAL ECONOMIES (Estimated)					
C.I.S.	44.4	44.4	44.4	44.4	44.4
Poland	25.4	25.4	25.4	25.4	25.4
China People's Republic	5.0	5.0	5.0	5.0	5.0
Yugoslavia	3.5	3.5	3.5	3.5	3.5
North Korea	1.6	1.6	1.6	1.6	1.6
Bulgaria	.7	.7	.7	.7	.7
Czechoslovakia	.6	.6	.6	.6	.6
German Democratic Republic	.4	.4	.4	.4	.4
Romania	.4	.4	.4	.4	.4
TOTAL	82.0	82.0	82.0	82.0	82.0
<i>Equivalent Metric Tons</i>	2,549.9	2,549.9	2,549.9	2,549.9	2,549.9
WORLD TOTAL					
TOTAL	431.9	442.7	446.6	451.1	459.3
<i>Equivalent Metric Tons</i>	13,434.5	13,769.8	13,890.5	14,031.7	14,286.2
Change from Previous Year	-8%	2%	1%	1%	2%

ADDITIONAL ANALYSIS	Actual 1991	Projected			
		1992	1993	1994	1995
Mexico					
Million Troy Ounces	62.7	67.3	70.0	72.5	75.8
<i>Percent of World Total</i>	14.5%	15.2%	15.7%	16.1%	16.5%
United States					
Million Troy Ounces	61.0	63.0	65.3	63.4	65.3
<i>Percent of World Total</i>	14.1%	14.2%	14.6%	14.1%	14.2%
Peru					
Million Troy Ounces	56.6	56.6	56.6	56.6	56.6
<i>Percent of World Total</i>	13.1%	12.8%	12.7%	12.5%	12.3%
C.I.S.					
Million Troy Ounces	44.4	44.4	44.4	44.4	44.4
<i>Percent of World Total</i>	10.3%	10.0%	9.9%	9.8%	9.7%
Canada					
Million Troy Ounces	39.9	36.7	29.9	30.2	30.5
<i>Percent of World Total</i>	9.2%	8.3%	6.7%	6.7%	6.6%
Australia					
Million Troy Ounces	37.0	37.3	37.3	38.7	42.0
<i>Percent of World Total</i>	8.6%	8.4%	8.4%	8.6%	9.1%
Poland					
Million Troy Ounces	25.4	25.4	25.4	25.4	25.4
<i>Percent of World Total</i>	5.9%	5.7%	5.7%	5.6%	5.5%
Chile					
Million Troy Ounces	21.7	22.7	27.2	30.2	30.2
<i>Percent of World Total</i>	5.0%	5.1%	6.1%	6.7%	6.6%
Morocco					
Million Troy Ounces	11.5	11.5	11.5	11.5	11.5
<i>Percent of World Total</i>	2.7%	2.6%	2.6%	2.5%	2.5%
Bolivia					
Million Troy Ounces	9.4	14.5	15.0	15.6	16.4
<i>Percent of World Total</i>	2.2%	3.3%	3.4%	3.5%	3.6%
All 48 Other Countries					
Million Troy Ounces	62.3	63.3	64.0	62.6	61.2
<i>Percent of World Total</i>	14.4%	14.3%	14.3%	13.9%	13.3%

SILVER-BASED PHOTOGRAPHY
Today and Tomorrow

by

Peter Krause

Silver-Based Photography *Today and Tomorrow*

Introduction

Silver salts have been the basic image capture and image forming materials in photography from the introduction of the Daguerreotype process in 1839. Since then, hundreds of other processes have been conceived and developed and the application of silver-based photography extended to every field of activity. The industry involved in the manufacture of these products now uses about one-half of all the silver employed for industrial purposes. In 1991 this amounted to about 195 million troy ounces. And, there are good reasons for projecting continuing growth in the demand for silver-based photographic products. These reasons are delineated in the body of this report which is divided into the following three sections:

1. Photographic products - volumes and silver contents
2. Economic and technical developments in the major photographic sectors
3. Other imaging systems and their expected impact on silver-based photography

1. Photographic Products - Volumes and Silver Content

1.1. Background

Photographic products are made for many different user groups in a wide variety of types, formats and sizes. This multitude of products has been condensed here into two basic types - films and papers. All of these are laminates, consisting of a flexible support and gelatin layers bonded to one or both of its surfaces. **The common feature of films is a transparent support**. Today, this is nearly always a cellulose acetate or polyester plastic film, ranging in thickness from 0.08 to 0.25 mm (0.003 to 0.01 in.).

Papers have mostly a resin coated (RC) paper support; i.e. a paper core covered on both sides with a water impermeable polyethylene layer. The front layer contains white titanium dioxide which imparts the desired high reflectivity. The matted, rear layer provides freedom from curl, as well as water impermeability. A few paper products still have a fiber-paper support, coated with a baryta layer. This is a gelatin layer containing white barium sulfate. The thickness of photographic papers varies from 0.06 to 0.38 mm (0.0025 to 0.015 in.). **The gelatin layers** that are applied to these supports, contain image forming and/or other substances that enhance the photographic, chemical or physical performance of the product. Up to 15 such layers may be coated on the front side and from 1 to 4 layers on the back side. The thickness of these layers generally measures from 1 to 3 microns.

Depending on the field of application, **photographic images can be in black-and-white (b&w) or color**. The image forming substance in b&w photographs are microscopic

aggregates of metallic silver grains, formed by reduction of exposed silver halide crystals during chemical development. Color images consist of dye aggregates, usually formed together with the primary silver images during color development. The silver is removed in subsequent processing steps, leaving pure dye images.

The six market segments are :

(1) Amateur and Professional; (2) X-ray; (3) Graphic Arts; (4) Motion Picture; (5) Micro-reproduction; and (6) Miscellaneous. Each of these sectors is served with products, equipment and processes tailored to its special requirements. These are reviewed in detail in Section 2.

The four major trading regions are:

(1) USA; (2) Europe; (3) Japan; and (4) Rest Of World, or ROW. The manufacture of photographic products is concentrated in the first three regions and is dominated by twelve companies, three of which account for over 60% of total output.

Information about the various products is summarized in six tables which are structured in accordance with the above segmentation of markets and regions. The data in these tables provide the estimated volumes and silver contents of products for 1991 and the projected values for 1996. Also included are two tables which provide a summary of all silver data by region and by product group (Tables 7 and 8). And, the final part of this section deals with the recovery and re-cycling of silver from manufacturing waste, processing solutions, and discarded radiographs and graphic arts films.

1.2 Amateur and Professional Products

The silver-based photographic products normally used by amateur and professional photographers have the same or very similar photographic characteristics, but often differ with regard to format and size. By and large, all of the films are so-called general purpose types designed for making still photographs. The papers are of the continuous tone type which yield a full range of tones in subtle increments.

Amateurs overwhelmingly use 35mm and 110 size (16mm) color negative films and want small color prints. These are made by photo finishers that offer rapid film developing and printing services. Professionals use fewer color negative, and more color reversal and b&w films than amateurs. They also use a greater variety of film formats and need larger prints in b&w and color. Professional laboratories provide most of the special film processing and print-making services.

The statistical data for consumption and silver content of amateur and professional products are summarized in Table 1.

TABLE 1

Amateur & Professional Products

	Millions of Square Meters		Millions of Ounces of Silver	
	1991	1996p	1991	1996p
Color Films				
USA	34.8	42.3	7.8	9.0
Europe	23.5	30.0	5.2	6.4
Japan	16.0	19.5	3.4	3.9
R.O.W.	19.1	24.4	4.3	5.0
Total	93.4	116.2	20.7	24.3
B&W and Instant films				
USA	11.40	12.00	0.90	0.95
Europe	8.10	8.30	0.70	0.71
Japan	2.20	2.30	0.15	0.15
R.O.W.	5.30	5.50	0.42	0.44
Total	27.00	28.10	2.17	2.25
<i>All Films</i>	<i>120.4</i>	<i>144.3</i>	<i>22.9</i>	<i>26.6</i>
	Millions of Square Meters		Millions of Ounces of Silver	
	1991	1996p	1991	1996p
Color Papers				
USA	346.0	450.0	8.9	11.1
Europe	230.0	310.0	5.9	7.6
Japan	138.0	180.0	3.4	4.3
R.O.W.	266.0	346.0	7.2	8.5
Total	980.0	1,286.0	25.4	31.5
B&W Papers				
USA	33.2	30.0	1.4	1.3
Europe	23.6	25.0	1.0	1.1
Japan	6.4	6.0	0.3	0.3
R.O.W.	23.8	25.4	1.0	1.2
Total	87.0	86.4	3.7	3.8
<i>All Papers</i>	<i>1,067.0</i>	<i>1,372.0</i>	<i>29.1</i>	<i>35.3</i>

p - projections

1.3 X-ray films

Traditionally, x-ray products are grouped into three sectors: medical, industrial and dental. The medical sector is by far the largest, accounting for about 92% of product volume and 79% of silver use. Each sector is supplied with a variety of films which can be divided into double-coated (duplitzed) and single-coated types, and into screen- and non-screen varieties. Double-coated films have imaging layers on both sides of the transparent support, single-coated films only on one side.

Double-coated, medical type screen films are exposed while sandwiched between two phosphor screens that emit light when stimulated by absorbed X-rays. This is the typical method for taking chest x-rays. Single-coated screen films are exposed while in intimate contact with one fluorescent screen, as in mammography or other applications where the best possible image detail is needed with minimum radiation dosage. Single coated, non-screen films are used for recording images displayed on CRT screens or generated by scanning laser beams.

Most dental and industrial radiographic films are of the double-coated, non-screen variety. Usually, they contain 3-4 times the silver of medical films, in order to maximize the absorption of high-energy x-radiation. The statistical data for these films are summarized in Table 2 below.

X-Ray Films				
	Millions of Square Meters		Millions of Ounces of Silver	
	1991	1996p	1991	1996p
Medical				
USA	108.0	131.0	17.1	19.7
Europe	68.0	89.0	10.9	13.6
Japan	44.0	60.0	7.6	9.1
R.O.W.	41.5	48.4	8.5	9.9
Total	261.5	328.4	44.1	52.3
Industrial & Dental				
USA	8.8	8.0	5.0	4.3
Europe	6.2	6.5	3.4	3.5
Japan	3.0	3.3	1.5	1.6
R.O.W.	5.0	5.5	2.7	3.0
Total	23.0	23.3	12.6	12.4
All Films	284.5	352.5	56.7	64.7

1.4 Graphic Arts Products

The photographic films and papers made for graphic arts applications have the special performance characteristics required for transforming continuous tone images and text into halftone or line copy which is suitable for reproduction by mechanical printing systems. The film products include camera, scanner, photo-typesetting and contact types. Most of them are supplied on polyester base which ensures good size holding. Camera films are mostly very high contrast "lith" type films. These are exposed through a half-tone screen to produce half-tone images from continuous tone originals; or, without a screen, for copying line drawings and text. Scanner films are used with electronic scanners that are replacing lith-film systems for generating halftone images.

Phototypesetting films are designed for CRT or laser exposure with computer-controlled type- and image-setters. And, high-contrast copy films are employed for copying first generation halftone or line images.

Graphic Arts papers include phototypesetting, diffusion transfer and high-contrast (reprographic) types. All are supplied on RC paper supports. The diffusion transfer products are based on the same principle as Polaroid Instant materials in which a negative image is produced on one sheet and a positive on a receiving sheet that is brought into contact with the negative during development. The two sheets are peeled apart after development. Summary statistics are given in Table 3 below.

TABLE 3				
Graphic Arts Products				
	Millions of Square Meters		Millions of Ounces of Silver	
Films	1991	1996p	1991	1996p
USA	68.5	83.0	8.1	9.3
Europe	67.9	78.5	8.0	9.0
Japan	65.0	78.0	7.8	9.0
R.O.W.	34.2	42.5	4.4	5.0
Total	235.6	282.0	28.3	32.3
Papers	1991	1996p	1991	1996p
USA	58.0	46.0	2.3	1.8
Europe	63.0	53.0	2.4	2.0
Japan	24.0	24.5	0.8	0.8
R.O.W.	32.5	35.5	1.2	1.3
Total	177.5	159.0	6.7	5.9
All Films & Papers	413.1	441.0	35.0	38.2

1.5 Motion Picture Films

Today, most motion pictures are made with color films, b&w films being used only for special applications where very high speed, or other unique performance characteristics are required. Three types of color motion picture films are used in quantity for theatrical motion picture production : (1) camera, (2) intermediate, and (3) print. Camera films are of the color negative type. They are available in different speeds and for exposure under artificial or day light illumination. Intermediate films are used for making color master positives from original camera negatives, as well as for making duplicate color negatives from such master positives. Release prints generally are made on print film from duplicate negatives by contact or optical reduction printing. There is a premium on fine grain and high sharpness in motion picture work, because the film images are magnified several hundred times when projected onto the screen of a motion picture theater.

Reversal type color motion picture films, once used extensively for 16mm and 8mm home movies and for commercial applications, have been replaced to a large extent by video-tape recording. Most professional motion pictures are made with 35mm film, but 16mm and 8mm sizes are preferred for television, educational, scientific and other lower volume applications. Occasional block-buster films are produced with 70mm and 105mm widths films for wide-screen presentations.

Cellulose tri-acetate is the most commonly used support for motion picture films, polyester being reserved for applications that require maximum strength, durability and dimensional stability. The volume and silver statistics for motion picture films are summarized below.

Motion Picture Films				
	Millions of Square Meters		Millions of Ounces of Silver	
	1991	1996p	1991	1996p
Camera & Intermediate				
USA	11.5	12.5	2.8	2.9
Europe	5.3	6.7	1.3	1.6
Japan	1.6	1.3	0.4	0.3
R.O.W.	<u>9.3</u>	<u>11.5</u>	<u>2.3</u>	<u>2.7</u>
Total	27.7	32.0	6.8	7.5
Print				
USA	21.3	24.5	1.3	1.5
Europe	9.9	11.5	0.6	0.7
Japan	2.9	2.5	0.2	0.2
R.O.W.	<u>36.1</u>	<u>45.5</u>	<u>2.2</u>	<u>2.8</u>
Total	70.2	84.0	4.3	5.2
All Types	97.9	116.0	11.1	12.7

1.6 Micro-reproduction Films

The three principal types of microfilm are:

- (1) *Document* - for recording of letters, checks, engineering drawings and other documents. These films account for about 80% of the total microfilm volume.
- (2) *Computer Output Microfilms (COM)* - for recording computer generated numbers and text, and
- (3) *Duplicating and Print films* - for producing same - or different - size copies of document or COM master films.

All are slow speed, polyester base films that produce very fine grain, very-sharp images. The most widely used formats are 35mm and 16mm long length rolls, single 35mm frames mounted in aperture cards, and 4x6 inch microfiche containing from 1 to 96 images.

Document, duplicating and print films are conventional, wet-processing materials, some of which are designed to yield negative or positive images by the use of normal or reversal processing methods. COM films can be of the wet or dry (heat) processing type.

The volume and silver statistics for these films are given in Table 5 below.

Microfilms				
Film Type	Millions of Square Meters		Millions of Ounces of Silver	
	1991	1996p	1991	1996p
Document				
USA	34.3	39.8	1.8	2.0
Europe	21.7	24.1	1.1	1.2
Japan	2.3	2.7	0.1	0.1
R.O.W.	<u>8.3</u>	<u>10.1</u>	<u>0.4</u>	<u>0.5</u>
Total	66.6	76.7	3.4	3.8
COM, Duplicating & Print				
USA	7.6	8.4	0.6	0.6
Europe	4.8	5.2	0.3	0.3
Japan	0.5	0.6	0.1	0.1
R.O.W.	<u>1.8</u>	<u>3.9</u>	<u>0.2</u>	<u>0.4</u>
Total	14.7	18.1	1.2	1.4
All Types Total	81.2	94.8	4.6	5.2

1.7 Miscellaneous Products

This catch-all group includes aerial, display and other kinds of b&w and color films, as well as specialty b&w papers for recording of instrument dials, CRT images, etc. Aerial films are used mainly in long length rolls in 5 or 9.5 inch widths, whereas display films are wanted mainly in 25 to 100 ft. rolls in 10 to 72 inch widths. These are cut into sheet sizes by the user to fit specific display requirements.

As shown in Table 6, aerial and display films account for most of the total product volume in this group.

Miscellaneous Products Worldwide Use				
	Millions of Squared Meters		Millions of Ounces of Silver	
	1991	1996p	1991	1996p
Films				
Aerial	30.0	30.0	5.8	5.8
Display	25.0	34.0	1.5	1.9
All other	7.0	5.0	0.7	0.5
Total	62.0	69.0	8.0	8.2
Papers Total	6.5	4.5	0.4	0.3
All Products	68.5	73.5	8.4	8.5

1.8 Summary of Data by Region and by Product Type

The summary statistics given in Tables 7 and 8 are intended to highlight two important facts, namely:

(1) Two very different results are obtained when determining the amount of silver contained in products actually used by consumers and the amounts used by manufacturers in each of the regions. The difference is especially great in Japan and R.O.W. countries, because Japan manufacturer over twice the photo products that are used domestically, whereas the R.O.W. countries import most products from the other three regions, and

(2) The silver contained in the films and papers actually used by consumers is less than that used by manufactures to produce these products. The difference is due to manufacturing waste which is assumed to average 16%.

It should be noted also that the 1991 values are estimates. These will require some adjustment after publication of final industry statistics. As for the projected 1996 values, these reflect the

anticipated increases in demand for various kinds of photographic films and papers, as well as probable developments in the expanding European market (which will include some of the countries included in the R.O.W. region for 1991). They also reflect the expected improvements in the utilization of silver which will result in reduced silver concentration per unit area of many products.

TABLE 7

Silver Use by Region - 1991

	Amounts in Products Used by Consumers	Amounts Used by Manufacturers
	Millions of Ounces	Millions of Ounces
USA	61.5	65.2
Europe	43.3	59.0
Japan	27.2	59.4
R.O.W.	<u>35.8</u>	<u>11.0</u>
TOTAL	167.8	194.6

TABLE 8

Silver Used for Films and Papers

	By Consumers Millions of Ounces		By Manufacturers* Millions of Ounces	
	1991	1996p	1991	1996p
Films	131.6	150.4	152.6	174.5
Papers	<u>36.2</u>	<u>41.5</u>	<u>42.0</u>	<u>48.1</u>
TOTAL	167.8	191.9	194.6	222.6

* Including 16% waste

1.9 Recovery and Recycling of Silver

Silver is recovered in the photographic industry from:

- manufacturing waste
- processing solutions
- discarded b&w radiographic and graphic arts films

Photographic manufacturers recover essentially all of the silver from the waste generated at the various stages of the production cycle. However, this silver has to be refined and nitrated

before it can be recycled. Since most manufacturers do not perform these two operations, the interval between recovery and recycling is indeterminate. (The 16% waste factor has been included in this analysis of overall recovery and recycling).

The amount of silver recoverable from photographic processing solutions varies from one product and associated chemical process to another. On average, 55% of the silver incorporated in b&w films and papers can be recovered from the processing solutions, the other 45% being utilized for image formation. The theoretical recovery potential with color films and papers is 100%, because all of the incorporated silver can be removed after it has provided the matrix for dye image formation. In practice, however, recovery seldom exceeds 95% and often is considerably lower than that. But, increasingly stringent enforcement of environmental regulations will bring actual recovery closer to its achievable volume in the coming years.

The most widely used silver recovery methods for photographic processing solutions are electrolysis, metal replacement, ion-exchange, and chemical precipitation. These methods are often used in combination, in order to meet local sewer codes. These vary widely. For example, in the USA the permissible silver concentration in effluent discharged into municipal waste treatment facilities ranges from 0.01 to 15.0 mg/liter, but usually is fixed between 0.05 and 5.0 mg/liter. The Federal limit is 5.0 mg/liter.

The third major source for silver recovery is discarded radiographs and graphic arts films. The average recovery rate from x-ray films is assumed to be 10% of yearly consumption, because radiographs must be kept for a minimum of six years and often longer in most countries. Recovery from graphic arts films often could follow within months of use for pre-press copy preparation, but only large printers tend to take advantage of this opportunity. Consequently, only a small portion of the recoverable silver is actually recovered.

The estimated, total amount of silver recovered in 1991 was about 133 million ounces, as delineated in Table 9.

	Millions of Ounces	
	Attainable	Actual
Manufacturing waste	27.2	27.0
Processing solutions	111.3	94.6
Discards	<u>21.6</u>	<u>11.8</u>
Total recovery	160.1	133.4
Required silver		194.6
Recovered silver		<u>133.4</u>
Net requirement		61.2

2. Economic and Technical Developments

2.1 Background

The photographic process has been developed during the past 150 years into a very “user-friendly” system that provides an unmatched combination of high image quality, convenience and low cost. However, the manufacture of silver-based photographic products has become ever more complex, requiring very specialized, capital-intensive equipment and state-of-the-art technology, especially for the making of modern color films and papers. This has led to domination of the industry by three large, multinational companies (Eastman Kodak; Fuji Photo Film, and Agfa-Gevaert) - they account for over 60% of total film and paper output. Six other manufacturers - Konica, DuPont, 3M, International Paper, Polaroid, and Mitsubishi Paper Mills - produce another 30 % of the total , and sixteen small companies the remainder.

The major manufacturing plants are located in the USA, Europe and Japan, with the big players having operations in two or more regions. For example, Kodak has plants in the USA, Canada, Mexico, Brazil, England, France and Australia. Within the last few years, several new factories have been built in the USA, Europe and Japan, as well as in South Korea, Taiwan and China. The Chinese facilities were designed and built with the technical support of Kodak, Fuji and Konica. They are expected to produce films and papers mostly for domestic consumption, but also for export into low quality markets.

Much progress has been made during the past 50 years, and especially the last 15, in understanding the fundamentals of image formation by the silver halide system. This has pointed the way towards optimization of the response of silver halide micro-crystals to light, and of the production of photographic emulsions (suspensions of silver-halide crystals in gelatin) which are the image capture and image forming component of films and papers. At the same time, major advances were made in the synthesis of new dyes for spectral sensitization and color image formation and of auxiliary emulsion components that enhance image quality and other performance characteristics. The net result of this new mastery over emulsion design and making, combined with better coating technology, has been a reduction in silver content of imaging layers by 50-60%. Other important advances in technology have resulted in reductions in wet processing times for all types of films and papers by a factor of ten or more. The one-hour minilab system is one example of these advances.

The impact of these and other expected developments on the major product groups are examined in the following portions of this section.

2.2 Amateur and Professional Sector

The dominant products in amateur photography are color negative films and color paper, as noted. For example, color negative films were used for about 95% of the estimated 16.5 billion camera exposures made by amateurs in the USA during 1991. And nearly 98% of the

22 billion amateur prints were made with color paper. Further growth in the use of these products is projected for the following reasons:

- the preference of most people for color reflection prints
- the excellent image quality and yields obtained with today's films
- the simple, nearly foolproof operation of automatic 35mm cameras equipped with electronic flash
- the low price of cameras, film and prints
- the quick and convenient photofinishing service available through thousands of shops, minilabs and mail-order finishers.

Another recent stimulus to the use of color negative films has been the introduction of single-use cameras which are factory-loaded with a roll of 35mm color negative film. About 36 million of such cameras were sold in Japan in 1991 and about 16 million in the USA.

Professional photographers use a much greater variety of films and papers than amateurs, because they must provide a wide range of imaging services. In the USA, for instance, about 25% of the camera exposure made by professionals in 1991 were with a variety of color negative films, 45% with different types of color reversal film and about 30% with various b&w films. The extensive use of color reversal films is explained by the superior image quality obtained with such materials, which makes for superior color reproduction in publications that feature color illustrations. Color slides are also the preferred visuals for business presentations and the like. Consequently, continuing, slow growth in demand for color reversal films is foreseen.

The call for b&w photographs is also expected to remain near the present level. B&W prints also are and will be in much greater demand in the professional than in the amateur sector. In the USA about 34% of the 1991 professional print volume was in b&w. A slow decline in this percentage is anticipated for the coming years.

The use of **Instant materials** has been on a downward path in the amateur sector, but has been increasing in the medical and a few professional segments. Among the major applications are ID pictures and recordings of CRT and other displays when immediate hard-copy images are needed. The anticipated net effect of the diverse trends in this imaging segment is a very modest increase in volume during the next five years.

The **silver requirements for amateur and professional films** are expected to increase by about 16% during the next five years from 22.9 to 26.6 million ounces. This is less than the projected increase in product volume, because further reductions in the coating weight of most films are in the offing.

The silver requirements for papers will be determined principally by the demand for color paper. This has been by far the highest volume photo product during the past 10 years and

has had the highest growth rate. However, this rate is expected to moderate during the period 1991-1996 and limit the aggregate increase in volume to about 31% and that of silver to 24%; i.e. from 25.4 to 31.5 million ounces. The difference between volume and silver increases will be due again to improvements in silver utilization.

2.3 X-ray Film Sector

The advances in photographic science and technology outlined at the start of this section have also brought many important improvements in the performance of films used in the medical x-ray sector. One of these resulted from the discovery and development of rare-earth phosphors whose light output is appreciably greater and covers a wider spectral range than that of the traditional blue light emitting calcium tungstate phosphor. This opened the way for gaining additional film speed by means of dye sensitization of the silver halide crystals to green light and ultra-violet radiation. Still further speed increases were achieved by the application of Kodak's new T-grain (tabular grain) emulsion technology. The cumulative effect of these innovations was a reduction in coating weight of screen-type x-ray films from about 10 grams to 5 grams per square meter.

Other major advances in diagnostic imaging have come through the development of electronic systems that transform energy transmitted, reflected or emitted by the patient's body into signals that can be displayed as images on a CRT screen. These screen images, in turn, are photographed with special single coated films. The best known of these new systems are Computed Tomography (popularly known as CAT scans); Ultrasonography (ultrasound); Nuclear Magnetic Resonance (NMR); Nuclear Medicine; and, Digital Subtraction Radiography. The most recent innovation is laser imagers. These utilize one of several known image capture methods, but generate enhanced radiographs by exposure of special heat or wet processable films with computer controlled laser beams.

Electronic systems have been used with increasing frequency in the USA, Japan and other affluent societies and accounted for about 20% of the total USA film volume in 1991. Some reduction in the use of duplitized screen films has been noted in these countries. However, the total film volume has continued to increase by about 4% per year and is expected to maintain that growth rate for the following reasons:

- the world population will continue to expand
- the population of most developed countries is aging and the elderly require more and more frequent radiographic examination
- the use of the new diagnostic methods will spread, resulting in an overall increase in the number of images that will have to be recorded for legal and other reasons. The silver-based system will continue to be the preferred image recordingsystem, because of its proven quality, reliability and relatively low cost
- alternative imaging systems require very expensive equipment. (See section 3 for more details.)

All of which provides the basis for projecting a 25% increase in film demand over the next five years which will entail an 18.5% increase in silver use from about 44 to 52 million ounces.

Industrial x-ray films are employed mainly for non-destructive analysis of metal objects, such as steel plates, turbine blades, pipe welds and aluminum castings. These films are mostly of the duplitized type with very high silver content, because they are exposed by poorly absorbed x-rays or gamma rays. Most dental x-ray films are of the same silver-rich kind, but lower coating weight film is used for panoramic dental images.

The demand for industrial x-ray film has been variable, owing to the wide swings in activity in the user industries. And, projections for the near future are beset by uncertainty about the demand for products that require x-ray inspection. The use of dental x-ray films, on the other hand, is expected to increase at a fairly steady rate. The likely net result will be a rather steady silver requirement of about 12.5 million troy ounces for these two types of products.

2.3 Graphic Arts Sector

The reproduction of continuous tone images in the graphic arts industry usually involves transformation into so-called halftone images, as noted. These consist of opaque dots of varying size that are too small to be seen without 8 to 10x magnification. Until the 1970s most halftone images were produced with high-contrast lith films in combination with contact halftone screens. Today, electronic scanners are employed increasingly with special scanner type films for much of this work, especially in color printing. However, lith films still accounted for nearly 50% of all graphic arts films used in the USA during 1991. Scanner films accounted for about 15%, contact films for 30% and phototypesetting films for 5%. The consumption patterns in Europe and Japan are similar.

The outlook for graphic arts film usage is good for the following reasons:

- a continuing, steady increase in the worldwide demand for printed matter
- a continuing shift from b&w to color reproductions which requires four times the number of film images. This will more than offset the gains in efficiency of copy preparation.

This is expected to translate into a volume increase of 4% per annum. The related silver requirements will increase more slowly from 28.3 million ounces in 1991 to 32.3 million troy ounces in 1996.

The papers used in the graphic arts industry are designed to produce only pure black and white tones, such as black letters, numbers or lines on a white background, or vice-versa. The use of these papers increased dramatically during the 1950-85 period for two main reasons. Firstly, the proliferation of phototypesetting systems which generate print-outs on special phototypesetting paper. And secondly, the expansion of reprographic operations that involve

use of diffusion transfer type materials. However, the demand for phototypesetting papers has started to decline and is expected to decrease at an accelerating rate during the coming years, as image composition systems replace dedicated phototypesetters and the related, more wasteful copy preparation methods. Diffusion transfer materials will also be affected by the introduction of new copy preparation techniques. The consequent reduction in use of silver will be more than offset by the increases in film volume, especially since films have much higher coating weights than papers.

2.4 Motion Picture Sector

The motion picture industry has been doing well and photographic film has remained the preferred imaging material for motion picture production. This is contrary to initial predictions that television would bring the demise of motion picture theaters and subsequent predictions that magnetic tape would replace silver halide type camera films for image capture. The fact is that just about all feature films for exhibition in motion picture theaters, as well as most prime-time video programs are still produced with color film. The principal reason has been and is image quality. The standard image of a 35mm motion picture color negative film (which has one-half the length of a still film frame) is made up of about 6.6 million pixels (picture elements). This is about 15x more than obtainable with the best current high-definition television (HDTV) system, and 4x more than the digital HDTV system under development. Furthermore, film systems are being introduced that include key-coding of the images during camera exposure, scanning of the coded images after processing and combining all the components of the final image (master-, special effects- and title images) with the aid of a digital workstation. The final output for this composite image may be a master print film exposed by laser light from which multiple copies are made for screening in theaters. Or, it may be a video tape or disc recording. In any event, photographic film will be the image capture medium and the output medium for large theater projection.

Another favorable development for the USA motion picture industry has been the 50% increase in the number of theatre screens during the last ten years. This has been accompanied by increased ticket sales, in spite of the popularity of video tape copies for home TV watching. Indeed, the biggest demand has been for copies of the biggest box-office hits. And, this situation is not expected to change with the introduction of HDTV.

In any event, silver halide films will be used in quantity for the next five years with an expected increase in volume of 3.5% per year and an increase in silver use from 11.1 to 12.7 million ounces.

2.5. Microfilm Sector

The microfilming industry has also fared much better than predicted about 15 years ago when magnetic and optical recording methods seemed poised to replace the photographic process. One reason was the lack of true operational readiness of these new systems, another the rapid

automation of all phases of microfilming which greatly facilitated and accelerated the taking, indexing, retrieval, and duplication of the microfilm images. Moreover, microfilm images can now be converted into digital form with scanners and then manipulated, transmitted and reproduced by the same means used for original digital data. These system features together with the qualities enumerated below, will ensure continued use of the microfilming method for data storage and reproduction:

- very high resolving power and fine grain which make it possible to record images of excellent quality at up to 96x reduction
- excellent retention of detail in images of continuous tone copy and text
- unexcelled image permanence, with a life expectancy of over 500 years under proper storage conditions
- simple and reliable equipment for image recording, reading and reproduction
- eye readable information
- lowest production and distribution costs for multiple copies

In 1991 about 70% of all micro-reproduction images were made with microfilm and 30% with magnetic media or optical disc systems. The prospects for the next five years are for a 17% increase in microfilm volume and a 11% increase in silver use from 4.7 to 5.2 million ounces. The digital recording systems will grow at a higher rate, because they can provide immediate access to a large amount of data, a feature that is gaining importance in many large operations.

2.6 Miscellaneous Products

Aerial films are the largest and most important products in this group. Their application ranges from mapping to surveys of natural and man-made terrestrial features with photographs taken from airplanes, rockets and satellites. Aerial films are also the principal medium of military organizations for reconnaissance, surveillance and damage assessment. Since this use varies greatly in peace and war times, it is the main variable in forecasts of future requirements.

Most aerial photography is done with b&w films, but color films are used for several special purposes, such as inventorying of healthy and diseased vegetation, crop assessments and studies of water pollution. One important feature of b&w aerial films is the capacity to provide substantially different contrast levels through adjustment in developing time. This is needed, because the effective tonal range of the terrain being photographed can vary greatly, depending on terrain features, atmospheric conditions, flight altitude and sun angle. Other important film characteristics are extended red-sensitivity to permit use of yellow haze-cutting filters without excessive speed loss and high dimensional stability. Good size holding is important, since the accuracy of maps derived from aerial photographs depends on maintaining the same orientation and distances between image points that exist between corresponding object points on the ground.

Display films are the second important products in this group. They have become very popular, because large, good quality color transparencies and color prints make superior advertising displays. These films are mostly color print materials that can be processed in the same processing solutions. The processing machines for such images accept up to 72 inch wide sheets of any desired length. The prospects for these films are good with an estimated volume increase of 36% during the next five years.

The forecast for the entire product group is less favorable; i.e. a volume increase of only 11.5% during the 1991-1996 period and a minimal increase in silver use from 8.4 to 8.5 million ounces.

3. Other Imaging Systems and Their Expected Impact on Silver-based Photography

Although silver-based photography has kept a dominant position in its traditional fields of application, several other imaging systems have come into prominence in other areas during the past forty years. And, some of them are projected to replace conventional picture taking and print making partly within the next 10 years, and altogether in the more distant future. The vexing questions are: which system, to what extent and when?

The most talked about of the alternate systems and the one posing the main threat to conventional camera/film use, is the electronic system. Two image capture devices are used in this system - image tubes and solid state arrays. Both types require a separate medium for recording the temporary image pattern, unlike silver halide materials which capture and record images with the same piece of film or paper. However, electronic images do not need chemical processing and can be displayed instantly on a monitor or transmitted via telephone lines or satellite to remote locations. They can also be enhanced and otherwise changed after recording and combined with other images. The present shortcomings of the electronic system are examined in greater detail in the review of its application to amateur and professional still photography.

The other important non-silver processes are electrophotography, thermal dye transfer and ink-jet. These are used mainly for printing and are especially useful for hard-copy output of digital information in monochrome or full color, but, by and large, they do not yield the image quality obtainable with silver halide papers and/or the output rate of optical printers.

Imaging with an electrophotographic system usually involves three steps: (1) the generation of a temporary charge pattern on the surface of a re-usable photoconductor, (2) development of this image by application of toner particles that adhere to the charged areas, and (3) transfer and fusing of the toner on a receiving sheet. The principal disadvantages of electrophotographic printers are their complexity and the moisture sensitivity of the charge generation and transfer steps.

The thermal dye transfer method utilizes a donor sheet or ribbon, coated with a layer containing dispersed solid ink. This donor material is brought into contact with an array of tiny elements which are heated to yield a temperature pattern that corresponds with the optical density pattern of the image. This effects differential melting of the ink followed by its transfer to a receiving sheet. Color prints can be produced by successive transfer of the usual yellow, magenta, cyan and black component images.

Ink jet printing involves one of two methods - continuous or drop-on-demand. In the continuous method, a steady stream of ink droplets is propelled against a receiving sheet, but unwanted droplets are deflected into a gutter for re-circulation. In the drop-on-demand method, the droplets are forced by pressure through a nozzle toward the receiving sheet. The necessary pressure impulses can be generated either by vibration of a piezo-electric crystal or by heating which effects evaporation and the formation of a so-called bubble jet. Each method requires special ink formulations, but all tend to yield a limited tonal range and poor resolution on ordinary paper. Other disadvantages are the susceptibility to clogging of the fine nozzle apertures and the propensity of most of the inks to fade fairly rapidly. However, very good image quality is being achieved with relatively high-viscosity inks, printed onto special, coated paper.

3.1 Amateur and Professional Sector

The main potential competitor of amateur and professional still photography is the still video system, as noted. Nearly all manufacturers of cameras and many major film manufacturers are developing such a system, but today only three "amateur" type cameras are sold in the USA - the Sony Mavica, the Canon XAP Shot and the Dycam Model 1. Other "low price" models are being offered by several manufacturers in Japan, but the acceptance of all of these cameras has been poor. For example, in the USA only about 3,000 still video cameras were sold during 1990, compared with over 11 million conventional cameras. The main reasons for this lack of success have been poor image quality and high price. Here is an example: the Canon XAP Shot camera, which sells for about \$500, is equipped with a 200,000 pixel CCD sensor and has an effective exposure index of ISO 100. But, an automatic, 35mm point-and-shoot camera, which sells for about \$100, and normally is used with ISO 200 color negative film, provides about 18 million pixels per frame. In fact, even a 10 dollar single-use camera which is loaded with ISO 200 or ISO 400 color negative film yields much better image quality than the XAP Shot.

It is generally accepted that the minimum number of pixels for producing color prints of reasonable quality is one million. This has been achieved and demonstrated with professional camera systems. However, the higher data handling and storage requirements of such cameras result in a sizeable increase in system complexity and cost. Therefore, hybrid systems, such as the new Kodak PhotoCD system, are much more likely than pure electronic still cameras to make their mark in the amateur sector in the immediate future. These hybrids will use color film for image capture and electronic means for image manipulation and display on TV sets.

As indicated above, much higher priced electronic camera systems are available and are being used; e.g. for several professional, industrial and military purposes. One of these is press photography where quick access and transmission of images are very valuable, while image quality is of secondary importance, due to the low resolution of newspaper reproductions.

One camera system recently introduced for this application is the Kodak Digital Camera System. It utilizes the body and lenses of a conventional 35mm Nikon F3 camera in combination with two interchangeable camera backs, each containing a 1.3 million pixel CCD imager. One of these backs is for b&w and the other for full color images. A separate digital storage unit can store up to 158 uncompressed or 400 to 600 compressed images. These images can be transmitted with a modem to any computer fitted with the appropriate formats. The nominal exposure speed is ISO 400 for the color system and 800 for the b&w system. The price of the equipment is about \$20,000.

Another viable application is electronic previewing and/or proofing. The former combines a conventional camera/film system with a color video camera and monitor which allows the photographer and client to preview the portrait or other picture about to be taken. A thermal dye transfer or other digital printer can be tied into the system to provide immediate proof prints.

Many other hybrid systems have been developed and are being used with increasing frequency. Nearly all of them use silver halide film for image capture and digitize the film image before reproducing it on photographic paper or with an electronic print system.

In summary, silver halide photography will continue to be the main imaging system in the amateur and professional sector for the next five years, but hybrid and pure electronic systems will have a growing share of an expanding market.

3.2 X-ray Sector

There are two image recording methods that have the potential for replacing the traditional silver based process, at least partly. One is based on magnetic tape or disc recording and the other on optical disc recording. However, neither has been used extensively so far. The main reasons have been the high cost of equipment, the lack of component compatibility and, often also, lower image quality than that achieved routinely with silver halide films.

Additional factors have been the large investment in traditional equipment and the opposition to change. Also, the realization that hundreds of optical discs would be required to store the radiographic images generated in one large hospital during one year. This would entail complex and very costly networking, if all of the images had to be accessible to many users.

These facts, supplemented by those cited below, have led to the conclusion that silver halide imaging will maintain its dominant position in the medical x-ray sector for the time being:

- Radiologists prefer viewing film images, because they find the viewing of CRT screen images much more stressful.
- Diagnosis often requires the synthesis of information derived with different systems and this is accomplished most effectively by comparing photographic films placed side-by-side on a large illuminator.
- Photographic film systems provide a superior combination of high information capacity, image quality, ease of interpretation, and relatively low cost.

3.3 Graphic Arts Sector

In the graphic arts much has been done to reduce or even eliminate operations and materials involved in traditional copy preparation and make-ready steps that preceded transfer of the final layout onto a printing plate. One very successful innovation has been the replacement of camera halftone preparation with electronic scanners. Another has been the replacement of phototypesetters with image setters that can create complete layouts of text and images and store them on magnetic or optical discs for subsequent transfer onto photographic film. This has eliminated the former manual paste up of text and image components and the subsequent copying of the assembly. Two other applications of scanners and associated equipment are the direct engraving of gravure printing cylinders and the direct exposure of printing plates with laser beams.

3.4 Motion Picture Sector

In this sector, video tape recording is the main alternative system to silver halide color films. Video tape has been used extensively and for many years in broadcast television and for producing video tape cassettes for home entertainment. It has also been used in some phases of theatrical motion picture production and occasionally for original camera recording. However, the quality of motion picture film images has been considerably superior to that achievable with magnetic tape systems. This difference is expected to diminish when high definition television is introduced and digital tape recording is improved to match the higher quality of that system. However, additional improvements in photographic emulsions probably will offset these gains and leave the relative quality levels unchanged.

One other aspect of theatrical motion picture film production is worth noting. The final product is release prints that are projected onto big screens for large audiences. It is unlikely that electronic image display systems will be able to match the quality or cost of film images or the convenience and reliability of the optical projection system for the next ten years.

3.5 Micro-reproduction Sector

The two alternate systems available and used for micro-image recording are the same as those applied in other sectors of the industry; namely, magnetic tapes or discs and optical discs. Both systems, as noted, are digital and benefit as well as suffer from that feature. One

advantage is immediate access to the information, another instant transmittability. However, magnetic recordings have lower information capacity and resolving power than silver films. They also have a much shorter life expectancy.

Optical disc systems, on the other hand, do have very high storage capacity and provide easy, random access to the recorded data. But, they often lack components needed for specific applications. Optical disc records also are thought to have a rather short life expectancy, but the proper evaluation of that property is just getting under way.

Much more serious, however, are the rapid obsolescence of magnetic and optical recording and play-back equipment and the lack of worldwide standards which would assure equipment compatibility. These deficiencies will have to be corrected before the two digital media gain full acceptance, especially where image permanence is an important requirement.

3.6 Miscellaneous Product Sector

The principal alternate systems for aerial and especially for satellite photography utilize electro-optical cameras equipped with image tubes or CCD arrays. Some of the advantages of these camera systems over the silver halide film/conventional camera system are:

- the immediate accessibility of the information at the point of image capture or at remote locations via transmission of the digital signals
- the ability to easily modify the signals to achieve improved tone reproduction and sharpness
- the freedom from wet processing, although this is offset to some extent by the need for electricity and an ample supply of magnetic tapes or discs.

The advantages of the silver halide system generally are considered to be:

- better inherent resolving power,
- the ease with which a very wide area can be imaged sharply on a single frame (CCD arrays and image tubes are much more limited with respect to image size and ground coverage)
- the large amount of information contained in a roll of thin-base film.
- the long life expectancy of photographic films

Alternate display materials are based on ink jet and electrophotographic systems. The strengths and weaknesses of these systems have been delineated.

INDIA: *SILVER 1991*

by

Timothy S. Green

India: Silver 1991

Introduction

This report covers the silver trade in India in 1991, rather than the whole Indian sub-continent. For the neighboring countries of Pakistan, Bangladesh, Sri Lanka and Nepal, current demand for new supplies of silver (as opposed to internal recycling) is limited by comparison with India; no more than 3-4 million ounces of silver from the world market was absorbed in 1991 in these other countries, while India itself absorbed around 43 million ounces of new supplies.

The Silver Market in India 1991

The Indian silver price rose by 13% in rupee terms in 1991, reflecting both a strong demand and the devaluation of the rupee. The total consumption is estimated at 55 million ounces, 8% down on 60 million ounces in 1990. However, more of this demand was met by internal recycling and dishoarding, due to the higher prices, so that inflow of "new" silver from world markets was considerably reduced and amounted to around 43 million ounces, 28% down from 60 million ounces in 1990.

The Indian price remained at a substantial premium over the international price throughout the year. This is because legal imports of silver are extremely limited and most silver is smuggled in. The opening prices in January averaged 219 rupees per ounce (equivalent to \$9.80 per ounce at the unofficial exchange rate) and reached 247 rupees (\$7.10 per ounce) in December. The reduction in the premium over the international price, reflected by the rupee devaluation, led to considerable decline in monthly imports from June as the profit margin fell. Had it not been for this devaluation, imports in 1991 would almost certainly have equaled or exceeded the record level of 1990.

Supply of silver

(a) Domestic

- Domestic silver production sold via Hindustan Zinc Ltd. was 0.9 million ounces.
- Additionally, 1.35 million ounces of silver confiscated by the authorities was sold through Hindustan Zinc.
- Internal recycling of silver from ornaments and utensils was 6.43 million ounces while an additional 3.2 million ounces came from dishoarding of silver bars sold to take advantage of higher prices.

- Total domestic supply: 11.88 million ounces

(b) Imports

- Official imports of silver via State Bank of India amounted to 1.24 million ounces.
- Unofficial imports of silver, both in bar form and in grain, are estimated at 42 million ounces (note this figure is subject to adjustment when Dubai and Hong Kong final year-end figures available).

This gives 55.1 million ounces total supply, rounded as 55 million ounces. What happened to it?

Official seizure

The authorities confiscated 6.4 million ounces of silver from smugglers in 1991, slightly down from 6.9 million ounces the previous year. The high volume of seizures confirms that the unofficial import of silver continued for much of the year. Indeed, the rise in official confiscations since 1988 is clear evidence of the increased volume of smuggling (see Table 4). The seizures rose over five-fold between 1988 and 1989 coinciding with an increase of over 300% in smuggled imports. Seizures doubled 1989-1990, as imports doubled and then fell in 1991, although less than imports. The authorities have been more effective in making some large hauls.

Industrial Applications

The rising trend of industrial demand in India, which had already doubled in the 1980s, continued in 1991, despite the country's economic difficulties to reach 21.7 million ounces. The main applications were:

	1990 Million Ounces	1991 Million Ounces
Photographic	5.6	5.6
Plating	4.8	5.6
Electronics	4.0	4.2
Brazing alloys	2.4	3.2
Foil	1.0	1.0
Other uses in chemicals pastes, tobacco	1.4	2.1
Total	19.2	21.7

The most noticeable increase is in plating which is used in a wide range of ornaments, from watches to picture frames.

There is also a significant increase in other uses, including an estimated 160,000 ounces now used by the tobacco industry which puts minute pieces of silver foil in cigarettes.

Decorative Applications

Decorative use of silver consumed an estimated 20.0 million ounces in 1991, compared to 26.2 million ounces in 1990. The decline is due to the higher prices, which curtailed orders for heavier items of silverware and jewelry. But the use of jari, or silver thread for saris, continued to increase. The main applications:

	1990 Million Ounces	1991 Million Ounces
Jewelry/ornaments	13.0	8.5
Silverware	10.0	7.5
Jari (silver thread)	<u>3.2</u>	<u>4.0</u>
Total	26.2	20.0

Coins / Medals / Commemorative Gifts / Investment Items

Small bars or medals of 10, 25 and 50 grams have become very significant in recent years. It is quite common to be given a silver medal as a gift, even at a lunch or dinner party. At weddings, several hundred guests may each be given a 25 gram medal to mark the occasion. We know of one family which gave out 5,000 ounces of silver gifts to celebrate a marriage early in 1991.

In the previous report these items were included under decorative use, but it seems more correct to assign them to their non-coin or investment category, not least because these items would be the first sold back should dishoarding occur.

	1990 Million Ounces	1991 Million Ounces
Coins / medals / investment	9.4	6.9

The decline is due to higher prices and the general economic difficulties.

Summary of Demand 1991

	1990 Million Ounces	1991 Million Ounces
Industrial	19.2	21.7
Decorative	26.2	20.0
Coin Investment	9.4	6.9
Total:	54.8	48.6
<i>Plus:</i> Official seizures going to government stocks	6.9	6.4
Total:	61.7	55.0

Outlook for 1992

Although India has recovered from its severe economic crisis in mid-1991, the inflation rate remains high and the rupee has seen further devaluation already in 1992. The budget in late February has sought to stabilize the rupee and some exchange controls have been deregulated. In particular, Indians abroad remitting funds home can now sell them firstly into the local money market as opposed to the authorities. Additionally, the stock market is strong following other industrial deregulation. This may take more investment funds, especially in the cities. Much will depend, therefore, on continuing purchases of silver by farmers in rural areas: but they face higher costs.

Consequently although the Indian price remains at a premium to world prices and import of silver will be required even to meet the basic industrial demand, the quantity may be more moderate than in the two previous years. Imports may reach only 25-35 million ounces, half what they were two years ago.

Table 1

Indian Silver Production

Year	Ounces
1970	not available
1971	not available
1972	not available
1973	137,000
1974	147,000
1975	84,000
1976	102,000
1977	104,000
1978	390,000
1979	370,000
1980	366,000
1981	556,000
1982	463,000
1983	508,000
1984	509,000
1985	816,000
1986	1,134,000
1987	1,220,000
1988	1,317,000
1989	1,141,000
1990	1,125,000
1991	900,000

By-product of zinc and copper produced by Hindustan Zinc Ltd. and Indian Copper Ltd.

Source: *Indian Bureau of Mines*

Table 2

Indian Silver Prices

Year	Bombay (Rs/KG)	New York (\$/oz)	New York* (Rs/Kg)	Premium / Discount Bombay vs. New York
1965	315	1.29	248.87	+ 66
1966	359	1.29	373.31	- 14
1967	430	1.55	448.55	- 19
1968	557	2.14	619.29	- 62
1969	489	1.79	518.01	- 29
1970	536	1.77	540.67	- 5
1971	561	1.55	473.47	+ 88
1972	554	1.68	513.18	+ 41
1973	796	2.56	781.99	+ 14
1974	1,122	4.71	1,438.75	- 317
1975	1,169	4.42	1,350.16	- 181
1976	1,249	4.35	1,328.78	- 80
1977	1,291	4.62	1,411.25	- 120
1978	1,391	5.40	1,649.52	- 259
1979	2,298	11.09	3,387.62	- 1,090
1980	2,700	20.63	6,965.11	- 4,265
1981	2,642	10.52	3,551.77	- 910
1982	2,737	7.95	2,811.90	- 75
1983	3,424	11.44	4,325.86	- 902
1984	3,514	8.13	3,811.43	- 297
1985	3,880	6.14	3,233.86	+ 646
1986	4,106	5.47	2,685.75	+ 1,420
1987	5,166	7.01	3,601.92	+ 1,564
1988	6,390	6.53	3,750.02	+ 2,640
1989	7,060	5.50	3,506.91	+ 3,553
1990	6,779	5.03	3,480.57	+ 3,298
1991	6,993	4.05	4,135.00	+ 2,857

* Calculated at the Hawala, or unofficial, dollar exchange rate. The real difference between Bombay and New York can only be determined by taking this rate.

SILVER PRICE MARGIN BETWEEN BOMBAY AND NEW YORK

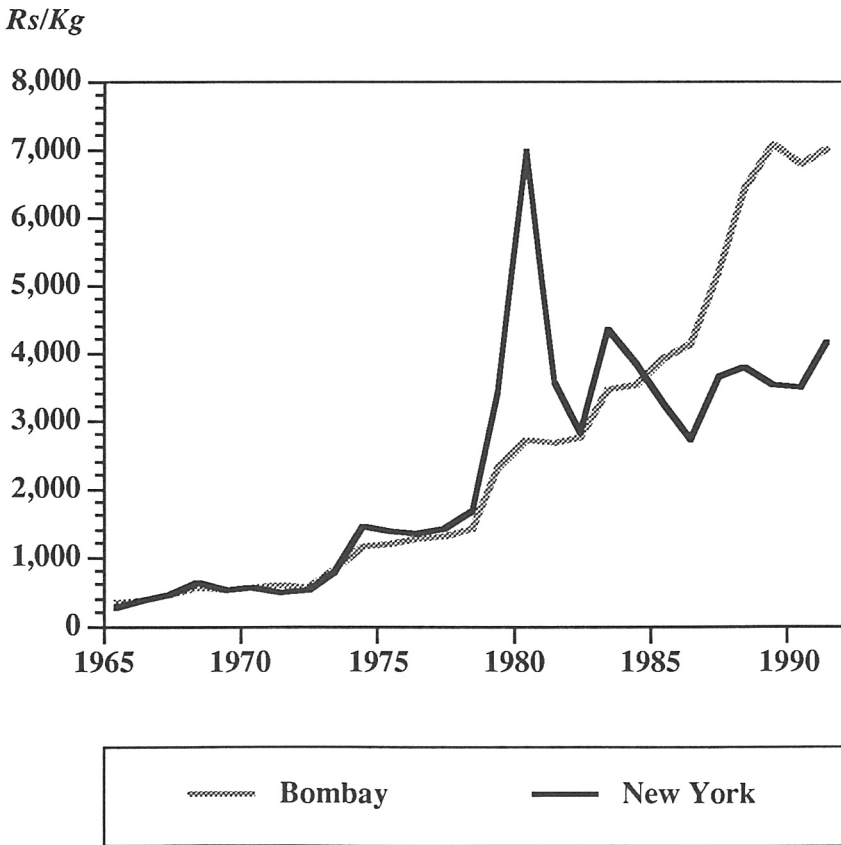


Table 3

Indian Silver: Imports and Exports
(million ounces)

Year	IMPORTS		EXPORTS	
	Illegal Imports	Legal Imports	Illegal Exports	Legal Exports
1965	-	-	6	-
1966	-	-	8	-
1967	-	-	20	-
1968	-	-	80	-
1969	-	-	30	1.73*
1970	-	-	25	-
1971	-	-	16	-
1972	-	-	13	-
1973	-	-	20.09	-
1974	-	-	16.08	43.72
1975	-	-	-	51.44
1976	-	-	1.61	52.89
1977	-	-	1.61	23.28
1978	-	-	2.25	29.19
1979	-	-	12.86	6.59
1980	-	-	20.09	1.29
1981	-	-	13.34	0.32
1982	-	-	11.25	0.32
1983	-	-	20.58	0.64
1984	-	-	1.13	0.16
1985	-	-	0.39	0.06
1986	4.82	-	-	-
1987	4.00	0.09	-	-
1988	8.00	0.31	-	-
1989	26.00	0.49	-	-
1990	60.00	0.72	-	-
1991	42.00	1.24	-	-
Total	144.82	2.85	319.28	212.53
Total Exports			531.81	

* by State Bank India

Table 4**Official Seizures of Silver**

Year	Ounces
1977	3,537
1978	19,644
1979	173,899
1980	989,931
1981	152,349
1982	22,794
1983	1,033,365
1984	24,241
1985	4,308
1986	352,010
1987	545,328
1988	546,550
1989	3,182,850
1990	6,880,100
1991	6,365,700

Table 5

Indian Silver
(million ounces)

Year	Domestic Production	Internal Dishoarding	Exports/ Imports	Industrial Use	*Ornamental Gifts	Official Seizures
1980	0.37	51.44	- 21.38	9.65	19.79	0.99
1981	0.56	41.80	- 13.66	9.65	18.90	0.15
1982	0.46	35.37	11.57	9.65	14.59	0.02
1983	0.51	45.01	- 21.41	11.25	11.83	1.03
1984	0.51	33.76	-1.29	11.25	21.49	0.24
1985	0.82	25.72	-0.45	12.06	14.03	0.004
1986	1.13	17.68	+4.82	12.86	10.42	0.35
1987	1.22	14.47	+4.02	13.66	5.50	0.55
1988	1.32	13.18	+8.04	14.47	7.52	0.55
1989	1.14	1.93	+ 26.50	14.47	11.92	3.18
1990	1.13	-	+ 60.64	19.29	35.60	6.88
1991	0.90	11.00	+ 42.00	21.70	26.90	6.40

* This sector includes jewelry, utensils, saris, medals, gift items and investment.

**SOUTHEAST ASIA:
*SILVER MARKETS 1991***

by

Timothy S. Green

Southeast Asia: *Silver Markets 1991*

During 1990 and 1991 there have been significant increases in the flows of silver from Australia, North America and Europe to the markets of southeast Asia. All told, these markets imported around 41 million ounces of silver in 1990 and 38 million ounces in 1991; a remarkable increase on 1989 when the region imported only about 17 million ounces.

There have been two prime reasons. First, especially in 1990, Singapore assumed a much more important role in the unofficial flows of silver to the Indian subcontinent. That alone largely accounted for the increase in 1990. But in 1991, while the flow to India subsided somewhat, the demand elsewhere in the region, notably in Thailand and South Korea, rose sharply. The flow to India in 1991 was just over 9 million ounces, compared to 20 million the previous year, while the demand in southeast Asia itself rose from 21 million ounces in 1990 to over 29 million ounces in 1991.

This rise of over 38 per cent in southeast Asia demand is evidence that the lower prices of the last year or two have stimulated the fabrication of silver into jewelry and tableware, particularly in Thailand and South Korea.

Thailand has replaced India as the major customer for silver in the Singapore market and stands out as the prime consumer of silver in the entire region. While part of this growth is due to the expansion of Thailand's role as a major manufacturer of carat gold, gem-set and silver ornaments and utensils for export, it reflects, too, the increased domestic consumer purchasing power in the wake of the country's rapid economic growth. The demand is also helped by tourist purchases of silver ornaments in Thailand, especially in the north of the country around Chiang Mai.

South Korea, too, is absorbing more silver for jewelry and utensils. Industry sources in Seoul report that there is a marked trend for carat gold jewelry to be of a lower caratage, requiring much more silver for the alloys. Equally it is now fashionable to give sterling silver gifts at weddings. They see this as the main reason for an increase of nearly 3 million ounces in South Korean demand during 1991. South Korea also leads the way in the industrial use of silver. The local manufacture of silver nitrate is growing by between 10% and 15% a year, as is brazing alloy fabrication (such alloys being protected by a high tariff).

Industrial fabrication is also increasing in Taiwan, with the establishment during the last three years of improved manufacturing plants for silver nitrates, cyanides and anodes.

But jewelry and silverware manufacture is declining, because of high labor costs, and is being transferred to Thailand.

Recycling of silver in southeast Asia is limited. Refiners report that, at current silver prices, there is little incentive to recover silver from film. Where this does take place it is largely an informal back-street affair. No major recovery network has been set up. Recycling is also declining in Taiwan, for example, because much tighter pollution controls make it uneconomic.

The slight build-up of stocks in Singapore and Hong Kong is due to the decline in demand for India. Dealers in Singapore, in particular, were left with silver they had booked in advance anticipating Indian offtake would remain strong. But these stocks will be absorbed during 1992.

1991 FAR EAST: SUMMARY OF FABRICATION
Recycling, Stocks
(millions of ounces)

	Jewelry / Silver Utensils	Industrial	Recycle	Stocks
Singapore	0.2	0.1	0.1	1.9
Malaysia	0.25	—	—	—
Thailand	13.8	—	—	—
Indonesia	0.8	0.1	—	—
Hong Kong	0.3	0.5	0.3	0.5
Taiwan	0.4	1.75	0.2	—
South Korea	5.7	2.9	0.3	—
Burma	0.3	—	—	—
Total	21.75	5.35	0.9	2.4

