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Monetizing Molecules

The Baby Boom That Isn't

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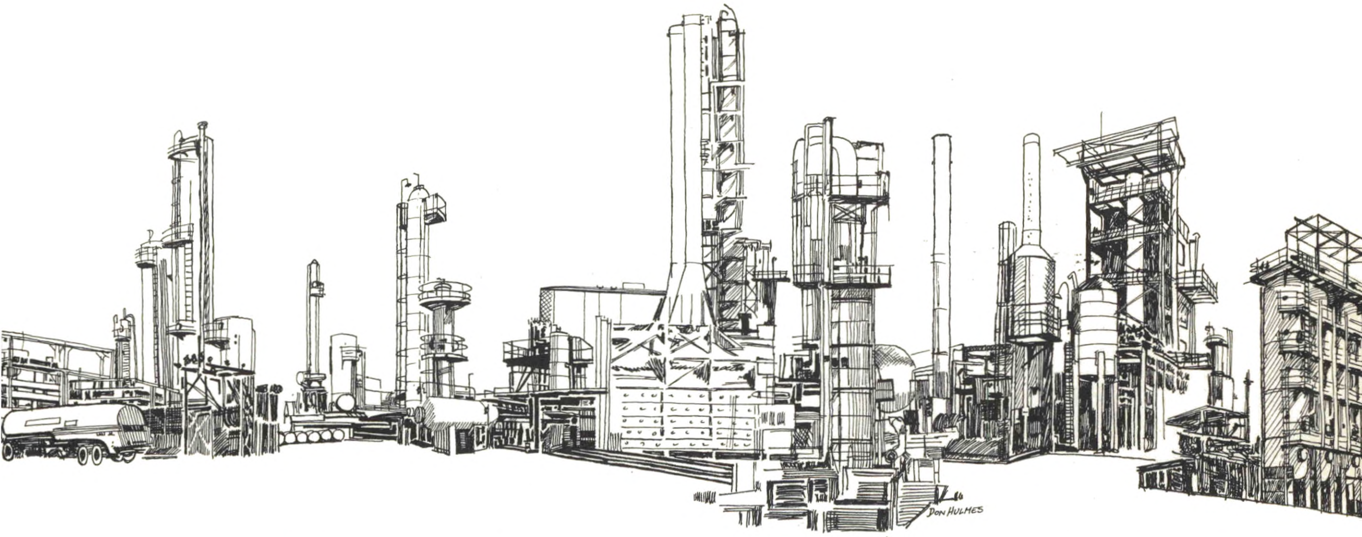


MONETIZING MOLECULES

The chemical industry is a multitude of people making money out of molecules. Some of its raw materials are invisible, its processes inscrutable, its products invaluable. The industry is as old as the ancient of days and as modern as tomorrow. Its highbrows work in laboratories and libraries, speak in obscure long-tailed words, write in abstruse cryptic symbols, and perform molecular miracles—more by mundane perspiration than by Divine inspiration. As an industry, it almost defies definition, description, or dissection—but somehow it monetizes molecules.

A molecule is a mite of matter with a personality. Sodium chloride, for example, is a common kitchen chemical with a salty personality and a friendly disposition—which is all the more remarkable because its constituent elements, when going their separate ways, are bad actors. Or, take sugar and alcohol, compounded from two different recipes of the same three elements (carbon, hydrogen, and oxygen), and what a difference in their personalities!

The raw materials of the industry are called elements—chemical elements. In the latest edition of the *World Almanac* is a list of all the elements neatly summarized alphabetically from actinium to zirconium, together with their tickertape-like symbols. The two parallel columns of numbers, however, are not their highs and lows.

Exactly 92 of the 103 elements listed comprised the complete kit of raw materials out of which the whole earth and the rest of the Universe were made when designed and built by the Great Architect. With such a cosmic storehouse of building blocks to draw on, no wonder the industry is so fabulous!

Building blocks and stumbling blocks

Discovery and utilization of many of the building blocks was fraught with frustration. Chemical elements are most unevenly distributed, and many of them long defied detection or extraction. Half of the earth's crust—oceans and atmosphere—is oxygen, and one-fourth is silicon (an important ingredient of sand). But certain atmospheric gases exist only one part in 20 millions. Elements such as sulphur and lead have been known and used since prehistoric times. Half the elements were discovered during the 19th century, and one as late as 1961. Some elements, though known for years, offered strenuous resistance to commercial utilization. Over a half-century elapsed between Oersted's discovery of aluminum in 1825 and Hall's development of the electrolytic process for making the metal available in commercial quantities.

The early growth of the chemical industry was impeded not only by the stumbling blocks imposed by Nature but also by a mental block. For years, the chemical industry neglected organic chemicals and confined its activities almost exclusively to inorganic chemicals derived chiefly from minerals, water, and air. Sulphuric acid, one of the oldest work horses of the industry, is an inorganic. The acid is used to pickle steel, refine petroleum, and to assist in many other industrial processes. Another inorganic is hydrogen peroxide—widely used to bleach textiles, paper-pulp, and brunettes.

The reason why organic chemicals were so long neglected was the mistaken belief that it was hopeless for man to try to improve on the products of Nature. Organic raw materials are the products of living things such as coal, petroleum, wood, and cotton—almost any kind of molecule containing the element carbon. Carbon is one of the most sociable of the elements; it readily joins hands for intermarriage with the more wayward members of the atomic family to form complex molecular miscegenations.

One of the first persons to entertain serious doubts about the generally accepted theory of the unimprovability over Nature was Friederic Woehler. In his Berlin laboratory he succeeded in isolating urea, present in urine, without the help of a kidney from man or monkey. He actually made urea out of lifeless compounds in an inanimate flask of glass. Thus, circa 1830, was slain "a beautiful theory by an ugly fact" and creative organic chemistry had arrived.

Carbon chemistry and organic chemistry are virtually synonomous, and they spell molecular magic. Not the rabbit-out-of-a-hat kind of magic but the if-you-don't-succeed-at-first-try-again kind. It was Ehrlich's 606th experiment that finally resulted in a killer of the syphilis microbe.

Until about 100 years before the atom smashers came upon the scene it was believed that the minutest particle of an element was the atom (Greek for can't cut; indivisible). Despite that erroneous assumption of natural philosophy, the chemists nevertheless made tremendous progress.

Coal, petroleum, and natural gas are geologically compressed packages of molecules containing carbon and hydrogen atoms. By torturing these molecules in heat and pressure chambers, they can be broken down into a variety of different useful products such as gasoline, kerosene, fuel oil, and many others. Or the lighter hydrocarbons can be built up into larger molecules of different tinkertoy-like arrangement, resulting in other useful products. Or, by injecting an atom of another element an entirely new compound results. For example, if an atom of chlorine is substituted for one of the hydrogen atoms in a molecule of methane (bottled gas), you get a refrigerant. On substituting two atoms of chlorine, you get a very effective paint stripper; by substituting three atoms of chlorine, you get an anesthetic; and substituting four, a cleaning fluid and a fire extinguisher. Such are the fruits of molecular manipulation, of which there appears to be no end.

Industrial dimensions

Today the chemical industry is, in round numbers, 700,000 people in more than 13,000 plants in all 50 states of the country. In 1962, the industry turned out 10,000 different products which were worth $16 billion more than the raw materials out of which they were made.

Among the 20 major families of manufacturing industries, as reported in the Census, "Chemicals and allied products" ranked fourth in value added by manufacture and value of shipments, tenth in employment, eighth in wage disbursements, and first in capital expenditures. The products of the industry are so numerous and diverse that the only sensible thing to do is to give a condensed summary.

CHEMICALS AND ALLIED PRODUCTS, 1962

Item	Value added by mfr. (millions $)
Basic chemicals	5,697
Fibers, plastics, rubbers	2,626
Drugs	2,636
Cleaning and toilet goods	2,525
Paints and varnishes	936
Agricultural chemicals	533
Gum and wood chemicals	101
Other chemical products	1,010
Total	16,064

Source: Bureau of the Census.

The best that can be said for this classification is that it is short, but it would horrify a chemist; the heterogeneity of chemicals raked together in some items is very unchemical. Basic chemicals, for example, is a hodgepodge of products such as alkalies, industrial gases, chlorine, inorganic pigments, and inorganic chemicals n.e.c. (not elsewhere classified) which probably means —we didn't know where else to put them. The last item, "Other chemical products," is a billion-dollar leftover of things like explosives, printing ink, and glue. Chemicals simply defy simplification.

Growth

Financial writers refer to chemicals as a "growth industry," by which they mean that it has grown rapidly in recent years and presumably will continue to do so. With respect to its early growth, however, there was nothing spectacular. John Winthrop's alum and saltpeter plant, built in Boston in 1635, is generally regarded as the country's first chemical factory. Alum was used to tan hides, and saltpeter to make gunpowder. George Washington signed the country's first patent issued in 1790 to Samuel Hopkins, a Philadelphian, for an improved kettle to make potash used in soap and glass manufacture. In 1793, John Harrison, another Philadelphian, built the first factory to make sulphuric acid by a new process developed in Europe.

In 1802, a French immigrant—E. I. du Pont—built a powder mill on the Brandywine near Wilmington. In 1819, the Lewises of Philadelphia started a white lead plant to manufacture paint. Chemical ventures during the latter half of the 19th century included fertilizer mixing factories, electrochemical manufacture of chlorine, and the manufacture of carbon electrodes. The emphasis was on inorganic products.

World War I gave a tremendous boost to organics which had just begun to flourish. The chemical industry supplied not only the huge demand for military explosives but also began making coal-tar dyes and pharmaceuticals which had been imported from Germany theretofor. Chemical processing of the by-products of coke ovens yielded a host of intermediates and finished products such as dyes, plastics, pharmaceuticals, insecticides, fertilizers, refrigerants, wood preservatives, varnishes, alcohol, and adhesives.

World War II cut off our Asiatic supplies of natural rubber, so the chemical industry developed synthetic rubber made out of petroleum and natural gas. A whole field of organics unfolded like crocuses and daffodils in springtime. Synthetic drugs began to take the place of natural drugs from herbs and roots; synthetic fibers appeared by the score to supplement natural fibers; synthetic foods and vitamins fortify our diet, and a variety of plastics are now competing with glass, metal, paper, and wood in thousands of consumer uses. Applying the value-added foot rule, chemicals grew almost 300 per cent between the two world wars, while all manufacturing grew 160 per cent. Since World War II the chemical industry has grown threefold, in contrast with a twofold growth for all manufacturing.

Name dropping

Among the famous names in the chemical industry are concerns such as Air Products, Air Reduction, Allied Chemical, Atlas, Chemetron, Cyanamid, Dow, du Pont, Hercules, Hooker, Monsanto, Olin, Pennsalt, Rohm and Haas, Stauffer and Union Carbide. These are only the most familiar names in the corporate cast, and it is not even a complete list of the blue chips. But all of them have attained considerable stature and play leading roles.

A lot of interesting things about the chemical industry appear in the Annual Reports which the companies prepare for their stockholders. A perusal of a score or more of these reports reveals, almost without exception, steady growth in dollar sales, expanding profits, acquisition of additional facilities by purchase or construction, the launching of new products with long chemical names and short trademark names—tetrachloromethane is to the chemist what Carbona is to the layman.

No two companies are alike, yet on reading their Annual Reports one is impressed more by their similarities than their differences. In millions of dollars of annual sales, the companies range from size 36 or even less to size 2,555 and anyone who reads the financial pages can readily identify the latter company. Practically all of the companies are multi-raw material, multiproduct, multi-process, multi-plant, multi-market, and the competition is multifarious.

Multifarious competition

Intense competition is said to characterize the chemical industry, but that is hardly a distinguishing characteristic because the same is said of almost every industry. Competition in the chemical industry, however, is unique in that the industry is beset with so many different kinds of competition—inter-raw material, interprocess, inter-commodity, inter-product, and inter-industry, and international.

Many chemicals can be made from alternate raw materials. Most sulphur, for example, is obtained by mining brimstone deposits; but sulphur is also derived from natural gas and and petroleum refinery gas, and is a by-product in the refining of sulphur-bearing ores. Similarly, detergents can be made from either natural fats or from petroleum; and ethyl alcohol can be made from either petroleum or molasses.

Numerous chemicals can be made by different processes. A widely used anti-freeze for automobiles (ethylene glycol) may be made by four different processes; carbolic acid by three different processes; and acetic acid by ten different processes.

Inter-commodity competition is widespread in chemicals. Chlorine, for example, competes with hydrogen peroxide as a bleaching agent and with ammonia compounds as bactericides.

Inter-product competition is especially keen in the chemical industry. Common examples are nylon versus saran; synthetic rubber versus natural rubber; and cellophane, wax paper, and aluminum foil all compete vigorously in the packaging and wrapping field.

Inter-industry competition gives chemical executives sleepless nights. Concerns in related or unrelated industries—such as electrical equipment, foods, metals, paper, rubber, photographic supplies, petroleum refining, and even ocean shipping—have invaded the chemical industry. According to a 1961 study of the Manufacturing Chemists' Association, 40 per cent of the new chemical construction covered in the survey was classified basically as "Nonchemical companies." Among the invaders, the petroleum industry is a natural because petroleum and natural gas are rich storehouses of hydrocarbons capable of producing an astonishing variety of petrochemicals—such as ammonia, synthetic rubber, carbon black, several different kinds of alcohol, and innumerable types of plastics.

And then there is international competition. French, English, German, Italian, and Swiss chemists are smart also. We need not be apologetic, but before waving the American flag too vigorously take a look at all the foreign winners of the Nobel prize in chemistry over the years.

R. and D.

Research and development in the chemical industry is not a fetish, not a religion, not a sideline; it is the industry's lifeline.

Competition begins in the company's laboratory and ends when the board of directors declares a dividend. To have a grey-haired Nobel prize winner on the board is a noble gesture, but it is even better to have a future prize winner in the laboratory.

Research is of two kinds—pioneering and supporting. Pioneering research is exploration—hunting and fishing expeditions in the world's molecular jungle. Many a scientific safari returns empty-handed, but an occasional journey is rewarded with the discovery of a hitherto unknown species. Examples: du Pont's nylon and corfam (synthetic leather), Dow's saran, and Sir Alexander Fleming's penicillin.

Supporting research has as its goal the improvement of existing products, or the development of new uses. This type of research, which has already opened up thousands of uses for plastics as fibers, films, and foams, is now developing larger markets in the automobile and construction industries.

Owing to the complexity of the molecular universe, chemical research frequently leads into unexpected and unpredictable avenues of revenue. This may be illustrated by the sorbitol story, which launched Atlas Chemical Industries into the labyrinthine field of organics.

When the company's explosives division made blasting caps and was using fulminate of mercury in the process, one of the by-products was a heavy fog that hung low over the valley where the plant was located. In the search for a substitute for the smog-producing mercury fulminate, which was sometimes scarce and always tricky, the company chemists hit upon a substance called mannitol hexanitrate, made from mannitol. The production of each pound of mannitol from sugar, however, was accompanied by four pounds of by-product sorbitol for which a market had to be found to justify the switchover from mercury to mannitol. In due time, expanding markets were found for the white, odorless, crystalline sorbitol as a food additive because of its ability to retard evaporation and to retain moisture in dry weather, and as the starting material for a new family of emulsifiers.

The sorbitol story is illustrative of what happens over and over again in chemical laboratories, and it explains why the industry spends millions on research. Fully 15 per cent of the people on a chemical concern's payroll may be in the research division, and there are not many industries which take research that seriously.

The sorbitol story also illustrates another characteristic of chemical research. Most of it is profit-motivated and pinpointed toward specific goals. Only the biggest companies with huge financial resources can afford the luxury of "wildcatting" which customarily goes under the more dignified title of pure research.

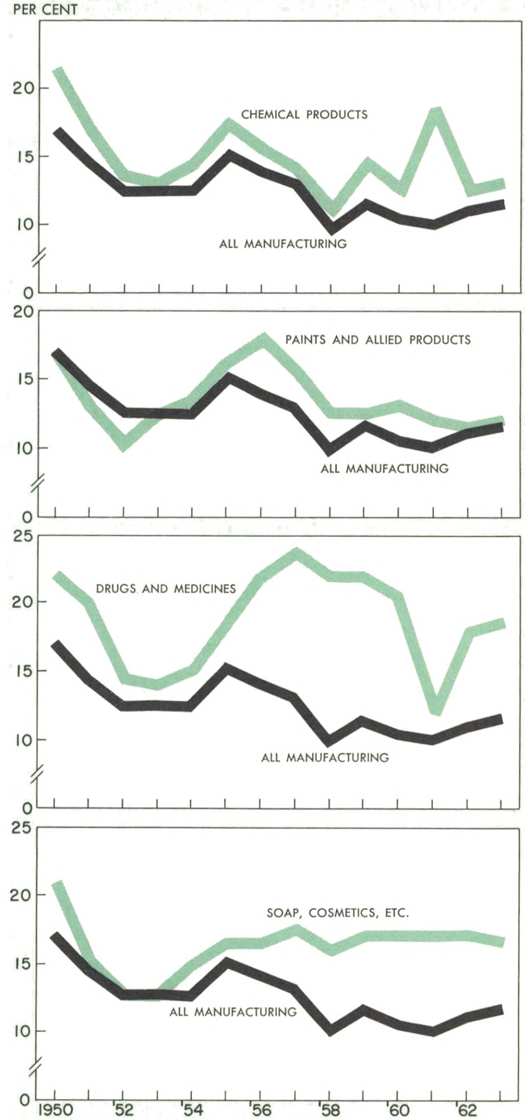
The sorbitol story reveals yet another characteristic or trend of chemical research. The industry's research is becoming more and more sophisticated. Scientific breakthroughs are seldom the product of the isolated chemist playing around with plain molecules in a corner of his garage; they are the result of a chemical crew working on fancy molecules with sophisticated equipment in a big laboratory which if not plainly labeled may be mistaken for the executive suite. The most successful companies are forever adding new products to their multiple lines and withdrawing old ones that have had their day. New products introduced during the past five years account for almost one-fifth of present sales volume, which is indicative of the industry's dynamics.

Profits

Earnings in the chemical industry are generally good; good in the sense that they are above average. There is just as much reason to call chemicals a profitable industry as there is to call it a growth industry, and of course there is some cause-and-effect relationship between the two. There is also a relationship between competition and products, and between products and profits.

Evidence of the chemical industry's better-than-average earnings is shown in the chart portraying the percentage return on net worth in several branches of the chemical industry in

RETURN ON NET WORTH IN CHEMICALS



Source: First National City Bank—New York.

contrast with all manufacturing. For the period from 1950 through 1963, it is apparent that earnings of the various lines of chemical products seldom descend to or below the all-manufacturing industry level. No doubt the luxuriant growth of organics in recent years is largely responsible for the superior earning power.

How well a particular chemical firm fares depends, in part, on its line of specialty. Manufacturers of so-called "heavy" chemicals, that is, the old-line, standardized products such as the acids, alkalies and salts (inorganics) encounter tougher competition than producers of the newer chemicals (organics). So many of the heavy chemicals are industrial chemicals, that is, they are bought by other chemical companies or other manufacturing industries—all sharp-pencilpoint buyers. Moreover, in some lines of chemicals the competitive going is rough because of the large number of producers in the arena. There are over a thousand manufacturers of paint. Selling paint is much like selling rugs at a Turkish fair. There is also a stampede into certain types of plastics, notably plastic pipe.

Observe, by way of contrast, the loftier profit curves of producers of drugs and medicines and also the manufacturers of soap and cosmetics. The producers of these products sell a large proportion of their output to the ultimate consumer. At the very outset in his Annual Report, the Chairman and chief executive officer of one of the big chemical companies said, in commenting on the substantial rise in consolidated sales: "The major part of the increase in sales volume came from greater sales of consumer products. . . ."

On taking another and somewhat harder look at the chart of "Return on Net Worth in Chemicals," it appears that all the lines slope irregularly downward toward the southeast. This tendency has inspired some financial scribes to say that the industry's honeymoon is over. That could be, but we are inclined to doubt it. First, because the sagginess in the trend of the chemical curves is no greater than that of the all-industry curve; and, second, because the chemical industry is so chemical, so dynamic, so resourceful, so exploratory, so irrepressible in its pursuit of new ways to net profits. Unlike the automobile industry, which makes automobiles, or the shoe industry which makes footwear, the chemical industry produces a smorgasbord of hors d'oeuvres for all industries, for everybody. The multiplicity of product lines and new products sticks out all over the Annual Reports of the leading companies.

Plain and fancy molecules on the Delaware

The fact that every state in the country has chemical plants does not mean that boards of directors roll the dice to select the location for a new plant. Proximity to the market often speaks loudest, and that is probably one of the major reasons why New Jersey is the country's most chemical state. In recent years, however, the growing importance of petrochemicals and agricultural chemicals has stimulated much new plant construction in the South Atlantic, and Gulf states—notably Texas. Nearness to markets, nevertheless, is a continuing attraction which accounts for the prominence of New York, Illinois, and Pennsylvania in the chemical industry.

In Pennsylvania and the Philadelphia Federal Reserve District (shown on the map), the heaviest concentration of chemical manufacturing is along the Delaware River and its tributaries. Water, you know, is a chemical compound which chemical plants use in a variety of ways and it is also handy to have a river for transportation.

Chemical manufacturing is one of the topranking industries in the Philadelphia standard metropolitan area, which includes Bucks, Chester, Delaware, Montgomery, and Philadelphia counties on the right bank, and Burlington, Camden, and Gloucester on the left bank in New Jersey. Plants and in some cases head offices in this part of the Valley and up-river tributaries bear such well-known names as Rohm and Haas; Smith, Kline, and French; Wyeth; Allied Chemical; American Viscose; Continental Diamond Fiber; Merck, Sharp, and Dohme; Union Carbide; Pennsalt; Publicker; General Dynamics; and numerous smaller firms.

On qualitative analysis, the chemical industry of the Philadelphia metropolitan area likewise stands up well. As shown in the table, the region goes in less for the plain molecules and more for the fancy molecules. In contrast with the country's distribution of chemical employment, the local manufacturing mix is proportionately much heavier in such things as drugs, plastics materials, synthetic resins, synthetic rubber, and synthetic fibers. Metropolitan Philadelphia goes in less for basic chemicals—the old-fashioned plain molecules.

PERCENTAGE DISTRIBUTION OF EMPLOYMENT IN THE MAJOR DIVISIONS OF THE CHEMICAL INDUSTRY, 1960

Major groups	Percentage employed	
	United States	Phila. 8-county area
Basic chemicals	33.3	16.7
Fibers, plastics, rubbers	18.0	31.0
Drugs	14.1	25.4
Cleaning and toilet goods	11.5	6.8
Paints and varnishes	8.3	9.2
Agricultural chemicals	5.9	2.9
Miscellaneous	8.9	8.0
Total	100.0	100.0

Sources: Industrial Directories of Pennsylvania and New Jersey and Annual Survey of Manufactures.

The chemical capital

The farther down the Delaware you go the more chemical the Valley becomes, and at Wilmington the Valley is at its chemicalest. Wilmington has been called the "chemical capital of the world." That might be a slight exaggeration, but there is just enough truth in it to make it credible for it would be difficult to find a region of comparable size so saturated, so super-saturated, with chemical plants and chemical products, and chemical laboratories, and chemical conversation, and chemical cerebration.

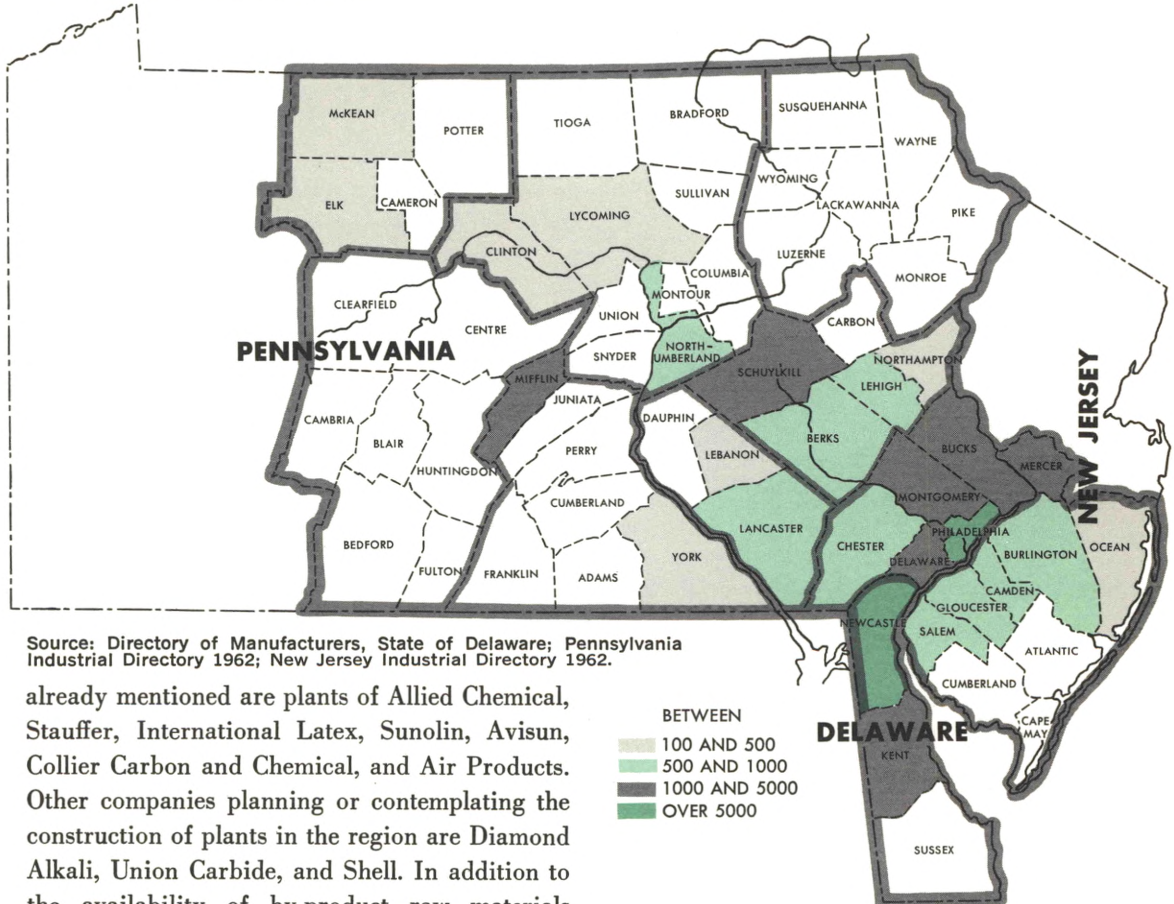
The mere mention of Wilmington suggests du Pont, headquartered in the city's two most imposing office buildings, linked together like a massive molecule in masonry. The buildings house the brain trust that supervises the operation of 80 plants in 69 communities in 28 states, not to mention numerous foreign subsidiaries and affiliates. From the upper floors of the central office building may be seen some of the company's plants on both sides of the river. Just a few miles west of the head office in suburban Wilmington are the company's head laboratories —eight neatly tailored buildings geometrically placed within 160 acres of green and quiet countryside. One is an administration building, and research in seven different directions is pursued in the remaining seven.

Nearby is the head office and the head laboratory of Atlas, and on the riverfront one of the company's numerous plants. Wilmington is also the home of Hercules.

The profusion of oil refineries on the Delaware, both above and below Wilmington, is a great attraction for the proliferation of petrochemical manufacturing. The lower Delaware petrochemical boom was rejuvenated upon the completion, in 1957, of Tidewater's big oil refinery. Along with the area's indigenous firms

CHEMICALS AND ALLIED PRODUCTS EMPLOYMENT

In firms with 100 or more employees.



Source: Directory of Manufacturers, State of Delaware; Pennsylvania Industrial Directory 1962; New Jersey Industrial Directory 1962.

already mentioned are plants of Allied Chemical, Stauffer, International Latex, Sunolin, Avisun, Collier Carbon and Chemical, and Air Products. Other companies planning or contemplating the construction of plants in the region are Diamond Alkali, Union Carbide, and Shell. In addition to the availability of by-product raw materials from the petroleum refineries of the region is the additional attraction of the availability of large plots of land along Delaware tidewater south of Wilmington and, of course, the proximity of big markets.

Inside the atom

Howsoever astonishing the achievements of the chemical industry in monetizing molecules, the scientists have already made considerable progress in taking "indivisible" atoms apart and putting them together again to see how they work. Up to now, more than 30 subatomic particles have either been discovered or predicted, thus enlarging our knowledge of the infinitesimal.

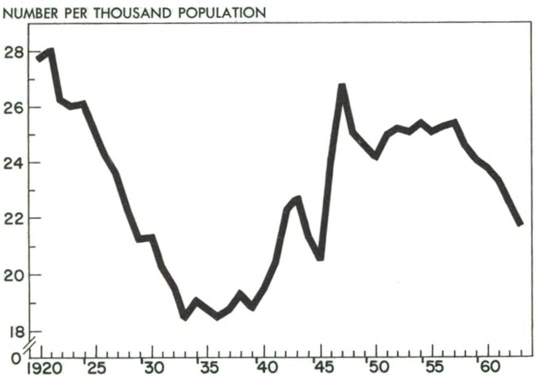
Under wartime stimulus, fissionable uranium and plutonium unlocked untold stores of power for destructive purposes, but the same materials can produce power for peace. Having discovered that matter is energy in captivity, the chemical industry may progress from monetizing molecules to fiscalizing fission.

THE BABY BOOM THAT ISN'T

For reasons as numerous as they are obscure, Americans are having fewer and fewer babies in the 1960's. The birth rate has fallen steadily since 1957 and the annual total number of births also has declined over the past few years. The reasons for these declines have been the subject of much speculation. Some people already are wondering what effect a slowdown in baby output might have on the economy, present and future. Below are several charts which may throw some light on what is happening, even if they do not explain completely why.

The birth rate has plunged steadily downward since 1957–8. In historical terms, the rate is neither high nor low, standing at 21.6 at the end of last year. Indeed, were the rate to hold at present levels, it might well be a comfortable long-term rate on the basis of past experience.

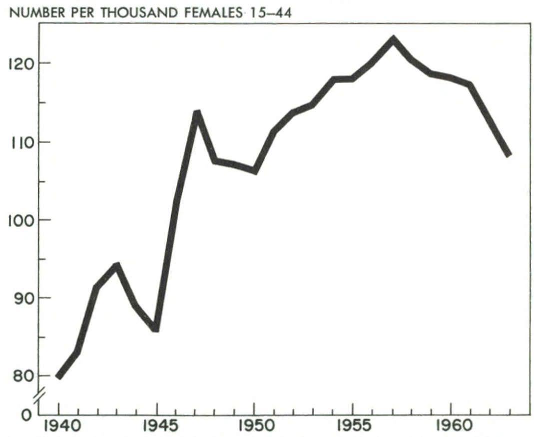
UNITED STATES BIRTH RATE



Source: Vital Statistics of the United States and Health, Education and Welfare Indicators.

The fertility rate—the number of births per 1,000 women aged 15 to 44—also has declined during this period. The great majority of mothers, actual and potential, fall into this age category and inclusion of other age groups would probably have little effect on the trend.

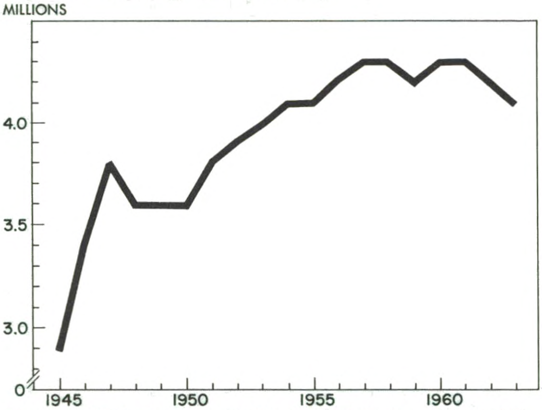
UNITED STATES FERTILITY RATE



Source: Vital Statistics of the United States and Health, Education and Welfare Indicators.

Until 1960 the number of births rose despite the fall in both the birth rate and the fertility rate. Even though these rates were lower, the child-bearing population had grown enough so that the number of births each year rose. This has not been true over the last three years, largely due to the further fall in the fertility rate.

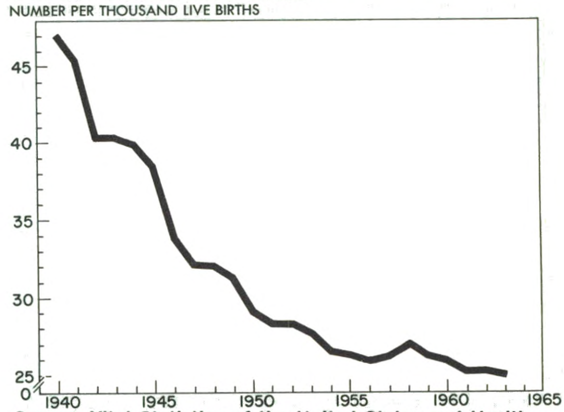
UNITED STATES LIVE BIRTHS



Source: Vital Statistics of the United States and Health, Education and Welfare Indicators.

One reason the birth rate has declined so sharply is that the American infant mortality rate for the total population has leveled out around 25 per 1,000 births after declining for many years. A key reason the rate remains so high is the substantially higher rate among poor and underprivileged groups across the country. A major drive has been started by health officials to cut the rate for non-whites down from its recent level of 41.4 per 1,000 births.

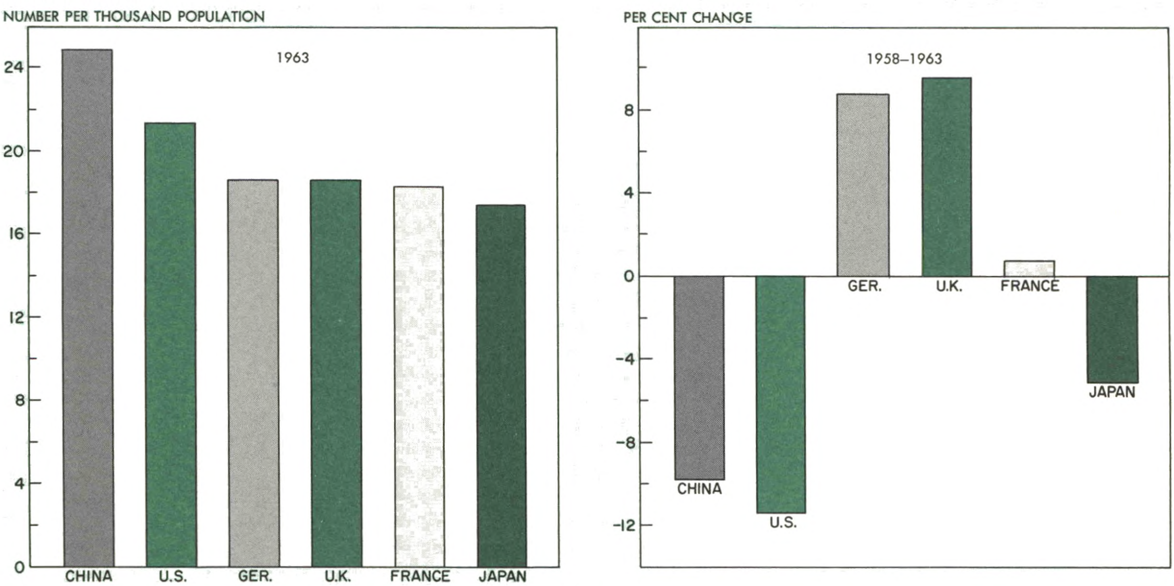
INFANT MORTALITY RATE



Source: Vital Statistics of the United States and Health, Education and Welfare Indicators.

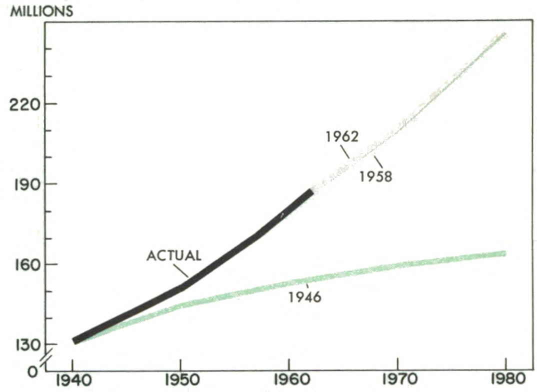
Despite its recent decline, the United States birth rate is still high compared to that of several European countries, although it is lower than the Canadian rate. Since 1958, however, our rate has fallen off by more than 11 per cent, while in France, Germany, and the United Kingdom, the rate has increased from about 1 per cent to about 10 per cent.

BIRTH RATES



Source: United Nations Monthly Bulletin of Statistics, June 1964.

UNITED STATES POPULATION PROJECTIONS, 1946, 1958 AND 1962



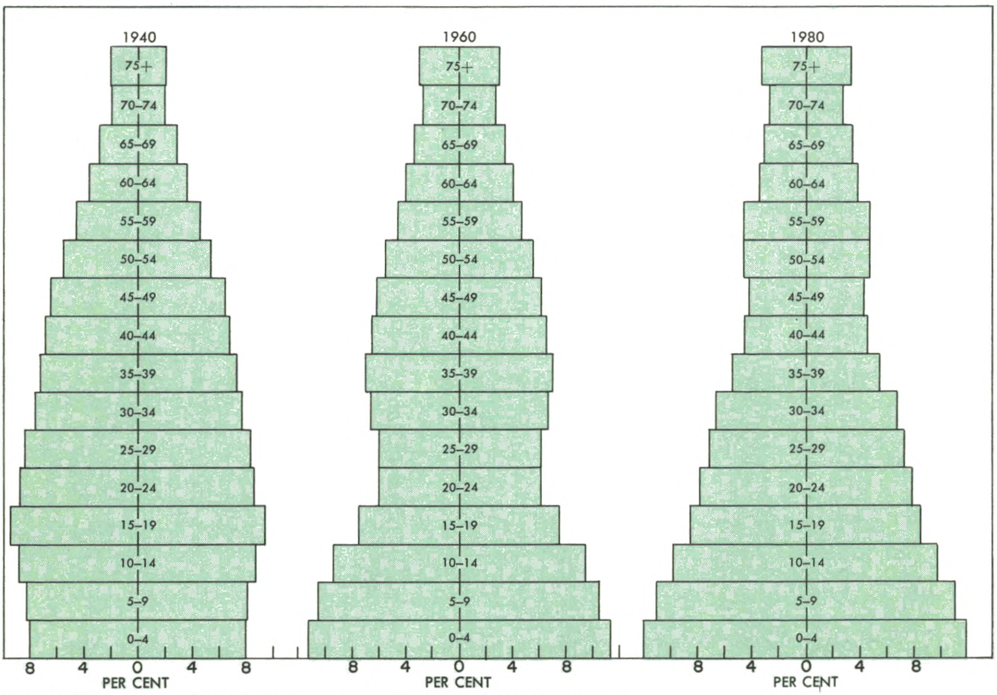
Source: Bureau of the Census.

In the 1940's, prognosticators predicted population increases using the birth rate of the late 1920's and 1930's. Their projections were a mite low. Two years ago the United States Public Health Service estimated there would be 209–214 million Americans in 1970. Now the estimate (not shown) has been revised downward to 206–211 million in 1970.

One key to the fall in the number of births, and perhaps the birth rate, over recent years is the shifting age distribution of the population. In the 1930's, the rate fell to its lowest level since the end of World War I. The result was that in the 1950's the 20–29 year-old groups were considerably smaller than usual, as shown in the middle figure below. The 20–29 year-old groups are the most productive ones for child-bearing. If they are smaller than usual, a fall in the birth rate for the total population should not be surprising. The chart in the middle below shows that the "waist" of the 1960 age distribution is precisely in these age groups.

The number of people in these groups is growing. By 1980, as the figure on the right shows, this "waist" will have moved out of the productive range and the 20–29 year-old groups probably will have returned to their former sizes. To the extent that age distribution is a factor determining the birth rate, we can perhaps anticipate a rise in the birth rate and the number of births as the war babies, coming of age, marry and start their own families.

UNITED STATES POPULATION BY AGE



Source: United States Department of Commerce, Bureau of the Census.

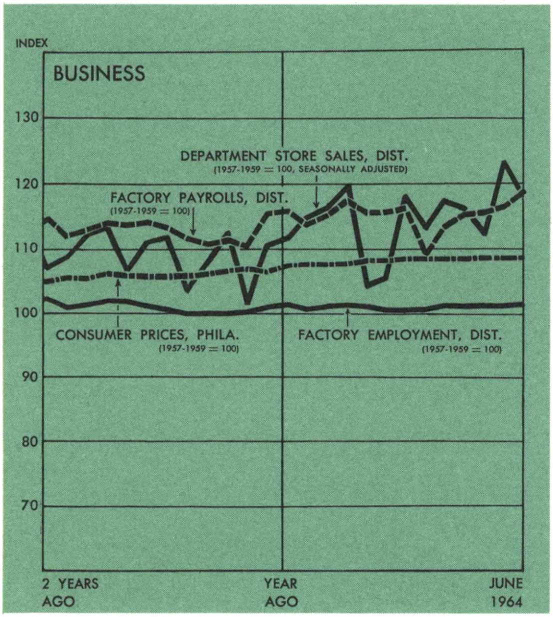
Summary

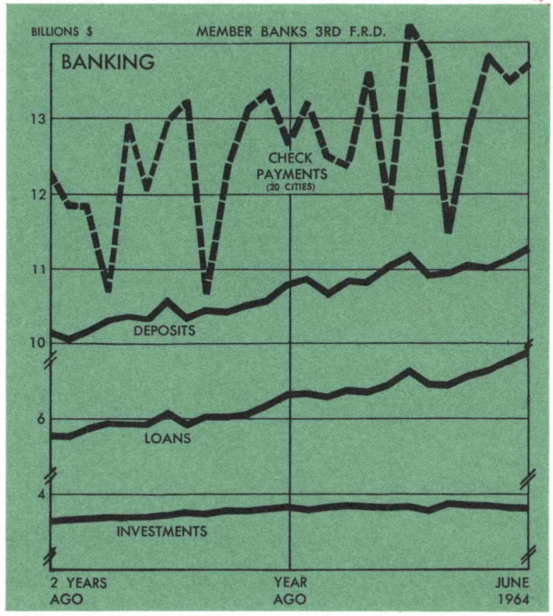
This section might well be called "Random thoughts on a curious phenomenon." Clearly, as more persons enter the most productive periods, there will be more potential parents. But this is no guarantee that the birth *rate* will rise dramatically.

One reason people are having fewer children today may be simply that it is increasingly expensive to have, raise and educate a child. Pre- and postnatal care, hospital charges and the like run around $400-500. Very roughly, barring any extraordinary expenditures, a child costs about $1,000 a year after taxes to maintain, costing less at the early ages and more in the teen-age years. A college education and upkeep for the four-year period may run from $10,000 to $15,000. Thus, the total cost of man's pride and joy may be in excess of $30,000 from womb to sheepskin.

Yet for most families above a certain income level, the decision to have children is not primarily an economic one. If families make any economic calculation, it is usually that of the "opportunity cost" of having a child. This is the real cost of any good, that of the next best alternative use of the money, in this case that which might be spent on a child. Made subconsciously this calculation is expressed as: What will a child cost in terms of foregone luxury or time-saving devices? Do we want a child or a color television? Do we want a second child or a trip to Canada? Do we want a third child or a second car? For most people these are the relevant economic calculations. In a time such as this when innovation and invention offer almost unlimited plenty to the majority of American families, the decision may be being made against the potential child and in favor of better material well-being.

FOR THE RECORD...





SUMMARY	Third Federal Reserve District			United States		
	Per cent change			Per cent change		
	June 1964 from		6 mos. 1964 from year ago	June 1964 from		6 mos. 1964 from year ago
	mo. ago	year ago		mo. ago	year ago	
MANUFACTURING						
Production	....	....	....	+ 2	+ 5	+ 6
Electric power consumed	+ 4	+ 8	+ 7	....	....	....
Man-hours, total*	+ 1	− 1	− 2	....	....	....
Employment, total	+ 1	0	0	....	....	....
Wage income*	+ 1	+ 3	+ 2	....	....	....
CONSTRUCTION**	−13	−16	+14	− 3	+ 2	+ 8
COAL PRODUCTION	+ 3	+ 4	+ 4	+ 1	− 8	0
TRADE***						
Department store sales	− 4	+ 5	+ 8	....	....	....
BANKING (All member banks)						
Deposits	+ 1	+ 5	+ 5	+ 2	+ 6	+ 7
Loans	+ 2	+ 9	+ 9	+ 2	+13	+13
Investments	0	0	+ 2	0	− 2	0
U.S. Govt. securities	0	− 7	− 6	0	− 9	− 8
Other	0	+13	+18	+ 2	+12	+15
Check payments	+ 1†	+ 8†	+ 5†	+ 7	+18	+11
PRICES						
Wholesale	....	....	....	0	0	0
Consumer	0‡	+ 1‡	+ 2‡	0	+ 1	+ 1

*Production workers only.
**Value of contracts.
***Adjusted for seasonal variation.

†20 Cities
‡Philadelphia

LOCAL CHANGES	Factory*				Department Store†		Check Payments	
	Employment		Payrolls		Sales			
	Per cent change June 1964 from		Per cent change June 1964 from		Per cent change June 1964 from		Per cent change June 1964 from	
	mo. ago	year ago	mo. ago	year ago	mo. ago	year ago	mo. ago	year ago
Lehigh Valley	+1	+1	+ 1	+ 7	....	....	+ 7	+11
Harrisburg	+1	+1	+ 1	+ 7	....	....	+ 4	−12
Lancaster	+2	+1	+ 3	+ 9	− 5	+ 8	+ 4	+23
Philadelphia	+1	−2	+ 1	0	− 5	+ 5	− 1	+ 4
Reading	0	+1	0	+ 5	− 9	+ 5	+ 2	+11
Scranton	+2	+3	+ 4	+ 9	− 6	+ 5	− 1	+11
Trenton	+1	+1	0	+ 3	− 4	+ 5	− 7	+10
Wilkes-Barre	0	+2	− 1	+ 9	− 2	+ 4	+ 4	+16
Wilmington	+2	+3	0	+ 8	− 8	+ 6	+11	+21
York	+4	+7	+ 4	+13	− 8	+ 7	+ 6	+49

*Not restricted to corporate limits of cities but covers areas of one or more counties.
†Adjusted for seasonal variation.