2.
House of Wonders

In this century Dow has grown to be a $20 billion-a-year firm, with operations pole to pole and an impact, in one way or another, on most of humanity.

E. N. Brandt, *Growth Company*

Herbert Dow arrived in Midland, Michigan just as the state's big timber boom was winding down. It was August 1890. A frenetic four decades of taking down Michigan's rich stands of big White Pine had preceded Dow's arrival. The gold rush to timber began in the late 1840s, and Central Michigan's Saginaw Valley was part of the frenzy. Huge flotillas of logs streamed down the Tittabawassee River past Midland to the mills in Saginaw Bay, and from there, out over the Great Lakes to Eastern and Midwestern markets. Enormous fortunes had been made. Now in 1890, as Herbert Dow rode the train to Midland, he was running against the tide. The fortune seekers were heading in the opposite direction—they were leaving Midland. All that remained around Midland, and what young Dow saw as he stepped off the train, were stumps. But Dow hadn't come for the timber in any case. What he wanted was under the ground; the remains of an ancient inland ocean, baked by eons of sun, leaving huge deposits of brine, nicely preserved by the preceding Ice Age.

Herbert Dow had heard about the brines in Michigan. For years, men had been pumping salt water in the Saginaw Valley and evaporating it for salt. In fact, Michigan in the late 1800s was the leading salt-producing state in the nation. But neither Dow nor anyone else fully realized just how big the underground cache of mineral- and chemical-bearing brines were. But young Dow, picking Midland, had an incredibly good stroke of fortune—locating over the geologic center of a nearly inexhaustible source of underground brine. "The sea of brine was his raw material waiting to be processed," writes Don Whitehead in *The Dow Story*, of Herbert Dow's coming to Midland in the 1890s. "It cost him nothing except the expense of pumping it. The earth was his storage tank to be drawn on any time he chose. The Michigan brine was rich in bromides, and in calcium, magne-

sium, and sodium chloride. And with his revolutionary process (using electricity to separate the bromine and chlorine from the brine . . .) his early manufacturing costs were lower than his competitors . . . "[1]

Young Dow was fully an Horatio Alger-type character, charging into projects with complete confidence and endless energy. Initially, he failed with a start-up business in Canton, Ohio before coming to Midland. Eventually, with the help of backers in Cleveland, Herbert Dow established the Dow Chemical Company in 1897. He soon saw chlorine as the bigger prize, with bleach as the first big possibility—the demand for which was then substantial from the textile, cotton, and paper industries. The invention of the rotary press helped power the demand for printing and paper—and for bleach in the paper industry. "About $2,000,000 worth of chloride of lime or bleaching powder is consumed here each year in the U.S.," he told a group of investors in Cleveland, "but none is now made here on a commercial scale. . . . We propose to manufacture it by a new electrical process. . . . "[2]* Within months of that claim, Dow was producing chlorine from brine at Midland. But Dow would later leave the bleach business, believing that chlorine had more valuable uses. Soon, other new chemicals such as phenol and chloroform began flowing from Dow's new business, building upon the original brine chemicals, but combining them with others to form a much broader chemistry.

It soon became clear to Dow that chlorine was the bigger prize.

Salt, Savvy & Synthesis

In many ways, salt is the cornerstone ingredient of the Dow Chemical empire—salt and Herbert Dow's electrochemical savvy in separating and exploiting salt's primary components: chlorine and sodium. Dow unlocked salt's chemical potential. "Dow's first generation products were bromine-based," explains author William Boddie in a company publication titled, *Salt, The Mysterious Necessity*. "His second generation products were chlorine-based. His third generation products were based on magnesium chloride and calcium chloride salts that were also components of the Midland brine." Further along, Dow also worked with iodine salts in brine and mined the ocean for bromine and magnesium. As Dow's empire grew, each expansion involved an affiliation with a brine deposit of some kind—or a way to get at

*Traditionally the brines were worked in a multiple-step process to get at the bromine. Dow changed that by running an electric current through the brine that released the bromine, then blowing air through the bromine to vaporize it into a direct-collection system. He later devised a similar system for chlorine.

the elements of salt.* But from the beginning, the Dow empire was built in a step-wise, building-block fashion—linking one chemical to the next.

From the basic compounds made from the brine in Dow's early years—mostly salts such as sodium chloride, calcium chloride, magnesium chloride—it was possible, in further reactions and combinations with other chemicals, to fashion new synthetic compounds. By the early 1900s, for example, Dow was making chloroform in a process that used, among other ingredients, sulfur chloride as a raw material. Chloroform, sold chiefly for medicinal purposes, became the first Dow product other than bleach to use chlorine. Carbon tetrachloride was also produced in the same process, but at an earlier stage in the reaction, and by 1908, had become more valuable to Dow than the chloroform, sold largely for use in fire extinguishers. Carbon tetrachloride, in turn, was also used as a starting material for making other chemicals. But Herbert Dow—always on the lookout for new ways to use bromine and chlorine—also had his eye on the constituents of petroleum for making new compounds as early as 1911. By 1913, his company was "cracking," or heating, gasoline in the lab to yield a gas that had "quite a percentage of butadiene," later to become important in plastics. Dow's scientists were also successful around the same time in making ethylene dibromide by cracking pentane. Explain Dow biographers Murray Campbell and Harrison Hatton: "[Herbert Dow] was looking for a cheap and plentiful source of such unsaturated hydrocarbons as butadiene and ethylene, which he knew could be treated with chemicals like chlorine to make almost an infinitude of new compounds."[3] Dow would later become a leader in making chlorinated petrochemicals. And when Dow scientists around 1915 moved to improve the making of phenol in a process using caustic soda, chlorobenzol, and hydrochloric acid, the process also yielded four useful by-product chemicals that helped reduce the cost of making phenol and more. Two of the by-product chemicals—orthophenylphenol and paraphenylphenol—were never-before-seen chemicals, and became the base of a line of Dow pesticides. Paraphenylphenol also was used to make a varnish for boat hulls. Another phenol by-product was diphenyloxide, later converted to a material for manufacturing that could hold high temperature at low pressures with great stability, a product that became known as *Dowtherm*.[4] And on it went,

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*Dow's expansion to Pittsburg, California in 1938 used salt produced by solar evaporation from the waters of San Francisco Bay. In Freeport, Texas in 1940, an underground salt dome was tapped for magnesium and bromine, as was the Gulf of Mexico. In Sarnia, Ontario during the early 1940s, salt was involved. In Plaquemine, Louisiana, in the 1950s, again salt and ethylene became key. In the 1960s, salt deposits were important in Europe—in the formation of Dow Unquinesa in Spain (1960); Terneuzen in the Netherlands (1964); and Stade, Germany (1972). Fifty years later, in 2002, Dow was still acquiring brine deposits, opening a field in Western Canada. See Mark Batterson and William W. Boddie (eds.), *Salt, The Mysterious Necessity*, Dow Chemical Company, 1972, pp. 110–12.

from chemical to chemical, product to product, a pattern that would stoke Dow inventiveness and chemical serendipity for the next century.

Autos & Gasoline

Herbert Dow had always thought there might be a way to link the fortunes of his business with those of the nascent automobile industry. His first idea was to use magnesium in automobiles—the magnesium he had begun extracting from brines. In 1919, using the DowMetal brand name adopted for its magnesium, the company began making DowMetal pistons for automobile engines. By 1921, a national advertising campaign began on behalf of DowMetal, and on Memorial Day that year, race car driver Tommy Milton won the Indianapolis 500 in a car using DowMetal pistons. Despite the notoriety, DowMetal pistons never caught on. But Dow's fortunes in the auto business were about to change.

The gasoline of that day was poorly refined and of low octane, causing engines to knock and run rough. The fuel, rather than exploding in the engine's cylinders smoothly and rhythmically, burned erratically or fired too fast, causing a jerky, uneven acceleration, and loud engine knocking noise. The poor performance was also hard on the engine. General Motors (GM), had been on the hunt for an additive to address the engine knock problem since about 1916, and GM's Thomas Midgley discovered in 1920 that tetraethyl lead did the trick. But the leaded gasoline left behind a metallic deposit that fouled the cylinders and spark plugs, resulting in a clogging action that was worse than the knocking problem. GM then sought a cure for the deposit problem. Herbert Dow, learning of GM's search, sent some samples of chlorinated compounds to GM's laboratories in Dayton, Ohio. Among the samples was ethylene dibromide (EDB), a derivative of bromine. At GM, Midgley had in fact already found that EDB had worked—using a mixture of two parts EDB to every three parts of tetraethyl lead. Dow had been producing EDB for some time, but had no real market. Now it did, as GM was satisfied that Dow and its favorably-located Michigan brine deposits could fill the bill. This was a huge development for Dow, and indeed, a project so big in its potential demand that Herbert Dow worried it would throw his company's production out of kilter and present a huge waste brine disposal problem. Nevertheless, Dow began supplying GM with bromide at a pilot level of about 100,000 pounds a month. Soon GM returned, and asked Dow to supply 600,000 pounds a month, sending the material to the tetraethyl lead company, then named Ethyl Gasoline Company. But two months after the deal was made with GM and Ethyl, tetraethyl lead came under suspicion as a dangerous substance. Workers handling and breathing the tetraethyl lead at the Standard Oil Company (today, Exxon) in Elizabeth, New Jersey, and later at a DuPont plant in Deepwater, New Jersey, had died. Questions surfaced

over the safety of the new lead anti-knock additive, to be used widely by the motoring public and in cities. New York banned the sale of leaded gasoline, and some other cities followed. State and federal investigations were begun into the worker deaths, and production was halted for more than a year. But in what many believe was a short-sighted ruling, even at that time, government reports found that leaded gasoline itself was not harmful and that faulty laboratory and safety procedures had caused the worker deaths, not the lead.[5] With this government blessing, leaded gasoline—and Dow's production of ethylene dibromide—boomed. Back in Midland, Herbert Dow's son, Willard was put in charge of building out the new bromine production capacity—the new wells and pipelines that would now be required to supply the bromine for ethylene dibromide production. "...We pushed out twenty to thirty miles from the plant with our wells and pipes...," Dow's Dutch Buetel would later recall.[6] For years thereafter, Dow's ethylene dibromide would be mixed with the tetraethyl lead in millions of gallons of gasoline, year after year.

By the late 1930s, Dow was supplying 30 million pounds of ethylene dibromide for leaded gasoline from one plant alone.

By 1928, Dow built its first plant outside of Midland to exploit brines, this one in Louisiana to produce iodine from waste brines, forming another Dow company in the process—the Jones Chemical Company. But the demand for Dow's brine-derived products was growing, especially for EDB in leaded gasoline, exceeding Midland's capacity. In June 1930, Dow had sent one of his men to scout the East Coast for a location where a plant could be built to extract bromine from seawater. By 1933, Dow and the Ethyl Gasoline Company had built a plant at Kure Beach on North Carolina's Cape Fear peninsula to extract bromine. At the time, Dow anticipated that its yearly production of 6 million pounds of EDB would meet the need for several years to come. But two years later, the plant capacity had to be nearly doubled to 10 million pounds, and then doubled again by 1937, reaching 20 million pounds. A year later it was expanded again, adding another 10-million-pound production unit. Dow by this time was supplying 30 million pounds of ethylene dibromide for leaded gasoline from this one plant alone.[7] Years later, after Dow had begun extracting minerals and chemicals from seawater in Texas, the company exited the Michigan-based brine business, leaving a network of more than 100 brine wells and miles of pipeline strewn through Midland, Bay, and Saginaw counties. These wells proved to have ongoing environmental problems during their operation and for years after Dow officially left the brine extraction business.*

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*See Chapter 19 for more detail on Dow's brine pollution problems.

Dow's business in the 1930s, however, went well beyond the brines and the auto industry. Dow's Midland operation by 1930 was producing over 800 rail-car loads a month of some 150 chemical products.[8] Dow was also beginning its early moves into wood cellulose-based plastics, and in 1935 formed the Cliffs Dow Chemical Co. at Marquette, Michigan to manufacture wood chemicals. By June 1936, Dow Chemical was listed on the New York Stock Exchange. In 1938, in what would later prove to be a key acquisition for its research and production capabilities, Dow acquired the Great Western Electrochemical Co. at Pittsburg, California. By the end of the 1930s, Dow was America's fastest growing chemical company, then ranked as the fifth largest, behind DuPont, Allied, Union Carbide, and American Cyanamid.[9] But soon, with World War II on the horizon, Dow was about to change and grow in some fundamental new ways.

World War II

Dow played a key role during World War II producing strategic materials for the Allies—magnesium, a key ingredient for bombers and fighter planes; silicone, produced and supplied through Dow's new joint venture, Dow Corning; and styrene for synthetic rubber. As early as 1909, Dow chemists had been searching for a synthetic rubber but had not found a viable substance. In 1941, Dow teamed up with Goodyear and proposed to the government the two companies build a synthetic rubber plant, but the government turned them down. After Pearl Harbor, and the Japanese takeover of Southeast Asia's rubber plantations, the government changed its tune and launched a crash program to make synthetic rubber. Dow, as the only company producing styrene on a commercial basis, was soon enlisted to help lead the effort, building styrene plants for the government at Velasco, Texas and Los Angeles, California. Dow scientists had also been exploring silicone, and in 1940, teamed up with a group of scientists from the Corning Glass Works in New York, also then working on silicone. By 1942–43, the Dow-Corning company was formed, a 50–50 venture that was soon supplying silicone sealants for the ignition systems of Allied aircraft.* *Dow Corning 4*, an engine grease, enabled B-17s to fly at 35,000 feet, which gave the Allies an important advantage in the air war. Stateside, in Texas, the Dow Company had set its sights on expansion, and had purchased land near Freeport, Texas where it began to build. By January 1941, Dow began its magnesium-from-seawater venture at Freeport, and had already been producing the light metal for years in Michigan. With WWII, however, and the need for lighter and faster warplanes, Dow was perfectly positioned as one of the few magnesium producers in the world. Supplying both British and American forces

*See Chapter 12 for more on silicone and Dow Corning.

with magnesium for aircraft—rising from 80 pounds to about 2,000 pounds per American plane for example—Dow became the global leader in magnesium production during the war, and continued to supply about 75 percent of the world's magnesium for many years thereafter.[10] Dow's other ventures also prospered after the war. In 1945, *Dow Corning 35,* an emulsifier used in tire molds, and Pan Glaze, which made baking pans stick-proof and easier to clean, were instant successes on the home front. Within a decade, in fact, Dow Corning alone had developed more than 600 products.[11] But Dow's talents and capabilities after the war were tapped for other purposes, too.

Within a decade, in fact, Dow Corning alone had developed more than 600 products.

In 1949, after the Soviet Union had exploded its first atomic bomb, the U.S. Congress authorized a major expansion of American nuclear weapons capability, and Dow Chemical was asked by the government to help build and manage a top secret nuclear weapons research and production project. By 1951 Dow was running a new $45 million plant at Rocky Flats, Colorado that would make plutonium triggers for America's nuclear bombs. Dow scientists worked in uranium chemistry, and its workers dealt with one of the deadliest substances on earth, plutonium.[12] Dow would operate the Rocky Flats complex under contract with the Atomic Energy Commission (AEC) for more than a decade, through the 1960s, a tenure marked by a series of incidents and some controversy (see Chapter 9). Dow would also become involved in a controversial nuclear power generating project with Detroit Edison and several other companies—a project that ultimately died. But the Dow of nuclear weapons and nuclear power was not the Dow most Americans would come to know. Rather, Dow became one of America's heartland companies, plugging away at commodity chemicals, and fashioning the ingredients of the American good life to come.

"House of Wonders"

In July 1950, the *Detroit Free Press* described the Dow Chemical Company in a most flattering way as inventive and essential to America's every product. "The fabulous Dow Chemical Company opened its doors to the working press for the first time and revealed itself as a hitherto hidden house of wonders," gushed the paper. "The clothes you are wearing, the ice cream you had for lunch, your wife's permanent wave [hair style], the pharmaceuticals in your medicine chest, your children's toys and your automobile all most likely have ingredients in them which came from Dow."[13] By 1958, Dow was the fourth largest chemical manufacturer in the United States, turning out "several hundred products," predominantly chemicals and plastics. By

then, about one-third of its total sales derived from plastics, including *Styron*, Dow's polystyrene brand, *Ethocel*, Dow's brand of ethylcellulose, saran, used in a number of applications, including *Saran Wrap*, polyvinyl chloride, polyethylene, *Styrofoam,* and various latexes used in paper coating and the production of latex paints. Dow was also the world's largest producer of magnesium, and still a leading producer of chlorine and bromine, consuming most of its own production of those chemicals internally to make other compounds. In addition to its extensive home-base operations at Midland, Dow had operations, subsidiaries, and associated companies throughout the United States and abroad. A refining operation in Bay City, Michigan handled products of petroleum refining. The Dobeckmun Company Division in Cleveland, Ohio and Berkeley, California worked in transparent packaging, gift wraps, metallic yarns and products from plastic films. The James River Division in Williamsburg, Virginia handled Dow's synthetic staple fiber *Zefran* for textiles. Its Western Division in California produced iodine at Seal Beach, plastics at Torrance, and chemicals at Pittsburg, Venice, and Inglewood. Dow's Hanging Rock Plant in Ironton, Ohio produced plastics, and its Dowell Division in Houston, Texas serviced oil wells and other industrial equipment. Other Dow subsidiaries included the Adams Paper Company in Wells River, Vermont, Ben-Mont Papers in Bennington, Vermont, and Cliffs Dow Chemical Company in Marquette, Michigan.

By 1958, one-third of Dow's sales were from plastics.

Dow Abroad

In 1950, Dow Chemical was pretty much a home-grown American company with a somewhat parochial focus. Only about 5 percent of its sales were in the export market, roughly about $10 million. Canada was then the extent of Dow's foreign expansion. But Dow's managers and planners soon saw the light of international opportunity, especially in 1951 when U.S. tax concessions were offered to American companies establishing foreign trade subsidiaries. Dow Chemical International and Dow Chemical Inter-American were formed that year, and by 1952, Dow's first overseas subsidiary was established in Japan in a partnership with Asahi Chemical Co.—a venture named Asahi-Dow Ltd., which would produce the plastic, saran.[14]

In the United Kingdom, Dow built a small polystyrene plastics plant at Barry, South Wales in 1954, and an agrichemical plant at King's Lynn in Norfolk, England in 1958. About 40 percent of the production from both of these plants would come to be exported, including much of the grass herbicide *Dowpon,* produced at Kings Lynn, and sold in quantity to Malaysian rubber plantations to kill tropical grasses that menaced slow-growing rubber

Saran Wrap

In the 1930s, Ralph Wiley, a research chemist, was working away at his post in the Dow Chemical research labs in Midland. He was focused on a process to make a chemical called perchloroethylene. This chemical, like many others, was made from chlorine. But in the making, Wiley kept confronting another chemical, a problematic byproduct. It was a bothersome substance that was sticking to the bottom of his flasks and beakers. And it was tough, too. If he left his beakers exposed to the substance overnight, he would have to use steel wool on them the next morning to remove the scum. Wiley's boss, however, got to thinking about the troubling substance, and encouraged Wiley to keep at it, which he did for another 10 years or so. Along the way, they tried using the substance to make battery casings and special-use tubing for chemical reactions, but nothing of consequence came to pass. By then, upper management thought this avenue was a waste of time, with little payback, even though Wiley by then had acquired 20 to 30 patents on the material. Wiley, in fact, threatened to quit if Dow canned the project. The head of the patent department supported Wiley's work, thinking there would be a payback. Just before World War II, the material was made into a film-like substance. Dow then began selling the film—then oily, green-colored, and of thicker composition—to the armed forces for wrapping military equipment being shipped overseas. The film protected the machinery from salty sea spay and moisture. Still, with the war's end, nothing much became of the material. Dow did develop a transparent version, and began selling it to industrial firms as a protective wrap in big 40-inch rolls. In 1947, two Dow employees bought the product from Dow and began packaging it in smaller rolls. They called it "Clingwrap" and began selling it locally in Midland as a food wrap, for which it was ideally suited since it blocked most air molecules. "It sold like hotcakes because women liked to put it over bowls," recounted inventor Ralph Wiley some years later. By 1948, Dow had bought back the new plastic wrap from the fledgling employee venture in Midland, and began selling *Saran Wrap* nationally in 1953. "Dow at that time was sort of resistant to the retail market," explained Wiley. "They liked to sell things by the ton and let other people worry about the retail market." But now, Dow was stepping into the retail business, and that meant a major change in the way it did business. Dow began its venture with *Saran Wrap* in October 1953, just as the Korean War was ending. New people were brought in to help move the product. One of those was William R. Dixon, Dow marketing manager who set his sights on TV as the vehicle for Dow's new products and the launch of *Saran Wrap*. "You had to show the housewife how to use the stuff," he said, "and TV was ideally suited to that purpose." Dow began its product launch for *Saran Wrap* with Dave Garroway, the host of the original *Today* morning TV show. In those days, TV ads were often done live on the shows, and at one point, Garroway and a group of ad agency and TV officials visited Dow's Midland plant so Garroway could become acquainted with the product and how it was made. But Saran Wrap was also advertised on the *Kate Smith Show* and the Sid Caesar/Imogene Coca comedy *Your Show of Shows*. But in those times, big shows were often cast around one featured product, so Dixon set

out to have "the Saran Wrap show." What Dow and Dixon pulled together took form in a new TV series, *Medic,* which presented for the first time dramatized medical cases based upon actual cases of the Los Angles County Medical Association. It would run evenings on NBC in prime time, and would star then unknowns, Richard Boone, Lee Marvin, and Beverly Garland, each of whom would rise to stardom. In August 1954, Dow invited press, medical leaders, food brokers, and others to a special closed circuit preview of *Medic*. Dow's Lee Doan told the special audience this was new ground for the company, but said that with *Medic*, "I believe we have found a vehicle of such caliber that it will not only serve our necessity but will additionally satisfy our sense of social responsibility." That may have been overstatement, but *Medic* did its job even though it was cast opposite CBS's *I Love Lucy*, then the most popular show on TV. "The little screen did its work," explains Dow historian E.N. Brandt. "By 1958 the 200 millionth roll of *Saran Wrap*, enough to go around the world 38 times, was on its way to someone's kitchen."

Saran Wrap, in fact, became the cornerstone product in a new Dow Brands consumer products enterprise, which by 1994 would include *Ziploc* bags, *Yes* detergents and *Dow Bathroom Cleaner* accounting for $930 million in annual sales. *Saran Wrap* alone by that time was a $30 million-a-year product. By the 1990s, *Saran Wrap*, a polyvinylidine chloride, could be found on the grocery store shelves along with other plastic food wraps like Reynolds *Plastic Wrap*, made of polyvinyl chloride, and DowBrand's own *Handiwrap*, made of polyethylene.

The tough stuff that researcher Wiley had discovered, and Dow later parlayed into a major product, was not without long-term consequence, however. Like other of its chlorinated brethren, products made with vinylidene chloride polymers, when burned in waste incinerators—or "pyrolytic decomposition," as the scientists call it—would yield, as emissions, some not-so-healthy substances, including the full range of highly toxic dioxins and furans. These little nasties, unseen and in seemingly harmless microscopic quantities, would add to the daily stream of other problematic chemicals wafting into the air, land, and sea—all covered in more detail later.[15]

seedlings. The Kings Lynn plant also came to produce glycols for antifreeze and latex for paints and carpet backing. In 1955, Nederlandsche Dow Maatschappij was organized in Rotterdam, with a chemical terminal established in the Botlek area for warehousing Dow products. Rotterdam became Dow's window on Europe. By 1959, Dow established an overseas headquarters in Switzerland.[16]

In Spain, Dow had "meteoric growth" in the 1950 to 1973 period, according to company biographer E. N. Brandt, starting from zero and becoming the largest chemical firm in the country. There, in 1960, Dow acquired half interest in Unquinesa, later named Dow-Unquinesa, which built a polystyrene plant at Bilbao by October 1963 and a polyethylene plant at Tarragona near a new government refinery in 1966. Spain's legendary leader, Franco, came to Tarragona in 1967 to dedicate the new Dow plant. By the 1990s, Dow's Spanish operations employed about

1,600 people with annual sales at $400 million.[17]

In Greece, Dow incorporated Dow Hellas to build and run a plastics plant at Lavrion about 33 miles from Athens. By late 1962, the plant—also a deep-water port that brought styrene in from the Netherlands—was operating and producing *Styron*. A sales office in Athens also served as a Dow "jumping-off point" to the Middle East. Dow salesmen there in the 1960s, for example, were selling: jet fuel additives to the Arab American Oil Company in Saudi Arabia; refrigerator insulating material in Israel; plastics and polyvinyl chloride in Tehran; and plastics for packaging and polyethylene for film in Turkey, among other products and markets.[18] Dow also moved rapidly in Asia and South America.

In Zurich, Dow established the Dow Banking Corporation in 1965, the initial purpose of which was to make medium- and short-term loans to the company's European customers in a market where money was usually tight. Dow's bank made a profit from day one, and by 1979, had become the eighth largest bank in all of Switzerland and the largest foreign-controlled bank there. Dow for a time flirted with the idea of becoming an international banking institution, and by 1980, its bank had branches in Hong Kong, Buenos Aries, Bogota, London, Singapore and Miami. But in 1986, the Dow Bank was sold to the Royal Trust Bank of Canada.[19]

In central Italy, Dow built a plastics plant on the coast at Livorno in 1963, and bought partial interest in the Milan-based drug company Lepetit, among the largest such companies in Europe with 21 subsidiaries selling products in 100 countries. Dow acquired full ownership in 1975, and its Italian market grew rapidly. By the late 1980s, annual sales there leapt to $650 million.[20] Back in the States, as Dow was setting up shop abroad, the company was also undergoing significant change in its business direction, looking for ways to diversify.

Drugs & New Chemistry

In the 1960s, Dow began to move away from an exclusive dependence on old process chemistry and into more sophisticated realms of chemical R&D. It was not enough for Dow to be a major player in bulk chemicals with a loyal base of industrial customers. Dow managers saw that a new business world was on the horizon, and they had to move both to protect themselves and get their share of the expanding pie. They saw that international expansion was not only a growth opportunity, but a way to produce the revenues necessary to finance research—research needed to produce a continuing parade of new, exclusive, patent-protected products. "Building new positions, each as exclusive as possible," is how Dow's president Ted Doan put it in 1960, seeing this strategy as "the answer to the disappearing exclusiveness of the historical chemical industry."[21]

In December 1960, for example, Dow entered the pharmaceutical business in a big way when it acquired Allied Laboratories, a $30 million business with research labs, products and operations throughout North America and several other countries. Allied was then one of the country's largest manufacturers and distributors of human health products. In all, Dow acquired more than 600 products in the Allied deal, and a long line of drugs, including those developed by Allied subsidiary Pitman-Moore. It also acquired a manufacturing capability for the Salk polio vaccine, and a new 4-in-1 vaccine named *Compligen* for protection against tetanus, diphtheria, whooping cough and polio myelitis. Pitman-Moore also had a line of animal health drugs and biologicals sold to veterinarians. Pitman-Moore labs became Dow labs in Indiana, South Dakota, Illinois, Canada, Italy, and Mexico. Allied labs and properties were also added to Dow in Canada and Panama. But the deal was significant for Dow in that it moved the company into a more sophisticated realm of chemistry. Dow's Ted Doan clearly saw the new reach and new synergies that might be possible:

Dow's chemicals might also fit pharmaceutical or veterinary needs, "whether or not this was their original aim."

> ....We have not only a large amount of biologically-oriented work to contribute to the Allied Division," he said, "but also the chemical synthesis people to turn up thousands of new chemicals each year, some of which may fit pharmaceutical or veterinary needs, whether or not this was their original aim.... Allied obviously offers us not only skill in the unique marketing methods of the pharmaceutical industry, but such things as pharmacology and clinical work, pathology, virology, and pharmaceutical product development and other areas which we of course had not developed to any extent.[22]

But Dow was not, by any means, throwing over its old chemistry. In fact, by 1962, Dow was the world's largest producer of chlorine and caustic soda, and "ranked at the top or near the top in supplying industries with vinyl chloride, propylene oxide, glycol, phenol, synthetic glycerine, hydrochloric acid, methylene chloride, bromine, aspirin granules, magnesium, and plastic monomers." Overseas, meanwhile, Dow "was pouring money into new plants and expanding at a faster clip than any of its competitors."[23] By 1964, Dow's sales had surpassed $1 billion for first time. That year, Dow's diversified offerings included 24 new products, among them, *Rovana* drapery fiber, *Zoalene* coccidiostat for poultry farmers, and *Handi-Wrap* for kitchen use. In February 1965, Dow's one-shot measles vaccine, *Lirugen*, was introduced, and would dominate the market by year's end. Two years later, the U.S. Public Health Service launched a campaign to eradicate measles in the United States, and most of the vaccine used was Dow's. The U.S. Agency for International Development

From Ramie to Plastic

In 1951, according to Dow's account of how the company's first Japanese venture began, two executives from Asahi Chemical came to Midland to talk to Dow's Lee Doan about fishing nets. The Japanese had always made their nets of cotton and ramie, a flax-like fiber produced from a woody Asian plant used in making fabrics and cordage. But at the time, Japan imported both cotton and ramie. Asahi had been experimenting with filaments made from saran and found them to possess great advantage over ramie. Would Dow build a plant in Japan to provide the raw material for such nets, asked the Japanese? Asahi would provide the capital, and Dow the know-how. The company would be jointly owned. Dow accepted the Japanese proposal, and in 1952, a plant was built at Nobeoka. Four years later, styrene and *Stryon* polystyrene were added to the production mix. By 1979, Asahi-Dow was the largest polystyrene producer and the most profitable petrochemical company in Japan, operating nine plants across the country. However, by 1982, parent Asahi Chemical wanted a bigger share of the venture and Dow sold out to them for $231 million. But by 1991, Dow and Asahi teamed up again, this time in a joint venture named Styron Asia Ltd., formed to market polystyrene in Asia beyond Japan. By 2002, this new venture had opened a large, 120,000 ton-per-year polystyrene plant in Zhangjiangang, China.

Source: Dow Chemical Co., "Dow and Union Carbide Have Merged," *Around Dow*, Special Commemorative Issue, 2001, p. 26.

also chose Dow's *Lirugen* vaccine to inoculate more than 24 million children in 15 West African nations.

During the 1960s, Dow was also involved with the federal government in the space program and in fact, years earlier, had fashioned magnesium "Dowmetal" gondolas for U.S. Army Corps high-altitude balloons in the pre-satellite era of space testing. At Cape Kennedy in the 1960s, a Dow Aerospace Services team helped with the firing of a Saturn booster rocket. In 1965, when astronaut Edward H. White made his historic space walk, the 27-foot hose which supplied his oxygen was made of Dow Corning *Silastic* silicone rubber. And by 1968, as Apollo 8 orbited the moon and splashed down in the Pacific, the heat shield on the vehicle was made from Dow epoxy resin. Back on earth, Dow's new Oyster Creek Division near Freeport, Texas, designed to mass-produce chemicals featuring the world's largest phenol plant, came on-line in 1969.

But in the 1960s, Dow had a major wake-up call, as it began producing napalm, a jellied, chemical explosive, for use in the Vietnam War. Protests against the war also focused on Dow's production of napalm, made from a combination of benzene, gasoline, and polystyrene. Between 1966 and 1969, hundreds of demonstrations occurred, many on college campuses aimed at

Dow college recruiters. Other protests targeted Dow facilities and offices with noisy pickets, some of which were televised in national newscasts. Napalm, and also Agent Orange, a herbicidal defoliant Dow supplied to the U.S. military during the Vietnam War, left long-lasting scars on Dow and affected the company's public image for years (see Chapter 3 and below). Still, Dow had its successes in the 1960s, and continued making chemicals and new products as it always had. By 1971, Dow sales would surpass $2 billion annually.

By 1968, as Apollo 8 orbited the moon and splashed down in Pacific, the heat shield on the vehicle was made from Dow epoxy resin.

Dow in the Oil Patch

Dow Chemical was also in the oil business, dating to the 1930s when it created an oil-well servicing subsidiary named Dow Well Services, later shortened to Dowell, Inc. This company was soon pulling in $75 million a year improving oil flow at wells across the country.[24] But Dow not only serviced the oil industry, it also established its own oil and gas business. From its earliest days, Dow was a company that used prodigious amounts of oil and gas to power its plants and to make its products. As the company became more immersed in synthesizing chemicals, it became more energy- and petrochemical-intensive. Dow officials in Texas during the 1940s, especially Dutch Beutel, pushed the idea that Dow should not be dependent on the oil industry for its energy and petrochemical feedstock. Operations like Dow's Freeport plant in Texas were then receiving their energy by contract, not all of which was delivered in a timely fashion. At Freeport, for example, Dow needed upwards of 30 million cubic feet of natural gas per day to fuel its magnesium-from-seawater plant alone. Ethylene and propane pipelines were also feeding the Freeport plant.

By the end of World War II, Willard Dow established the Brazos Oil and Gas Company in Texas, and by 1947, the new company had 265,000 acres of oil and gas leases in Texas and California. Brazos soon became a growing part of Dow and took on a life of its own. By 1950, the company was drilling oil and gas wells in Texas and Michigan and soon built a pipeline system in California. In Texas, Brazos pipelines covered 1,000 miles in nine counties transporting natural gas, ethylene, and liquefied petroleum gas to Dow's Freeport plant. Brazos became the Oil and Gas Division of the Dow Chemical Company, and soon had operations in Ohio, Louisiana, Wyoming, Oklahoma, Colorado, Kansas, Nebraska, Florida, and New Mexico. By 1965 it was even drilling in the Netherlands and Libya. Dow's Oil and Gas Division also subcontracted out to other oil drillers, such as Texas Oil & Gas and MacMorran,

companies that helped Dow boost its oil and gas reserves going into the 1970s. Dow would also pick up smaller energy companies or pipeline systems on occasion. In the early 1970s, Dow had purchased the Wanda Petroleum Company from Ashland Oil, a gas liquids processor. It also became a 30 percent owner of the Oasis Pipeline Company, operator of a big 36-inch natural gas line from west Texas that kept gas flowing to Dow's plant at Freeport. In the 1970s, Dow also dabbled in coal, lignite, nuclear, and geothermal. In 1972, it was issued a license by the Atomic Energy Commission to build a nuclear power plant at Midland, Michigan—an endeavor that embroiled the company in controversy and a long battle with anti-nuke activists. The plant never operated. In 1974, Dow acquired a partial interest in Magma Power Company of Los Angeles, a geothermal energy developer.[25]

Brazos Oil & Gas Co. soon became a growing part of Dow and took on a life of its own.

But in the 1970s, Dow planners had correctly predicted rising natural gas prices, and were better prepared than many other chemical companies for the energy price shocks that came. On supply too, Dow was well situated. When the energy crisis of 1973–74 arrived, Dow plants continued to hum, as the company then controlled 50 percent of the pipelines that carried fuel and feedstock to its plants and produced 80 percent of its own power. In Europe, Dow became active in North Sea oil exploration off northern England through the Sovereign Oil Company. Dow bought some North Sea oil properties, funded oil exploration there through Sovereign, and also acquired a landing site for pipelines it expected to bring ashore. In Canada, Dow teamed up with Dome Petroleum to develop oil and gas in Western Canada to help supply natural gas to Dow's Fort Saskatchewan plant, which came on line in 1980. By the end of 1981, Dow had proven oil and gas reserves of 40.5 million barrels of oil and 702.5 billion cubic feet of natural gas in the United States and Canada. However, in September 1982, under pressure to reduce its debt load, Dow exited the major part of its oil and gas business, selling its U.S. holdings to Apache Petroleum Co. for $402 million. Still, in that deal, Dow managed to secure first rights to feedstock supply and agreed to purchase 75 percent of the gas Apache produced from the properties.[26]

The "Go-Go" Years

The 1970s were generally a tremendous growth period for Dow Chemical. In 1970, the company launched a complete line of products for automotive applications, even though in 1971, with lead-free gasoline coming on the market, Dow would soon lose its lucrative market for ethylene dibromide, used for years as an anti-fouling additive with leaded gasoline. By 1972, the

year President Richard Nixon established the U.S. Environmental Protection Agency, Dow would issue its first set of pollution control guidelines, the year it also launched its *Lorsban* insecticide—a soon-to-be top-seller that would later become controversial for its toxicity (see Chapter 5). Still, the money rolled in for Dow as business was better than ever; sales reached $3 billion in 1973. For the next four years running, Dow became the world's most profitable chemical company. Overseas, it became the first foreign industrial firm to be listed on the Tokyo Stock Exchange.

Dow's corporate profile continued to become more pharmaceutical, with drugs playing a bigger role in the company's bottom line.

At the opening of the 1980s, a recession took its toll on Dow for a time, causing a 30 percent drop in income. But soon, the company was back on track, expanding and growing. Dow's corporate profile continued to become more pharmaceutical, with drugs playing a bigger role in the company's bottom line. Dow acquired the Merrell pharmaceutical business of Richardson-Vicks in 1981, for $260 million. Building on Merrell's prescription drug business, Dow introduced *Seldane* (terfenadine), a nonsedating antihistamine in 1985 that produced nearly $400 million in worldwide annual sales. In 1989, Dow went further into the drug business by merging its existing pharmaceutical lines with Marion Laboratories of Kansas City, Missouri, forming Marion Merrell Dow, which Dow headquartered in Kansas City. Doctors across the country at the time were writing more than 1 million prescriptions monthly for Marion's *Cardizem* heart drug, which alone accounted for nearly 60 percent of Marion's $930 million in sales. Dow's new drug empire would soon exceed $2 billion in annual sales, with products such as *Lorelco*, a cholesterol-lowering drug, *Nicorette*, an anti-smoking drug, *Gaviscon,* a heartburn medicine, *Citrucel* a laxative, and *Cepacol*, a mouthwash. With these and other products—such as *Texize* cleansers which it bought from Morton Thiokol in 1985—Dow was becoming more of a consumer-products company.[27]

Bad Drugs

Dow's entry into businesses with more direct consumer products also presented the company with new kinds of risks and potential liabilities, especially with drugs. In February 1980, for example, research on a Dow's *Lorelco* cholesterol drug—also known as probucol, and then taken by 25,000 people—was found to cause fatal heart abnormalities in laboratory monkeys. Dow was required by the FDA at the time to send letters to 115,000 doctors warning them to check for abnormal heart rhythms in patients then taking the drug.[28] But a bigger problem for Dow came with another drug that

Dow inherited in the acquisition of the Merrell drug business—a drug named *Bendectin*. Widely prescribed to pregnant mothers for morning sickness since the mid-1950s, by the time Dow was marketing the product in the early 1980s, more than 33 million women had used it. But *Bendectin*—a drug that combined two chemicals with unwieldy names, doxyalimne succinate and pyridoxine hydrochloride—was suspected of causing birth defects. By 1983, in fact, Dow's Merrell-Dow unit was facing some 300 lawsuits over the product, and FDA was looking closely as some troubling animal studies. But by June 1983, Dow decided to quit selling the drug worldwide, citing the rising costs of lawsuits. "Although we have no doubt of its safety and effectiveness," said Merrell-Dow president David B. Sharrock in June 1983, "the burdens of continuing to market *Bendectin* have become just too heavy…" He said the firm had to increase prices to cover the costs of litigation. But others said Dow was simply moving in advance of an expected FDA action on the drug after reviewing studies on birth defects. "The company knew that these studies were going to be released soon, and they pulled their drug off the market in advance of an FDA recall," said J. Douglas Peters, an attorney with Charfoos, Christensen, Gilbert & Archer in Detroit then representing several *Bendectin* plaintiffs. Merrell-Dow had indeed been in intensive negotiations with FDA over the drug. In fact, it agreed at one point in June 1983 to send a "dear doctor" letter alerting physicians to the drug's problems. But then a month later, Merrell-Dow reversed course and refused to send the letter. Merrell-Dow reversed itself, it said, because of another study, using a larger database, that found no association between birth deformities and the drug. FDA, preparing a bulletin on the drug at the time, had also acknowledged the same study in its bulletin: "Nevertheless, the reported association…is of concern because it represents the first observation of a possible adverse fetal effect of *Bendectin* that had been reported from more than one study.…It is therefore important that all who may prescribe or receive *Bendectin* be kept as fully informed as possible about factors that might influence a decision to use it." It appeared from internal memos and reporting by *Washington Post* writer Morton Mintz, that Merrell-Dow officials had, after some debate, first agreed to the "Dear Doctor" letter and to FDA language in the letter citing all the studies. But then Dow Chemical headquarters became involved and instructed Merrell-Dow officials to inform FDA it would not agree to the letter, with a message from Dow Chemical saying "our research executive staff…concluded that the data do not support a finding that [the] association [re: the drug and fetal effects] exists." FDA tried again to persuade Merrell-Dow to send the letter, but the company said it would not yield. FDA then issued its bulletin to doctors, which cited

By 1983, Dow was facing some 300 lawsuits over its morning-sickness drug, *Bendectin*.

increased rates of a stomach deformity among infants whose mothers took *Bendectin*. The defect, called pyloric stenosis, constricts the stomach outlet soon after birth, reducing ability to eat, and can cause severe dehydration and malnutrition. Untreated, the condition could prove fatal in weeks. A short surgical procedure could fix the defect, which was estimated to occur one to three times in each 1,000 live births. But that wasn't the only problem. By 1987, other *Bendectin* birth defects cases were also coming to light, resulting in a few unfavorable verdicts against Merrell-Dow, many of which were later reversed on appeal. Still, some of the cases reveal a look at the issues involved at the time and how Dow handled them. One such case is offered in the sidebar opposite.

Dow headquarters instructed Merrell-Dow officials to inform FDA it would not agree to the "dear doctor" letter.

The Image Problem

By the mid-1980s, Dow was getting a little too much publicity it didn't like, and was developing a negative image among consumers. So it embarked on a public relations campaign to fix the problem. Dow's image woes had been bubbling up in the company for more than a decade, since the 1960s in fact, when the Vietnam War had thrust the company into the public spotlight over two controversial military products: napalm, a jellied gasoline explosive, and Agent Orange, a herbicidal defoliant.*

Dow's experiences with napalm and Vietnam War protestors moved the company in the 1970s to consider its social responsibilities. The company crafted a statement of corporate objectives, written by Dow's president Ted Doan and Ben Branch—an official who would follow Doan as president in 1971. As Doan recalled in an interview with author Cathy Trost:

> "They [the corporate objectives] were cribbed from a book of John Gardener's called *Excellence*." A lot of stuff about people doing things well and honestly. It was real motherhood and it was real good motherhood. The last statement was: "We'll do business in a way that leaves the world better because we were in business." That was [Ben] Branch, direct quote. That was the way he felt. He couldn't stand having a product go out if he thought it was going to do anybody harm. He would go a long way toward putting a company out of business and restructuring it in some way if he thought he was really doing damage. Let me not be so modest. I think all of us were the kind of guys who would say, "If we have

*See Chapter 3, "Dow Goes to War," for more details.

Kids Made Fun of Him

In July 1987, an 8-year old Washington, D.C. boy named Sekou Ealy, son of a State Department employee who took the Merrell-Dow drug *Bendectin* during her pregnancy, was awarded $20 million in compensatory damages for permanent deformities of his hands and arms. Punitive damages of $75 million were also awarded in that case, determined by a jury trial panel of six women. In the five-week trial, argued before U.S. District Court judge June L. Green, the proceedings included one session where the young boy was presented to the jury to see that he could not raise his arms high enough to button his own shirt, could not tie his shoelaces in a tight knot, and was made fun of by his 2nd-grade classmates because he couldn't straighten out his arms or throw a football normally. Barry J. Nace, attorney for the boy, argued that Merrell-Dow "played a form of Russian roulette" with the 1.34 billion *Bendectin* pills sold in the U.S. since 1956. "They didn't have anything that said the drug was safe," Nace contended of the company. "All they had was [the position that] you can't prove the drug is not safe." In the proceedings, Judge Green had divided the trial and the jury's considerations into two phases—one on whether Merrell-Dow had caused the child's deformities and had engaged in wrongful conduct that led the mother to use the product, and a second, in which the amount of damages was considered. The polled jury answered yes to 10 written questions which found, among other things, that Merrell-Dow had been negligent in testing, making, selling, and distributing *Bendectin*; had failed to warn physicians; that the negligence was "a proximate cause" of the young boy's injuries; and that the *Bendectin* tablets taken by the boy's mother were "unreasonably dangerous." The boy's attorney, Barry Nace, concluded the jury's message was that Merrell-Dow "knew, and had to know, of the dangers associated with taking any drug in pregnancy, yet did not take any active steps to prove that *Bendectin* was safe, and instead, went so far as to ignore all the signs that were there." In the damages phase, Merrell-Dow's attorney, Mark L. Austrian, told the jury that Merrell officials "may have been negligent" or "wrong," but that there was nothing in the record to show that any of them acted with "reckless indifference," engaged in "malevolent or malicious conduct," or believed *Bendectin* "would hurt children." Still, the jury thought otherwise and called for $20 million in compensatory damages and $65 million in punitive damages. Merrell-Dow's Donaldson called it "incredible" that the jury blamed *Bendectin* for the boy's deformaties, and awarded what he called "grossly excessive" damages. "We can only conclude that the jury was motivated by emotion and sympathy for the child," he said. Merrell-Dow appealed to the D.C. Circuit Court of Appeals, which in March 1990, overturned the jury case based on other litigation that had found the weight of scientific testimony offered on behalf of injured children was not enough to justify verdicts in their favor. The plaintiffs, however, pledged to appeal. By this point, Merrell-Dow had been the target of hundreds of such cases, with only one 1983 case resulting in an award of $750,000. Five other cases had ended in favor of injured children, but most of those were also appealed by Dow.

Source: Morton Mintz, "Deformed D.C. Boy Awarded $95 Million," *Washington Post*, July 15, 1987, p. A-1.

> to go out of business, fine, we'll go out and we'll find a way to rebuild the damn thing some other way. We won't put arsenic in babies and kill 'em." You know, that kind of thing.[29]

Yet it was Dow's string of problems in the early 1980s that really focused the company's attention on the image problem and how to change it. Dow's dioxin controversy in Michigan, and its role in altering an EPA report on the subject, were also part of the mix.* But there were other factors, too.

Dow was then approaching $1 billion in direct sales to consumers for household and healthcare products. Dow's CEO at the time, Paul Oreffice, a hard-nosed executive in his late 50s who had little patience with critics, was nonetheless more attuned to the value of public communications than his predecessors. Oreffice became president and CEO in 1978, and he had already set some of Dow's makeover in motion:

> In the late '70s we took a look at our company—not from a public standpoint at all, more from a standpoint of how it was going to grow and thrive—and we decided that we've always been very good at marketing large quantities of basic chemicals and plastics which are sold to industry, and that [the bulk chemicals] business had been hurt very badly by the fact that every country in the world wanted to have petrochemical plants; it became the buzzword. . . .
>
> We needed to move further downstream, and that meant moving into more things like pharmaceuticals, like consumer products, like agricultural chemicals, like insulation materials, like *Styrofoam*. At the time, 85 percent of the profits of the company were in the basics and only 15 percent were in what we call the specialties. I set a goal that by 1987 we would have 50–50, and that's about where we are today [September 1986].
>
> We had a good reputation with the industrial buyers, but we did have problems with the general public. So there was a business reason for better public relations too, no question about it, because we're moving closer to the consumer.[30]

But Dow's environmental problems in the late 1970s, its confrontations with EPA over a plant inspection, its dioxin woes, and its negative publicity over altering the EPA dioxin report in 1981, all began to take a toll. In the mid-1980s, a Dow task force under the direction of Keith McKennon, then Dow's head of U.S. operations, government and public affairs, surveyed 213 employees, managers, directors, and government and outsiders about how Dow was then perceived by the outside world.

The results were not good: "The current reputation of Dow with its many publics may be at an all-time low," explained the internal report. "We

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*These and other issues are discussed in more detail in subsequent chapters.

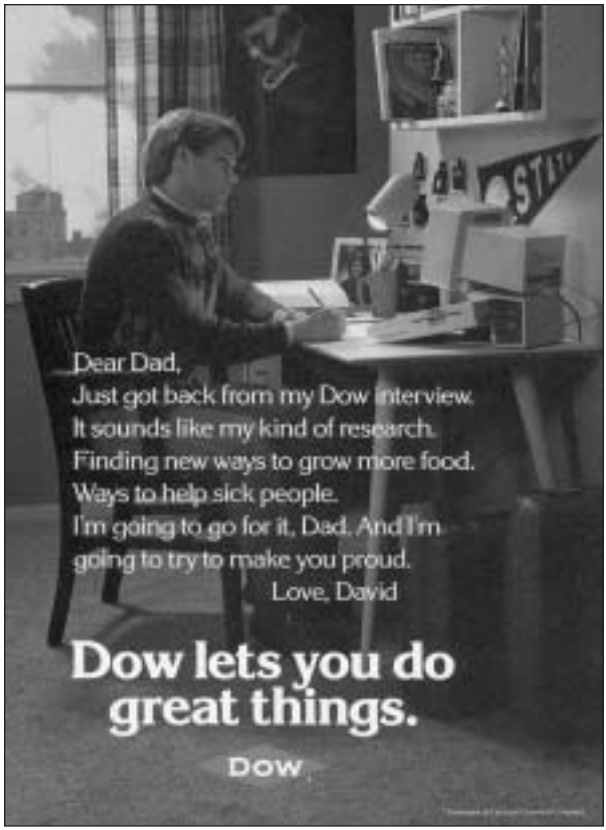
are viewed as tough, arrogant, secretive, uncooperative and insensitive."[31]

"It was a very difficult time," recalled Richard K. Long, Dow's manager of external communications in late 1985. "We got accused of things that we felt were inaccurate." Even some of Dow's employees at the time viewed the company as arrogant and secretive, Long acknowledged. "Management began to look at ways in which we could change the perceptions of several key audiences," he said.[32] So in 1985, the company began a series of television advertisements built around the theme, "Dow Does Great Things." It was Dow's attempt to boost internal company morale and woo back the public. Three 30-second TV ads made their national debut in late September 1985. Print ads in the same genre also began appearing in *USA Today, Time, Newsweek, Business Week*, and *U.S. News & World Report*. Dow's intent was to use positive and buoyant themes—which according to Richard F. Dalton, Dow special projects manager in communications—were intended to connect the company to the optimistic attitudes of the 1980s. "Those are the kind of positive feelings we are trying to generate toward Dow," he explained to *Chemical Week* in October 1985. "We want the public to see that we're not a bunch of ogres."[33]

In 1985, the company began a series of television advertisements built around the theme, "Dow Does Great Things."

In 1985, Dow spent about $7 million for producing the ads and air time, but planned a much bigger commitment of $40 million over the next four years for the total campaign, which included other outreach and "good cause" undertakings. "We recommended that Dow get involved in a national social issue that would be humanitarian and not have to do with the company's business," explained Dow's Richard Long. Dow chose organ donation and transplantation and gave $1 million to the America Council on Transplantation.

In Dow's TV and magazine ads, young, bright-eyed college students had the starring roles. "It sounds like my kind of research," says one student in an ad showing the student at his dorm room desk writing home to his



father about an interview he has just had with the Dow Chemical Company. "It sounds like my kind of research. Finding new ways to grow more food. Ways to cure sick people." (See ad, left.) In another ad, a young woman in cap and gown waiting to receive her diploma, recalls how "Mom made me clean my plate 'cause there were places where kids were starving." But now, as a college graduate, she was "about to walk into a Dow laboratory to work on new ways to help grow more and better grain for those kids who so desperately need it."[34] These images were quite a change from the 1960s, when Dow was pilloried on many campuses for its role in the Vietnam War. Dow's testing of viewer responses in 1985 showed the ads to be effective in "making Dow a highly regarded company among its key publics," explained communications specialist Dalton. Back in Midland, however, some environmental activists such as Diane Hebert remained skeptical. "I'm not convinced that there really is a new Dow," she said.[35]

But Dow had other audiences in mind, too. "We found that if we were perceived as not running our business in the public interest," explained Dow chairman Robert W. Lundeen to *New York Times* reporter Phil Shabecoff in January 1985, "the public will get back at us with restrictive regulations and laws. That is not good for business." Dow was then selling about $1 billion worth of products directly to consumers. "Our reputation has a real dollar sign on it," added Lundeen.[36] Two years later, Dow's Richard Long, then the company's public affairs manager in Washington, put more of a fine point on the same observation."We had made a lot of enemies who could influence our future. We recognized we had to clean up our act."[37]

"In fact," wrote *Wall Street Journal* reporter John Bussey in November 1987, describing Dow's efforts at that time, "the company is seeking nothing less than public redemption through an extraordinary image-makeover campaign." Other ingredients in Dow's program included: a performance review system that took into account a manager's public relations skills; sharing more information with regulators; support for environmental legislation; and extra efforts with the media.[38]

"We had made a lot of enemies who could influence our future."

Richard Long, Dow Chemical

Yet by 1989, there had come a whole new set of revelations and environmental concerns—ranging from new EPA data on the extent of toxic chemical pollution in the U.S., to the *Exxon Valdez* oil spill and Earth Day 1990, touching off a new round of public concern about the environment and corporate responsibility.* Dow would be in the thick of these matters, coming under considerable public scrutiny in the years ahead, and would continue to use public relations to address controversy and mend its corporate image.

Business As Usual

Apart from its image problems, Dow continued to pursue its business interests and expand its operations through the 1980s. It continued, for example, to acquire companies that fit into its business plan. In 1988, Dow added to its auto supply business, acquiring Essex Chemical, a leading producer of auto sealants and adhesives. Dow was always looking for new chemical niches to fill. By the late 1980s, Dow was not only selling its normal menu of bulk chemicals, but also a range of speciality chemicals and other products, including surfactants, antimicrobials, glycol ether products, superabsorbents, coatings and binders, plastic-lined pipe products, heat transfer fluids, brake fluids, deicing fluids and pellets, compressor lubricants, membrane systems, gas separation products, window film, insulation, adhesive films, electronic grade epoxies, epoxy hardeners, rigid foam products, carpet backing, herbicides, insecticides, nitrogen stabilizers, soil fumigants, gas fumigants, detergents, bleach, hair care products, plastic bags, stain removers, hybrid seed, mouthwash, a fiber laxative, cough and cold remedies, antibiotics, antihistamines, an intravenous cardiostimulant, and artificial kidneys.[39] In agricultural chemicals, Dow formed a major joint venture in 1989 with Eli Lilly—DowElanco—which quickly became one of the world's largest pesticide makers (see Chapter 5). By 1989, overall profits at

*See Chapter 11, "Dow Environmentalism."

Dow were running about $2.5 billion a year. Stockholders who took a chance on Dow in the1980s and stuck with it had made some money too. Dow stock bought for $1,000 in 1980, sold for $5,405 on January 2, 1990.[40] But Dow was not without its problems. In 1992, Dow posted a net loss of $496 million—its only loss in the century. Dow also faced new troubles, and thousands of lawsuits, as its Dow-Corning venture, the number one producer of silicone breast implants, had stopped making the devices following allegations the company had put the implants on the market without proper testing.* Dow plastics business faltered a bit in the early 1990s. But even with the difficulties, Dow's overall corporate sales by 1994 had surpassed $20 billion.

Back To The Future

By the mid-1990s, Dow began to change its corporate strategy in a couple of ways. First, it began to move away from two decades of diversification, most dramatically by selling its 71 percent stake in its Marion Merrell-Dow pharmaceutical business to Hoechst A.G. for $5.1 billion. Between 1995 and 1996, Dow also began selling off speciality businesses, including acrylamides, boride products, gas separation lines, membrane filtration systems, industrial cleaning, aspirin, and personal care businesses. "In the 1970s and '80s diversification was the means to growth," explained Dow's CEO William S. Stavropoulos in August 1996, "but we found we couldn't diversify enough to make a difference to cyclicity." But in the post-Cold War era there were some new opportunities, and Dow especially liked what it saw. With the opening of formerly closed economies, explained Stavropoulos, "the potential consuming market for chemicals has increased fivefold"—much of this in Dow's traditional line of businesses.[41] So Dow began buying up some bargain-priced European companies, such as three formerly state-run East German firms southwest of Berlin known as BSL. In this case, Dow announced that it planned to revitalize East German chemical production, starting with polypropylene, acrylic acid, and polyethylene terephthalate. It also expected to add and expand specialty lines at the new German companies (see sidebar). Dow had also acquired Enichem's Inca International subsidiary, giving Dow a good position in the European polypropylene and polyethylene terephthalate markets.

Meanwhile, Dow's agricultural chemicals business, DowElanco, acquired a stake in biotech seed developer Mycogen, and planned to push Mycogen's line of insect-resistant corn hybrids. DowElanco, said CEO Stavropoulos in August 1996, was at "the forefront of biotechnology" and had "a good pipeline" of products. Dow was also planning to double its plant

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*See Chapter 12, "Silicone."

"Cleaning Up" in Germany

After the Berlin Wall came down in the late 1980s with the fall of Communism, the big three West German chemical makers—BASF, Bayer, and Hoechst—were offered a chance to acquire the huge East German chemical works at Schkopau, a sprawling and crumbling 2,100-acre complex near the Polish border that was built in the 1920s and 1930s. The West German firms said no thanks, as the complex was a mess and highly contaminated. The costs of cleaning it up appeared prohibitive, and the German chemical makers saw no real strategic value in the deal. Dow Chemical, however, jumped at the chance, seeing the location as an opening to future East European markets. The German government was also dangling some attractive inducements: it would give Dow 80 percent of the project and $4.8 billion in cash and subsidies to cover the cost of the cleanup and new construction. There was a catch, however: Dow had to do the job in five years, between 1995 and June 1, 2000, or lose the subsidies. Dow jumped in. By late May 2001, Dow had transformed the place, demolishing more than 2,300 buildings and factories, rebuilding more than 65 miles of roads, pipes, canals and rail lines, and erecting 14 entirely new chemical plants. The complex, known in German as Buna Sow Leuna Olefinverbund, or BSL for short, was transformed. Dow had tackled some very nasty pollution and contamination—including mercury contamination from an old mercury-based chlorine works and a coal-based acetlyne operation that spewed 30,000 tons of ash a year that fed a perpetual yellow-brown haze in the region—and cleaned it up. Dow dug out toxic soils down to a depth of 9 feet in some locations. In all, more than 5 millions tons of wastes and rubble were hauled out, with hazardous wastes treated or otherwise disposed. The conversion and clean up were not without their difficulties, and local traffic was a mess for a time. But Dow met the government's deadline, even if it did spend over $100 to $200 million more than it planned. Still, Wall Street viewed the Dow-refurbished BSL as a good deal, and projected that BSL would be generating more than $2 billion in revenue and more than $1 a share in profit for Dow by 2003. Dow says there are 22 "world-scale plants" operating there today, with several of them producing products or using technologies that are new for Dow—such as acrylic acid, synthetic rubber, dispersion powders and hydrocarbon resins. BSL is now one of Dow's largest production sites outside of North America, which Dow sees as well-positioned for booming European growth. "The whole enterprise is a technological trendsetter," says Dow, "the nucleus for industrial regeneration in the region; the area's biggest industrial employer and one of the greatest hopes for new job creation."

Irish Fight. But Dow wasn't always welcomed everywhere. In July 1988, when Dow announced it was planning to build a Merrell-Dow pharmaceutical plant to produce the antihistamine terfenadine about 23 miles from the small Irish village of Killeagh not far from Cork and Waterford, it soon confronted local opposition that grew to include farmers, citizens, and some politicians. Through 1989, the fight was front page news in Ireland, regularly featured on evening TV broadcasts. But before a final decision on the merits could be made, Dow decided the factory no longer economically fit its plans, since during that time, in

August 1989, Dow had made the Marion Laboratories/Merrell-Dow merger. The controversy, however, is credited with helping create Ireland's Environmental Protection Agency in 1990.

Source: Susan Warren, "For Dow, A Dirty Job In Germany Presented A Chance to Clean Up," *Wall Street Journal*, May 19, 2000, p. A-1;, Dow Chemical Co., "BSL—Restructuring A Piece of History," *Around Dow*, Special Commemorative Issue, pp. 33–34; and E. N. Brandt, *Growth Company*, pp. 387–93.

capacity at the Peroquimica Bahia Blanca plant in Argentina, and hoping to build an ethylene and chlor-alkali project in China with a then-unnamed partner.[42] But in 1997, Dow still had its bread-and-butter customers—among them: Electrolux, the Swedish kitchen appliance and refrigerator manufacturer using Dow plastics at its plants throughout the world since 1981; Reynolds Metals, the Richmond, Virginia maker of aluminum foil and other products, using Dow polyolefins, magnesium, and caustic soda since the late 1960s; and Eastman Kodak, the Rochester, New York photo giant and Dow customer since 1908, using Dow's polyethylene, polystyrene resin, allyl chloride, organic intermediates, formulation products, and antimicrobial, among others.[43]

"[B]iotechnology is an important growth platform for Dow, and we will continue to invest in it."

William Stavropoulos, CEO, 1998

In 1998, continuing its move back to basic chemicals, Dow sold off its consumer brands unit, including its bathroom cleaners, and its *Ziploc* and *Saran Wrap* lines, to S.C. Johnson. But Dow's leaders also continued talking up the prospects for biotechnology. "Every sign points to the fact that the biotech revolution is ushering in an entirely new economic era, comparable to the age of the transistor," said CEO William Stavropoulos at the company's 1998 shareholders' meeting. "In the future, biotechnology will touch nearly all aspects of our lives: food, medicine, electronics—and chemicals and plastics," he continued. "The important fact is biotechnology is an important growth platform for Dow, and we will continue to invest in it."

Dow was by this time a $20 billion company with 43,000 employees, selling chemicals, plastics, and agricultural products in 164 countries. It was also a company increasingly concerned about its image, and was spending money to make sure the public saw the kind of company Dow management had in mind. Stavropoulos told his shareholders in May 1998 that Dow needed to increase its "public presence," and to that end was launching some new advertising around the theme: "Look at All the Good Things a Little Good Thinking Can Do." The Dow TV ads would portray a company deeply involved in everyday things—"from the clothes we wear to the food we eat

to the computer and telecommunications products that have come to define the Information Age," explained Stavropoulos. "We want to be known as a science company that is trying to help solve problems," he said.[44]

Union Carbide

In August 1999, Dow announced it would spend $9.3 billion to acquire Union Carbide—a company then ranked as the world's 28th largest chemical firm. The combination with Carbide would push Dow ahead of Bayer, then making it the world's No. 2 chemical company. The new Dow-Union Carbide would have $24 billion in annual sales with operations in 168 countries. Adding Carbide would immediately make Dow a much bigger global player in basic and intermediate chemicals—the "building block" chemicals like polyethylene, ethylene glycol, and propylene oxide; chemicals found in products from computers to food wrapping. Dow-Union Carbide would be No. 1 in ethylene production, a primary component of most plastic products; No. 1 in low-density polyethylene, used in plastic bottles, food wrapping and dry cleaning bags; No. 1 in linear low-density polyethylene, used in garbage bags and tops for butter and coffee containers; and No. 3 in high-density polyethylene, used in plastic garbage cans, cereal box liners, and grocery bags. The new company would also be a leading supplier of solvents and other chemicals to the paint industry. The deal also brought new plants to Dow where it had none or few—in the Middle East and Southeast Asia.[45] But aside from all the business synergy and new markets that Dow would gain, there was something else: the 1984 Bhopal toxic gas leak, the most horrific chemical accident in modern times (see Chapter 20). Why would Dow acquire a company that was still mired in the seemingly endless liability of the Bhopal victims' litigation and compensation claims?

Why would Dow acquire a company mired in the liability of Bhopal?

In May 2000, *Business Week* put some of those very questions to Dow's CEO, William Stavropoulos. "Carbide was involved in the 1984 chemicals spill at Bhopal, India, that killed or maimed thousands. Will that create an image problem for Dow?" asked *Business Week*. "It could," replied Stavropoulos, who also noted he couldn't comment directly because Carbide and Dow were then still separate companies. But he did say that "Union Carbide settled with the Indian government," indicating that was Dow's understanding at the time. "But our whole drive," he said, "no matter what business we're in or acquire, is to be an absolute leader in environmental health and safety performance. Yes, people might tag us with it [Bhopal]. But we're looking to improve the situation, to bring it to the next level."[46]

In early February 2001, after the merger was approved, Dow ran full-

page ads announcing the new company in selected newspapers under the banner, "Today Is a Big Day For Us."

> Today, we're proud to say Dow and Union Carbide have come together. Our two companies have rich histories for innovation—a combined 217 years to be exact.
>
> We're enhancing medicines for human health. Producing more abundant and nutritious foods. Improving insulation for more comfortable homes. And helping create faster, more powerful computers. From health and medicine to electronics and entertainment, starting today, we're better together.
>
> Uniting to improve the essentials of life.
>
> ...**Dow.** Living. Improved Daily.[47]

By early 2002, Wall Street analysts were generally giving Dow high marks for the Carbide deal—focusing mainly on financial savings. Environmentalists and human rights activists, however, kept pointing to the damages and victim compensation tab yet to be paid by Union Carbide for its 1984 Bhopal chemical plant disaster. And there were still festering toxic wastes at the site. Carbide also had its own environmental baggage, ongoing emissions and waste problems, and significant asbestos liability. But none of that appeared to matter much to the deal makers or Dow management.

In addition to Carbide, Dow also made other acquisitions in the late 1990s—deals that involved at least $3 billion beyond the $9.3 billion shelled out for Carbide. Among these were: Bassel's Cologne polypropylene plant; Cargill's hybrid seed business; Enichem's polyurethane lines; two foam makers, Flexible Products and General Latex; Integral Compounding, a manufacturer of an engineering plastics compound; Reichhold's latex business for paper and carpet; Rohm and Haas's agricultural chemicals business with its line of fungicides, insecticides and herbicides; and Zeneca's herbicide, acetochlor.[48] Although Dow had divested its drug businesses in the mid-1990s, it did not sell the chemical basis for making the basic pharmaceutical intermediates vital to the drug industry. By the late 1990s, Dow acquired several chemical-specialty companies that fit into its pharmaceutical-supply business, turning out "custom and fine chemicals." It also added a company in fermentation technology. Explained Dow's Andrew N. Liveris in February 2002, then a performance chemicals manager, "Even if you have just a few drug company customers, it can easily be a $1 billion business."[49]

Dow Chemical Today

Today, Dow Chemical is a company with $28 billion in annual sales. On the *Fortune 500* list for 2003, Dow stood at No. 51, outranking companies such as: Lockheed-Martin, Intel, Motorola, Disney, DuPont, Georgia Pacific,

Bell South, Alcoa, Caterpillar, Aetna, Coca-Cola, Cisco Systems, Weyerhaeuser, and Bristol-Meyers Squibb. Dow operates 208 manufacturing plants and has 50,000 employees worldwide, selling 3,200 products in more than 170 countries.

Although Dow is still a company close to it traditional businesses, and still makes much of its money selling basic commodity chemicals in bulk, it is gradually shifting to more speciality lines. And like the rest of the chemical industry, it is always inventing new things. Dow's researchers have designed a new polymer film which can be used in semiconductors. The product, called SiLK, increases the chips' speed by protecting copper circuits from extraneous electronic noise. IBM, using semiconductors built with Dow's SiLK, has announced 30 percent faster computing speeds. A new electronics polymer market is already booming. According to *Forbes* magazine, Dow is also working on "polymeric light-emitting diodes," semiconducting polymers made of fluorine that give off colored light and can be used to make vivid, wide-angle display screens. Dow's first diode, which gives off green light, went on the market October 1999 (red and blue diodes were expected to follow). Cell phone displays using the diode are 40 percent to 60 percent thinner than ones made with previous materials, says Dow's manager for electro-active polymers.[50]

Using biotechnology, Dow researchers hope to manipulate crop plants to make fuels and supply new kinds of bio-materials for next-generation Dow products and processes. In early 2000, Dow AgroSciences and Dow Chemical joined forces with four academic centers in a $10 million initiative called the Oilseed Engineering Alliance. The aim, in part, is to turn green fields into bio-factories that produce commodity chemicals and raw materials for plastics. Some crop plants "perform complicated synthetic reactions that are impossible for chemists to do in the lab," explains Michael Pollard, a scientist at Michigan State University working with Dow on the project. Crop plants also produce hundreds of different oils and coaxing some of them to make just one kind of oil in quantity could prove very valuable to Dow, and much cheaper than petroleum.[51] Yet the reality of Dow's business and business expansion continues to be built around its chlorinated products. That chemistry is at the root of much of this company's culture and history, and continues to mold its future.