
U.S. Market of Flavors & Fragrances

An Industry Study Elaborated by Laszlo Unger

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The U.S. flavor and fragrance industry occupies a very important place on the world scene (probably between 25% and 30% world market share). There is much confusion, misinterpretation and misunderstanding concerning its real market size and trends, which is due to an inadequate definition of terms and also to bad research and research methods. The classical definition of the different flavor and fragrance product categories, which we adopted in this study, follows:

- Natural essential oils and other natural products (absolutes; aqueous distillates and solutions; concretes; concentrates; enfleurage greases; oleoresins; terpenic by-products; animal secretions; etc.)
- Aroma chemicals (natural and synthetic flavor and perfume materials)
- Fragrance compounds/blends/mixtures
- Flavor compounds/blends/mixtures (artificial and natural)

The above definition *excludes* such products as: fruit juices and concentrates; spices; flavor enhancers (monosodium glutamate, etc.); synthetic sweeteners (cyclamates; saccharin; xylitol; etc.); or any other food additives or soap, detergent and cosmetic raw materials.

The major objective of this study is to clarify the situation and to establish the real market size, growth trends and competitive situation of the U.S. flavor and

fragrance industry during the last ten years. We hope we have made a modest, but original and meaningful contribution to better industry knowledge and a better understanding of basic market forces.

I. U.S. Consumption (merchant sales) of Natural Essential Oils and Other Natural Products

The U.S. is a very important producer and consumer of natural essential oils and other natural products, such as balsams, beans, gums, resins, etc., and such animal secretions as ambergris, castor, civet and musk. Natural essential oils are volatile materials of vegetable origin which are isolated from particular plants and flowers mostly by steam distillation or solvent extraction. Some, however, are prepared by enfleurage, maceration or expression. Although more than 3000 essential oils have been identified (obtainable from some 300 flower/plant families), only 150 or so are commercial products. Natural essential oils suffer from uncertainties of supply since many come from remote countries. Availability varies with weather, politics and tariffs, and their prices fluctuate sharply. In spite of these disadvantages, essential oils are used where they are more economically obtained, or where a certain richness and natural character are desired. They also constitute an important raw materials basis for natural aroma chemicals. Natural essential oils are used for different purposes, such as deriving/isolating natural flavor and perfume aroma

Table I. U.S. Consumption (Merchant Sales) of Natural Essential Oils and Other Natural Products
(Absolutes, aqueous distillates & solutions, concretes, concentrates, enfleurage greases, oleoresins, terpenic by-products, etc.)

	1970 (In millions of U.S. \$)	1976	1980	Average Annual Growth Rate		
				1976/1970	1980/1976	1980/1970
Merchant Shipments (Domestic Sales + Exports)	66	180	240	+ 18.2 %	+ 7.5 %	+ 13.8 %
+ Imports (C.I.F.)	40	80	146	+ 12.3 %	+ 16.1 %	+ 13.8 %
- Exports (F.A.S)	33	81	125	+ 16.1 %	+ 11.5 %	+ 14.3 %
Apparent Consumption	73	179	261	+ 16.1 %	+ 9.9 %	+ 13.6 %

Remarks: Merchant Shipments includes U.S. domestic sales and exports. Merchant shipments are not equal to domestic production, this latter is usually larger. Indeed, there is, besides inventories, a rather important captive use of essential oils and other natural products by domestic manufacturers in their flavor and fragrance compounds, as well as in their production of natural flavor and perfume aroma chemicals. Imports are valued C.I.F. (costs, insurance, freight), excluding import duties, at the first port of entry in the U.S.A. Exports are valued F.A.S. (free alongside ship) at the U.S. port of export. Apparent consumption does not take into consideration changes (+) in inventories.

Sources:

1. Census of Manufactures, 1967, 1972, 1977, Bureau of the Census, U.S. Department of Commerce, Washington.
2. U.S. General Imports (FT 135), Bureau of the Census, U.S. Department of Commerce, Washington.
3. U.S. Imports for Consumption and General Imports (FT 246), Bureau of the Census, U.S. Department of Commerce, Washington.
4. U.S. Exports (FT 410), Bureau of the Census, U.S. Department of Commerce, Washington.
5. Kline & Co., Fairfield, U.S.A.
6. Delphi Marketing Services, Inc., New York.

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chemicals; making flavor and fragrance compounds (blends/mixtures) which are used in flavored and fragranced end-products (foodstuffs, beverages, tobacco, soaps, detergents, cosmetics, toiletries, pharmaceuticals, etc.); and directly flavoring and fragranting different end-products.

Most of the animal secretions and many of the exudates are used as fixatives rather than odors. The major domestically produced essential oils include (in order of their approximate importance): peppermint oil; lemon oil; orange oil; spearmint oil; other citrus oils (grapefruit, lime, etc.); and other oils (cedar leaf, etc.).

Imports of natural essential oils and other natural products are an important part of the U.S market (56% of consumption in 1980) since most odoriferous flowers and plants are not grown in the U.S.A. However, the U.S. is an equally important exporter of natural essential oils (52% of merchant shipments in 1980), first of all, peppermint, spearmint, and citrus oils (lemon, orange, etc.). In the final count, the U.S. is a net importer of natural essential oils and other natural products.

By comparing the period 1980/1976 with that of 1976/1970 (see Table I), it becomes evident that there was a substantial decrease in the average annual growth rate of consumption: + 9.9% during 1980/1976 compared to + 16.1% during 1976/1970. This decrease was due to a substantially lower average annual growth rate of merchant shipments (domestic sales and exports): + 7.5% during 1980/1976 com-

pared to + 18.2% during 1976/1970. The main reason for this was an extremely low average annual growth rate of domestic sales during 1980/1976: only + 3.8%, whereas exports grew at + 11.5% (see Table II). Thus, U.S consumption of natural essential oils and other natural products was essentially sustained through imports which had an average annual growth rate of + 16.1% during the 1980/1976 period. Domestic sales seem to have suffered from imports, price erosion (due to very keen local competition) and sluggish domestic demand, and probably also from exports due to favorable foreign exchange rates (cheap dollar) which have sustained foreign demand for U.S. produced essential oils.

II. U.S. Consumption (merchant sales) of Aroma Chemicals (natural and synthetic flavor and perfume materials)

Aroma chemicals include such products as:

- isolates from natural essential oils (citral; geraniol; linalool; etc.)
- derivatives of natural essential oils (hydroxycitronellal; ionones; etc.)
- synthetic chemicals (benzyl acetate; phenylethyl alcohol; etc.) either being substitutes (copies/imitations) of natural essential oils or having no counterpart in nature

Aroma chemicals are used for their chemical configuration, their chemical structure is clearly known and

Table II

		1976 (in millions of U.S. \$)	1980 (in millions of U.S. \$)	Average annual growth rate 1980/1976 (%)
Merchant shipments	Domestic sales	99	115	+ 3.8
	Exports	81	125	+ 11.5
	Imports	80	146	+ 16.1

adequately described by specification. They are used for different purposes, such as making flavor and fragrance compounds (blends/mixtures) used in flavored and fragranced end-products (foodstuffs, beverages, tobacco, soaps, detergents, cosmetics, toiletries, pharmaceuticals, etc.) and for directly flavoring and fragrancing different end-products.

Synthetic aroma chemicals were first used as inexpensive extenders of natural odors. Today, however, the majority of fragrance compounds, for example, are compounds that are predominantly synthetic. Nevertheless, synthetics have not been able, until now, to duplicate exactly and completely the odors of natural materials because of impurities in the natural products which add a certain richness to their aroma. But, on the other hand, synthetics are freely available, more uniform and stable in their composition, and they can be tailored for specific uses. When compounded with natural products, they can both enhance the natural product and add new notes never obtained in natural products. Synthetics are also lower and more stable in terms of cost and price. The development of synthetic aroma chemicals has allowed the compounder (perfumer and flavorist) to develop new, imaginative flavor and fragrance notes, and to manufacture relatively unlimited quantities of such compounds. Almost all fragrances, and many flavors, are, today, blends/mixtures of synthetics and naturals.

The U.S. is a very important producer and consumer of all kinds of aroma chemicals. In 1979, 417 aroma chemicals were reported as produced and sold (domestic sales + exports) by 37 original manufacturers. Table III enumerates these original manufacturers. However, data are reported by original manufacturers for only those items where the volume of production or sales, or value of sales, exceeds 1000 pounds (454 kgs) or \$1000. The total number of aroma chemicals effectively produced and sold is much higher than 417, probably around 700 to 800, but these aroma chemicals are very small in quantity and value, and the majority of them are probably used captively by the original manufacturers. Imports and exports are also very important. Until 1978, the U.S. was a net importer of aroma chemicals, but it has become, since then, a net exporter, due partly to very favorable foreign exchange rates (cheap dollar) which have lowered the prices (in foreign exchange terms) of

U.S.-produced aroma chemicals on international markets.

By comparing the period 1980/1976 with that of 1976/1970 (see Table IV), the most striking feature is a very considerable decrease in the average annual growth rate of consumption: only + 3.4% during 1980/1976 compared to + 18.7% during 1976/1970. Indeed, the 1975 recession has broken down the high-flying trend of the early 1970s: the sales value of merchant shipments (domestic sales and exports) decreased by 14% between 1974 and 1975, and by 25% in quantity. Domestic production in quantity decreased even more dramatically by 27% between 1974 and 1975. Since then, the U.S. aroma chemical industry has settled itself on a new, but extremely low trend of 3% to 4% average annual growth rate in consumption. However, exports of aroma chemicals continue to boom, due partly to very favorable foreign exchange rates (cheap dollar), but domestic sales (out of total merchant shipments) have practically stagnated during the period 1980/1976, and domestic consumption was only sustained (rather weakly) through imports (see Table V).

Domestic sales seem to have suffered not only from import competition, but also from a very keen local competition and sluggish domestic demand which together have caused a very serious price erosion. Indeed, the average sales unit value (\$/lb) of merchant shipments (domestic sales plus exports) shows the following trend during the period 1979/1970:

1970:	0.97
1971:	1.25
1972:	0.85
1973:	0.93
1974:	1.44
1975:	1.66
1976:	1.69
1977:	1.87
1978:	1.40
1979:	1.70
1980:	not available

The average annual growth rate for 1976/1970 is + 9.7%; for 1979/1976 is + 0.2%; and for 1979/1970 is + 6.4%. There was thus virtually no average price increase per unit (lb) during the period 1979/1976 due

Table III. U.S. Manufacturers of Aroma Chemicals (synthetic and natural flavor and perfume materials)
Number of Products Manufactured by Companies in 1979

Companies	Cyclic						Total Cyclic & Acyclic			
	Benzenoid and Naphtalenoid		Terpenoid, Hetero-Cyclic and Ali-cyclic		Total					
							Acyclic			
1. Givaudan	74	75	34	36	108	111	52	65	160	176
Hoffmann-LaRoche	1		2		3		13		16	
2. Fritzsche Dodge & Olcott		36		18		54		49		103
3. Elan Chemical	29	31	7	8	36	39	35	41	71	80
Felton International	2		1		3		6		9	
4. Intl Flavors & Fragrances		25		25		50		27		77
5. SCM Corp (Organic Chem Div)		4		12		16		26		42
6. Orbis Products	16	22	4	13	20	35	4	5	24	40
Norda	6		9		15		1		16	
7. Chem-Fleur		16		6		22		12		34
8. Ritter International		4		10		14		15		29
9. Polaks Frutal Works	6	8	1	3	7	11	14	14	21	25
Hercules	2		2		4		--		4	
10. Union Camp (Terpene & Aromatics Div.)		1		8		9		11		20
11. UOP (Chemical Div.)		16		--		16		4		20
12. Biddle Sawyer (Aroma Resources Div.)		3		8		11		3		14
13. Rhone-Poulenc (Chemicals Div)		4		1		5		4		9
14. Monsanto (Industrial Chemicals)		7		--		7		--		7
15. Northwestern Chemical/Wrigley		--		--		--		5		5
16. Pfizer (Chemicals Div.)		1		3		4		1		5
17. Sherwin-Williams (Chemical Div.) (Acquired by Bell F&F in 1980)		3		--		3		2		5
18. Arsynco/Aceto Chemical		3		1		4		--		4
19. Ungerer		2		2		4		--		4
20. Fairmount Chemical		1		--		1		2		3
21. Upjohn (Fine Chemicals Div.)		2		--		2		--		2
22. Tenneco Chemicals		2		--		2		--		2
23. Velsicol Chem/Northwest Indus.		2		--		2		--		2
24. American Bio-Synthetics		1		--		1		--		1
25. Arizona Chemical		1		--		1		--		1
26. Florasynth		--		--		--		1		1
27. Monroe/Kalama Chemical		1		--		1		--		1
28. Penick/CPC International		1		--		1		--		1
29. R.S.A. Corporation		--		--		--		1		1
30. Stauffer (Specialty Chem Div.)		1		--		1		--		1
31. Stockhausen		1		--		1		--		1
32. Sunkist Growers		1		--		1		--		1
33. Warner-Lambert		1		--		1		--		1

Remarks:

1. Similar to the Givaudan/Hoffmann-LaRoche Group are three others: Elan Chemical is a subsidiary of Felton International (acquired in 1978); Orbis Products is a subsidiary of Norda; and Polak's Frutal Works is a subsidiary of Hercules (acquired in 1973).
2. UOP (Chemical Division) ceased production of aroma chemicals in March 1980.
3. The most common aroma chemicals are manufactured by several companies. Altogether, there were, in 1979, 37 companies manufacturing 417 aroma chemicals:

Product Categories	Number of Products
<u>I. Cyclic</u>	
1. Benzenoid & Naphtalenoid	167 (40.0%)
2. Terpenoid, Heterocyclic & Alicyclic	93 (22.3%)
<u>Total Cyclic</u>	260 (62.3%)
<u>II. Acyclic</u>	157 (37.7%)
<u>TOTAL (I & II)</u>	417 (100.0%)

Source: Elaborated by Givaudan's Marketing Research Service, Geneva (Mr. L. Unger, Manager) on the basis of Synthetic Organic Chemicals (U.S. Production and Sales 1979), U.S. International Trade Commission, Washington.

Table IV. U.S. Consumption (Merchant Sales) of Aroma Chemicals (Natural and synthetic flavor and perfume materials)

	1970	1976	1980	Average Annual Growth Rate		
	(In millions of U.S. \$)			1976/1970	1980/1976	1980/1970
Merchant Shipments (Domestic Sales + Exports)	59	160	200	+ 18.1 %	+ 5.7 %	+ 13.0 %
+ Imports (C.I.F.)	16	51	70	+ 21.3 %	+ 8.2 %	+ 15.9 %
- Exports (F.A.S.)	15	43	78	+ 19.2 %	+ 16.0 %	+ 17.9 %
Apparent Consumption	60	168	192	+ 18.7 %	+ 3.4 %	+ 12.3 %

Remarks: Merchant Shipments includes U.S. domestic sales and exports. Merchant shipments are not equal to domestic production, this latter is usually larger. Indeed, there is, besides inventories, a rather substantial captive use of aroma chemicals by domestic manufacturers in their flavor and fragrance compounds. We estimate that about 30% to 40% of their total domestic production is used in their manufacturing of flavor and fragrance compounds. Imports are valued C.I.F. (costs, insurance, freight), excluding import duties, at the first port of entry in the U.S.A. Exports are valued F.A.S. (free alongside ship) at the U.S. port of export. Apparent consumption does not take into consideration changes (+) in inventories. All the above figures exclude monosodium glutamate (flavor enhancer) and synthetic sweeteners (cyclamates, saccharin, xylitol, etc.) which can not be considered as aroma chemicals.

Sources:

1. Synthetic Organic Chemicals/Flavor and Perfume Materials, U.S. International Trade Commission, Washington.
2. U.S. General Imports (FT 135), Bureau of the Census, U.S. Department of Commerce, Washington.
3. U.S. Imports for Consumption and General Imports (FT 246), Bureau of the Census, U.S. Department of Commerce, Washington.
4. U.S. Exports (FT 410), Bureau of the Census, U.S. Department of Commerce, Washington.
5. Stanford Research Institute, Menlo Park, California
6. Kline & Co., Fairfield, U.S.A.
7. Delphi Marketing Services, Inc., New York.

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to very keen domestic and foreign competition, sluggish domestic demand and pressures from customer (user) companies which together have caused this very sharp price erosion. In fact, domestic sales have increased at an average annual growth rate of 6.5% in quantity, but only of 5.7% in value during the period 1979/1976 which is a clear sign of keen price competition and pressures.

As to the breakdown of total aroma chemicals consumption according to different uses, for 1980, we estimate that \$115 millions (60%) of aroma chemicals were used in fragrances and \$77 millions (40%) of aroma chemicals were used in flavors.

Although the U.S. aroma chemical industry still largely consists of privately owned companies, it is traditionally international in orientation and will continue to be so. Because of this and the relatively low freight costs for these products, foreign trade is relatively important for aroma chemicals. Indeed, imports constituted 36.5% of total U.S. consumption in 1980 compared to 30.4% in 1976, whereas exports constituted 39% of total U.S. merchant shipments in 1980 compared to 26.9% in 1976. The concentration

profile of manufacturers has not changed much during the 1970s: 5 companies account for about 50% and 15 companies for about 75% of total U.S. merchant sales. The increasing use by the aroma chemicals industry of sophisticated technology and instrumentation in research and development and production will probably continue to slow the entry of smaller-scale producers. Continuation is foreseen in the use of crude sulfate turpentine, a by-product of kraft paper mills, as a raw material in production of about half (in terms of sales value) of all aroma chemicals, whereas petroleum-based raw materials (acetylene, etc.) are used in the production of the other half. The manufacture of certain bulk-quantity aroma chemicals (benzyl alcohol; coumarin; menthol; phenylethyl alcohol; vanillin; etc.) is being concentrated among a number of chemical and flavor and fragrance companies with appropriate technology. Whereas flavor and fragrance tended, in the past, to produce their own aroma chemicals for reasons of security and process control, these bulk items are now increasingly purchased by them from other manufacturers.

The original technological foundations of the aroma

Table V

		1976	1980	Average annual growth rate
		(in millions of U.S. \$)		1980/1976 (%)
Merchant shipments	Domestic sales	117	122	+ 1.1
	Exports	43	78	+ 16.0
	Imports	51	70	+ 8.2

Table VI. U.S. Consumption (Merchant Sales) of Fragrance Compounds (blends/mixtures)

	1970 (In millions of U.S. \$)	1976 (In millions of U.S. \$)	1980 (In millions of U.S. \$)	Average Annual Growth Rate		
				1976/1970	1980/1976	1980/1970
Merchant Shipments (Domestic Sales + Exports)	140	260	370	+ 10.9 %	+ 9.2 %	+ 10.2 %
+ Imports (C.I.F.)	10	19	29	+ 11.3 %	+ 11.1 %	+ 11.3 %
- Exports (F.A.S.)	11	32	48	+ 19.4 %	+ 10.7 %	+ 16.0 %
Apparent Consumption	139	247	351	+ 10.1 %	+ 9.2 %	+ 9.7 %

Remarks: Merchant Shipments includes U.S. domestic sales and exports (it is not equal with total domestic production). Imports are valued C.I.F. (costs, insurance, freight), excluding import duties, at the first port of entry in the U.S.A. Exports are valued F.A.S. (free alongside ship) at the U.S. port of export. Apparent consumption does not take into consideration changes (+) in inventories as well as captive manufacture of fragrance compounds by manufacturers of perfumed end-products (such as Procter & Gamble, Colgate-Palmolive, Lever Brothers) who mostly buy only essential oils and aroma chemicals for blending/mixing into fragrance compounds.

Sources:

1. Census of Manufactures, 1967, 1972, 1977, Bureau of the Census, U.S. Department of Commerce, Washington.
2. U.S. General Imports (FT 135), Bureau of the Census, U.S. Department of Commerce, Washington.
3. U.S. Imports for Consumption and General Imports (FT 246), Bureau of the Census, U.S. Department of Commerce, Washington.
4. U.S. Exports (FT 410), Bureau of the Census, U.S. Department of Commerce, Washington.
5. Kline & Co., Fairfield, U.S.A.
6. Predicasts, Inc., Cleveland, Ohio, USA
7. A.D. Little Co., Cambridge, Mass., USA

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chemicals industry were constructed upon the basic techniques used for identification, isolation, synthesis and manufacture of naturally-occurring chemicals. As a result of these scientific investigations, many chemicals have been identified and extended for use in formulations unrelated to their original setting in the natural environment. For example, numerous naturally-based chemicals such as citral, decanal and terpineol (the major flavor components in lemon, orange and lime) are today synthesized for use as ingredients in both flavor and fragrance compounds. Further technological frontiers for the aroma chemicals industry are opening up in the area of imitating/simulating nature (for example, batch tissue cultivation techniques; reaction flavors; etc.). Due to increases in energy costs, new efforts have been under-

taken to develop energy-efficient production technologies (for example, chemical extraction techniques, instead of distillation procedures, using supercritical fluids, normally gaseous substances such as carbon dioxide).

III. U.S. Consumption (merchant sales) of Fragrance Compounds (blends/mixtures)

Fragrance compounds are complex mixtures (blends) of natural essential oils, their derivatives (absolutes, concentrates, etc.), aroma chemicals (natural and synthetic) as well as fixatives. Highly refined ethyl alcohol is almost always the supporting vehicle for fragrances. Fragrance compounds impart a desired odor to a great number of different end-products, such as soaps and detergents (washing,

cleaning, polishing, disinfecting products), cosmetics, toiletries, etc.

The U.S. is a very important producer and consumer of fragrance compounds, due to its outstanding position in world production and consumption of all kinds of perfumed end-products (about 25% of world market share). Imports and exports are relatively important. Exports substantially exceed imports, so that the U.S. is a net exporter of fragrance compounds. However, it is important to underline that there is also a very substantial captive production and consumption of fragrance compounds by such perfumed consumer goods manufacturers as Procter & Gamble, Colgate-Palmolive, Lever Brothers and others. These three companies together detain about 25% of total U.S. production of all kinds of perfumed end-products, and they manufacture the greatest part of their fragrance compounds needs by buying, stocking and blending/mixing essential oils and aroma chemicals into fragrance compounds. This captive manufacture and consumption of fragrance compounds is, of course, not included in total U.S. merchant sales (consumption), because it is not part of the free commercial market. Thus, consumption of fragrance compounds, calculated as merchant sales on the free available market, is not equal to total consumption.

We estimate the market value (merchant sales) of this captive manufacture and consumption of fragrance compounds to be about \$150 millions in 1980. That is to say, if all manufacturers of perfumed end-products bought their fragrance compounds from external sources (fragrance houses), total U.S. consumption of fragrance compounds would have been around \$500 millions in 1980 instead of \$350 millions. This figure (\$500 millions) is to be put in relation with the total ex-factory value (at manufacturers' selling prices) of all kinds of perfumed end-products, which was around \$19,500 millions in 1980. The average U.S. perfume ratio is thus 2.56% (500: 19,500) which means that, out of \$100 ex-factory sales of perfumed end-products, about \$2.56 represent, on average, the costs of fragrances (which is a relatively low figure).

By comparing the period 1980/1976 with that of 1976/1970 (see Table VI), we find that there has not been a dramatic change in the average annual growth rate of consumption: + 9.2% during 1980/1976 compared to + 10.1% during 1976/1970. It means that fragrance compounds—which are high value-added specialty products—are less sensitive to cyclical fluctuations in demand, and less exposed to price erosions, compared to essential oils and aroma chemicals which are more commodity-type products inside the

Table VII

		1976	1980	Average annual
		(in millions of U.S. \$)	(in millions of U.S. \$)	growth rate 1980/1976 (%)
Merchant shipments	Domestic sales	228	322	+ 9.0
	Exports	32	48	+ 10.7
	Imports	19	29	+ 11.1

Table VIII. U.S. Consumption (Merchant Sales) of Flavor Compounds (blends/mixtures)

	1970	1976	1980	Average Annual Growth Rate		
	(in millions of U.S. \$)	(in millions of U.S. \$)	(in millions of U.S. \$)	1976/1970	1980/1976	1980/1970
Merchant Shipments (Domestic Sales + Exports)	105	185	275	+ 9.9 %	+ 10.4 %	+ 10.1 %
+ Imports (C.I.F.)	5	15	23	+ 20.0 %	+ 11.3 %	+ 16.5 %
- Exports (F.A.S.)	9	17	23	+ 11.2 %	+ 7.9 %	+ 9.8 %
Apparent Consumption	101	183	275	+ 10.4 %	+ 10.7 %	+ 10.5 %

Remarks: Merchant Shipments includes U.S. domestic sales and exports (it is not equal to total domestic production). Imports are valued C.I.F. (costs, insurance, freight), excluding import duties, at the first port of entry in the U.S.A. Exports are valued F.A.S. (free alongside ship) at the U.S. port of export. Apparent consumption does not take into consideration changes (+) in inventories as well as captive manufacture of flavor compounds by manufacturers of flavored end-products. All the above figures exclude fruit juices and concentrates, spices, flavor aroma chemicals, flavor enhancers (monosodium glutamate) as well as synthetic sweeteners (cyclamates, saccharin, xylitol, etc.) which can not be considered as flavor compounds.

Sources:

1. Census of Manufactures, 1967, 1972, 1977, Bureau of the Census, U.S. Department of Commerce, Washington.
2. U.S. General Imports (FT 135), Bureau of the Census, U.S. Department of Commerce, Washington.
3. U.S. Imports for Consumption and General Imports (FT 246), Bureau of the Census, U.S. Department of Commerce, Washington.
4. U.S. Exports (FT 410), Bureau of the Census, U.S. Department of Commerce, Washington.
5. Kline & Co., Fairfield, U.S.A.
6. A.D. Little Co., Cambridge, Mass., USA

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flavor and fragrance industry. Nevertheless, domestic sales of fragrance compounds had a much lower average annual growth rate than exports and imports (see Table VII). Indeed, exports are more and more important inside merchant shipments like imports inside consumption. The favorable foreign exchange rate of the dollar (cheap dollar) has certainly contributed to sustained exports during the period 1980/1976, whereas quality and segment differences might have played a significant role in sustained imports.

As to the breakdown of total fragrance compounds consumption (merchant sales/free commercial market) according to large perfumed end-products categories, for 1980, we estimate that \$210 millions (60%) were cosmetics, toiletries and alcoholic fragrances sold to all outlets; \$120 millions (34.3%) were washing, cleaning, polishing, and disinfecting products sold to all outlets (consumer/household and industrial/institutional outlets); and \$20 millions

(5.7%) were other products (industrial; paper; etc.).

Due to substantial manufacture of fragrance compounds by soaps and detergents manufacturers (Procter & Gamble, Colgate-Palmolive and Lever Brothers), the free commercial (available) market is relatively small in the U.S.A. compared to West European countries where Lever buys all, and Colgate-Palmolive a substantial part, of their fragrance compounds needs from outside sources (fragrance companies), whereas Procter and Gamble still remains a closed market for fragrance compounds submissions.

IV. U.S. Consumption (merchant sales) of Artificial and Natural Flavor Compounds (blends/mixtures)

Flavor compounds are complex mixtures (blends) of natural essential oils, their derivatives (absolutes,

Table IX

		1976 (in millions of U.S. \$)	1980 (in millions of U.S. \$)	Average annual growth rate 1980/1976 (%)
Merchant shipments	Domestic sales	168	252	+ 10.7
	Exports	17	23	+ 7.9
	Imports	15	23	+ 11.3

concentrates, etc.) and aroma chemicals (natural and synthetic), mostly diluted in a permitted solvent such as food-grade ethanol, propylene glycol or isopropanol, edible oil, or absorbed in an edible carrier such as vegetable gums. Flavor compounds impart a desired flavor to, or reinforce natural flavors in, a great variety of different end-products, such as foodstuffs, beverages, tobacco, pharmaceuticals, etc.

The U.S. is a very important producer and consumer of flavor compounds (artificial and natural) due to its outstanding position in world production and consumption of all kinds of flavored end-products. Imports and exports roughly counterbalance each other, and they are not very important. By comparing the period 1980/1976 with that of 1976/1970 (see Table VIII), we find that there has not been a significant change in the average annual growth rate of consumption: + 10.7% during 1980/1976 compared to + 10.4% during 1976/1970. It means that flavor compounds—which are high value-added specialty products—are less sensitive to cyclical fluctuations in demand, and less exposed to price erosions, compared to essential oils and aroma chemicals which are commodity-type products inside the flavor and fragrance industry. Nevertheless, imports had a higher average annual growth rate than exports and domestic sales (see Table IX).

As to the breakdown of total flavor compounds consumption (merchant sales/free commercial market) according to the two basic product categories (natural and artificial), for 1980, we estimate that \$160 millions (58.2%) were natural flavor compounds and \$115 millions (41.8%) were artificial flavor compounds.

Flavor aroma chemicals and flavor compounds are exposed to much more stringent legislation than fragrances, and there has been a marked increase in the number and scope of federal regulations during the last ten years. Food and Drug Administration (FDA) regulations on the use of chemicals and natural materials in flavors require that all food additives be qualified GRAS (Generally Recognized As Safe). GRAS status for these ingredients is achieved as a result of their being recognized as safe through long and continued usage or as a result of scientific testing. Being "nature-identical" is not sufficient to permit a substance to be labeled "natural." "Natural" ingredients

must, according to the FDA, be produced via physical methods and not through chemical reactions. This regulation has created serious problems for the U.S. flavor industry. Traditionally, the flavor industry has used synthetic aroma chemicals that are nature-identical to fortify the natural components in flavor compounds, in order to achieve greater flavor impact at lower cost and also to provide substitutes for natural aroma chemicals that are hard to obtain. These chemicals must be clearly identified on food labels as "arti-

Table X. U.S. Consumption (Merchant Sales) of Flavors and Fragrances (recapitulation)

	1970	1976	1980	Average Annual Growth Rate		
	(In millions of U.S. \$)			1976/1970	1980/1976	1980/1970
I. Natural essential oils and other natural products	73 (19.6%)	179 (23.0%)	261 (24.2%)	+ 16.1 %	+ 9.9 %	+ 13.6 %
II. Aroma chemicals (natural and synthetic)	60 (16.1%)	168 (21.6%)	192 (17.8%)	+ 18.7 %	+ 3.4 %	+ 12.3 %
III. Fragrance compounds	139 (37.3%)	247 (31.8%)	351 (32.5%)	+ 10.1 %	+ 9.2 %	+ 9.7 %
IV. Flavor compounds (natural and artificial)	101 (27.1%)	183 (23.6%)	275 (25.5%)	+ 10.4 %	+ 10.7 %	+ 10.5 %
Total Apparent Consumption	373 (100.0%)	777 (100.0%)	1079 (100.0%)	+ 13.0 %	+ 8.6 %	+ 11.2 %

Remarks: Total apparent consumption does not take into consideration changes (+) in inventories, captive consumption of natural essential oils and aroma chemicals by their manufacturers as well as captive manufacture and consumption of fragrance and flavor compounds by manufacturers of perfumed and flavored end-products. Thus, total apparent consumption of flavors and fragrances is measured in effective merchant sales, that is, what is effectively sold on the market. It consequently means the total free market which is available for flavor and fragrance submissions.

Elaborated by Givaudan's Marketing Research Service, Geneva (Mr. L. Unger, Manager)

ficial." Efforts on the part of the U.S. flavor industry to persuade the FDA to adopt the less-stringent European rules (which permit flavors to be labeled

"nature-identical") are not likely to be successful in the near future, unless the FDA becomes more flexible.

V. Total U.S. Consumption (merchant sales) of Flavors and Fragrances

Table X recapitulates total U.S. consumption of all the four basic flavor and fragrance product categories. By comparing the period 1980/1976 with that of 1976/1970, it becomes evident that there was a very substantial decrease in the average annual growth rate of total consumption: + 8.6% during the period 1980/1976 compared to +13.0% during the period 1976/1970. This decrease was due to a dramatic decrease in the average annual growth rate of aroma chemicals, a substantial decrease of essential oils, and a smaller decrease of fragrance compounds, while flavor compounds have maintained their previous growth rate.

The U.S. flavor and fragrance industry, which has passed beyond the \$1000 millions barrier in 1980, is experiencing a period of lower current and real growth rates, increased competitive pressures and lower profitability. We estimate that its real (inflation-adjusted) growth rate was between 4% to 5% during the period 1980/1976 against 6% to 7% during the period 1976/1970. The U.S. flavor and fragrance industry is living in a dangerous price-erosion period due to the fact that its average unit price increases (\$/lb) (which we estimate to be about 4% to 5% for the period 1980/1976) do not follow the general inflation rate. It is, however, known from experience that those companies who do not raise their prices to cover increases in their costs and to maintain a reasonable profit will, in time, have serious difficulties and can go bankrupt. Today, flavor and fragrance companies need a much bigger capital investment than ever before to service customers properly. Much

more equipment is needed to provide better stability and longer shelf life of flavored and perfumed end-products, to comply with an ever lengthening list of ingredient and manufacturing safety standards and environmental safeguards, plus added working capital to finance the more frequent deliveries of smaller quantities to customers. Price increases are a fact of business life today and no company can survive by selling this year's products at last year's prices.

VI. Overall Competitive Situation in the U.S. Flavor and Fragrance Industry

The U.S. flavor and fragrance industry comprises about 120 to 130 companies which proves that it is a highly competitive and a rather "atomized" market. Many of these companies have already been, and will be, faced with significant merger or takeover proposals because the major trend is, and will be, toward further consolidation into vertically integrated business units with both forward and backward linkages. Many of these companies are relatively small, lacking sophisticated professional management, and specializing either in the flavor and fragrance raw materials (essential oils; aroma chemicals) or in compounds, mostly according to specific end-products segments. A trend of larger acquisition moves can be expected during the next five years which will then probably level-off by the mid-1980s as most of the available and desirable companies will have been acquired. This forecasted acquisition activity is likely to involve major multinational chemical companies (including European and Japanese ones) with strong technical skills and secure financial positions, who seek to enter a compatible field or consolidate existing activities.

We have tried in Table XI to establish the approximate overall competitive position in 1979 of the 22 most important flavor and fragrance companies who detain about 78% of the industry's total domestic sales. The remaining about 100 companies have approximately 22% of total domestic sales (on average, \$2.5 millions yearly sales per company). However, inside these 100 companies, we still find several ones which are relatively quite sizeable (between \$5 and 15 millions yearly domestic sales), such as American Flavor & Fragrance Corporation; Bell; Chemfleur; Continental Flavors; Crompton & Knowles/Gentry International; J. Manheimer; Proprietary Perfumes Ltd.; Rhodia; Ritter International; Shaw Mudge; SCM Corporation; Synfleur; Takasago; and Union Camp. Future growth and profitability are likely to be increasingly dependent on the category and characteristics of the individual companies. The better-positioned companies in the 1980s will be those that have integrated modern corporate management practices with traditional creativity in basic research, compounding and product development, which presupposes a flexible management, an independent and innovative group of creators (chemists, perfumers, flavorists, marketing specialists), and a profound understanding of consumer and industrial marketing techniques and the needs of consumer-oriented companies.

Table XI. U.S. Domestic Merchant Sales of Flavors and Fragrances by Major Companies in 1979

(Estimates in Millions of U.S. Dollars)

Companies	Product Categories(*)	U. S. Sales in 1979 (Millions of \$)	Overall Market Share (%)
1. Intl Flavors & Fragrances	2,3,4	110	11.0
2. Universal Flavor & Fragrance Corp.	1,2,3,4	70	7.0
3. Fritzsche, Dodge & Olcott	1,2,3,4	65	6.5
4. Givaudan	2,3,4	63	6.3
5. A. M. Todd	1	50	5.0
6. Firmenich	2,3,4	45	4.5
7. Naarden	1,2,3,4	45	4.5
8. Norda/Orbis	1,2,3,4	42	4.2
9. Florasynth	1,2,3,4	40	4.0
10. Felton/Elan	1,2,3,4	35	3.5
11. Fries & Fries) Mallinckrodt Perry Brothers)	3,4	26	2.6
12. Roure Bertrand Dupont	1,2,3,4	25	2.5
13. Lautier Fils	1,2,3,4	25	2.5
14. Polak's Frutal Works	1,2,3,4	25	2.5
15. Bush, Boake & Allen	1,2,3,4	20	2.0
16. Haarmann & Reimer	2,3,4	17	1.7
17. Dragoco	2,3,4	15	1.5
18. S. B. Penick	1,2,3,4	13	1.3
19. Noville Essential Oil	1,2,3,4	13	1.3
20. Ungerer	1,2,3,4	12	1.2
21. Stepan Chemical	2,3	12	1.2
22. Neumann-Buslee & Wolfe	1,2,3,4	10	1.0
Sub-Total		778	77.8
23. Others (about 100 companies)(**)	1,2,3,4	222	22.2
Total		1000	100.0

(*) Product Categories are:

- 1) Natural Essential Oils and Other Natural Products
- 2) Aroma Chemicals (Natural and Synthetic Flavor and Perfume Materials)
- 3) Flavor Compounds (Natural and Artificial)
- 4) Fragrance Compounds

(**) There are a great number of other small and middle-sized companies manufacturing flavors and/or fragrances, such as (in alphabetical order):

Adams Extract Company, Inc.	McCormick & Company, Inc.
Alpine Aromatics	J. Manheimer, Inc.
American Aromatics	Meer Corporation
American Flavor & Fragrance Corporation	Mero Aromatics
(acquired by Crompton & Knowles in 1980)	D. Michael & Company
Aromatic Flavors & Fragrances	Monsanto (Industrial Chemicals Division)
Bell Flavors & Fragrances	Shaw Mudge & Company
Belmay	Northville Laboratories
Berje Chemical Products	Novarome
Bertrand Freres	Noville Essential Oil Co.
Biddle Sawyer Corporation	Henry H. Ottens Mfg. Company
M. Brown & Sons, Inc.	Pfizer (Chemical Division)
Camilli, Albert & Laloue	Polarome Manufacturing Co.
Charabot & Co.	Proprietary Perfumes Ltd.
Chemessence	Reynaud Ltd.
Chem-Fleur	Rhodia (Rhône-Poulenc)
The Cino Company	Ritter International
Citrus & Allied Essences	Robertet
Compagnie Parento	Scientific Flavors, Inc.
Continental Aromatics	SCM Corporation/Organic Chemical Division
Continental Flavors	(former Glidden-Durkee)
Creations Aromatiques	Stange & Company
Crompton & Knowles/Gentry International	Standard Aromatics
Davis Flavors Corporation	Sunkist Growers
deLaire, Inc.	Synarome Corporation
The Edlong Corporation	Synfleur (Nestle)
Elias Fragrances	Takasago
Food Materials Corporation	Tenneco Chemicals
Alex Fries & Brothers	Tombarel Freres
D.W. Hutchinson Co.	Twitchell, Foote & Jenks
Industrial Aromatic Co.	U.O.P. (Aroma Chemical Division)
Ingredient Technology Corporation	(ceased production in March 1980)
(acquired by Neumann-Buslee & Wolf in 1980)	Union Camp Corporation
ITT Rayonier	Van Dyk & Company
H. Kohnstamm & Company	Virginia Dare Extract Company
MacAndrews & Forbes	Warner-Jenkinson (7 UP)
V. Mane Fils	

The above list is, of course, incomplete. Many of these companies specialize either in the flavor and fragrance ingredients/materials (essential oils, aroma chemical) or in the flavor and fragrance compounds (blends/mixtures), mostly according to special end-products segments. The U.S. flavor and fragrance market is, no doubt, a highly competitive "atomized market."

Sources:

1. Delphi Marketing Services Inc., New York
2. Kline & Co., Fairfield, U.S.A.

Estimates elaborated by Givaudan's Marketing Service, Geneva (Mr. L. Unger, Manager)