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Expansion is a symbol of many things

**by Fred L. Hartley,
Chairman and President of
Union Oil Company**

"This enlarged research complex, with its visionary concepts and advanced designs, symbolizes Union's approach to the future ...we see this center as Union's vote of confidence in America's future."

At the groundbreaking ceremonies two and a half years ago, I spoke of the great pride I take in having this research center—this center of creativity—bear my name. I said then, and I must say again now, that the honor is all the greater because the men and women who work here were the ones who made that decision.

This major expansion of our research facilities and research staff is a symbol of many things. It is a symbol of what Union Oil has become, and of what we are determined to be in the future. And, perhaps, it is also a symbol of the solution to one of America's most persistent problems.

America's near-term energy problem is how to discover and produce adequate supplies of conventional oil and natural gas. The majority of our science and technology effort is directed to the solution of this problem. This effort has been, and continues to be, highly successful. Many of our new exploration, drilling, well completion, enhanced recovery and environment-protecting techniques originated here.

Looking to the long-term and to the gradual depletion of our conventional energy sources, it is clear that America must soon turn to alternative, unconventional energy sources. It is our creativity in learning how to develop these alternative resources, coupled with our willingness to take the risks that go with the pioneering plants, that allows us to boast of being true innovators in energy development.

Union Oil leads the world in geothermal energy production. In addition to our activity at The Geysers in northern California, we are involved in projects in the Philippines, Japan and Indonesia. The invitations that brought us to these foreign countries reflect Union's supremacy in geothermal knowledge and technology.

In oil shale, Union is many years ahead of other companies, and we are daily widening the gap. Next year we will start operations at the first commercial shale oil plant in the country. This plant will produce 10,000 barrels a day of high quality synthetic crude—the first clear signal to OPEC that America is capable of replacing its depleting oil resources.

Our shale oil plant exemplifies Union's long-term approach to research—and to our faith in the scientists who invent and in the engineers who turn these inventions into commercial realities.

Union's acquisition of 20,000 acres of oil shale property, containing over one and one-half billion barrels of recoverable oil, started in the 1920s. Research into how to extract oil from these resources began some 40 years ago in a small pilot plant in a corner of the Los Angeles Refinery. In the 1950s, this research was expanded to a semi-works plant at the Colorado site. And then pursued most recently at sophisticated pilot plants here at the research center.

Step by step our scientists and engineers have developed Union's own oil shale retorting and shale oil upgrading processes. Today's $600 million investment in the commercial plant in Colorado indicates our faith in their work and in the commercial future of oil shale.

Union is also an innovator in learning how to convert low quality crude oils and refining stocks into

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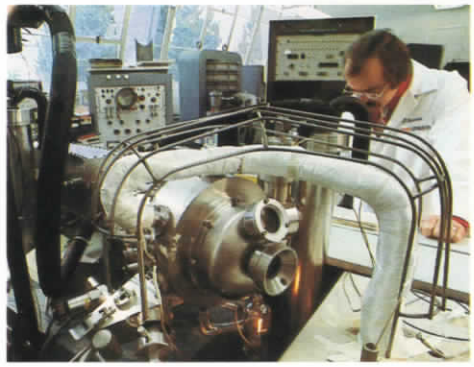


"America's near-term energy problem is how to discover and produce adequate supplies of conventional oil and natural gas. The majority of our science and technology effort is directed to the solution of this problem."

high quality products—a skill learned from the necessity of having to process the California crude oils that were our inheritance. Refining techniques developed at this center—be it Unicracking, Unionfining or dozens of other processes and catalysts—are quickly incorporated in our own refineries. But the true measure of their excellence is that they have been licensed for use in some 600 other plants in 23 countries. Truly, an amazing accomplishment.

I said at the outset that this enlarged research complex, with its visionary concepts and advanced designs, symbolizes Union's approach to the future. I believe it is also fair to say that we see this center as Union's vote of confidence in America's future.

This is not the time nor place to discuss the many problems plaguing our national economy. However, when we focus on the future, as we are today, it quickly becomes clear that the long-term real economic growth that America is so much in need of cannot take place without corresponding long-term growth in the nation's rate of productivity.

In that difficult decade spanning the late 60s to late 70s—the decade that saw such massive increases in inflation and government regulations—the U.S. had no appreciable increase in real research and development expenditures. We should not be surprised to find that in this same period national productivity fell.

But at last we're in a position to turn that situation around. Both the regulatory environment and inflation are improving substantially. If Union's leadership in expanding its research effort is now followed by the rest of American industry, I'm confident that we will soon see the needed upturn in the growth rate of productivity.

Innovation, followed by its twin, technological change, is a first-class ticket to higher living standards. As we dedicate these new facilities here, it is our determination to provide Americans with just as many tickets to higher living standards as we possibly can.

This new investment is Union's pledge that we are determined to do what we can to contribute to America's real long-term growth. It is a pledge we will continue to augment—not only in the nation's interest but in our own.

Though I know I won't be able to prove it personally, I believe that more than 50 percent of Union's net earnings by the year 2000 will flow from innovation and technological change which the research staff here, and in the future, has yet to develop or apply.

Just how it will evolve we cannot presently know. One answer is that of the great 18th century scientist, Joseph Priestley. "In completing one discovery," he noted, "we never fail to get an imperfect knowledge of others of which we could have no idea before." In short, persistence can have its rewards.

Another response has to do with our tremendous faith in the men and women who involve themselves in this mysterious creative process.

We have nearly doubled our laboratory and office space in this center, and stocked it with the latest equipment. The physical plant now dwarfs those original structures which seemed so spacious when the 225 members of Union's research department moved to Brea from the Los Angeles Refinery in 1951.

But the crucial change has to do with people rather than plant. There are now more than three times as many Union employees working here.

Personnel has increased by nearly 60 percent in the last four years alone. And they are more highly trained, in a more diverse range of specialties, than ever before.

Companies like Union Oil have many choices when it comes to creating capital, to taking risks and to investing in the innovative abilities of its employees. Union's priorities have never been in doubt since the company established the petroleum industry's first research department in 1891.

Now, with the addition and dedication of these magnificent new facilities, we eagerly await even more magnificent accomplishments in the years ahead.

Thank you for this great personal honor. 76

New Facilities Dedicated at the Fred L. Hartley Research Center

Union Oil's newest and most sophisticated facilities, a $32 million expansion of the Fred L. Hartley Research Center, opened in late September amidst celebration and gala that lasted the better part of a week. These new facilities not only represent the state-of-the-art in architectural design and advanced equipment, but also signal Union's determination to continue its proud tradition of growth through innovation. The new technol-

ogy developed here will help to meet the nation's energy needs for decades to come.

The expanded facilities at the center, headquarters of the Union Science and Technology Division, include a new administration building, three new laboratories, a geological sample process laboratory, an auditorium, a new cafeteria, expansion of a pilot plant building and even an ice bank for air conditioning.

A festive air prevailed during the dedication week, which began when the company's board of directors were given a tour by Fred L. Hartley, chairman and president of Union Oil, before gathering for the official unveiling ceremonies in the modern auditorium.

More than 450 business associates, public officials and employees attended the dedication proceedings.

Cloyd P. Reeg, president of Union's Science and Technology Division, formally welcomes guests to the dedication of the Fred L. Hartley Research Center's new facilities (above). *Fred L. Hartley, president and chairman of Union Oil, mingles with guests in the patio after delivering his dedication speech.*

Hartley, who served as the head of Union's research arm in the late 1950s, outlined the accomplishments of the company's research group which have made the company a technological leader in refinery processes, alternative energy sources such as oil shale and geothermal and revolutionary techniques for discovering and producing oil and natural gas reserves.

All guests were invited to tour the complex. One of the most popular stops on the tour was the debut of the world's first automobile to be fueled and lubricated by products made from shale oil. Visitors were also taken through the pilot plant facilities, where they saw demonstrations of the latest technological advances being developed and tested there.

All of the major processes used in the company's shale oil project in Parachute Creek, Colorado, the nation's first commercial shale oil venture were developed in these pilot plants.

Within this modern research facility, operating departments provide the fully integrated science and technology requirements of the entire company. And quite a facility it is. For example, a new ice bank building contains 1,200 horsepower of refrigeration and produces 1.1 million pounds of ice per day. Approximately 95 percent of the air conditioning in the

The company's Board of Directors reviews Union's experimental shale car at the dedication (above left). *Richard J. Stegemeier, director and senior vice president, addresses guests in the new auditorium* (above). *Fred L. Hartley chats with Gloria Terry who sculpted the bust now on display in the lobby of the center.*

entire facility is now produced by the ice bank. Ice is made at night when peak power demand (and electricity costs) are lower and subsequently cool the air as it melts during the day.

More than half of the new laboratory space is devoted to research on conventional petroleum resources including exploration methods, enhanced recovery techniques and environmental protection processes.

The new facilities will more than accommodate the expected growth of the Science and Technology Division over the next few years.

The Fred L. Hartley Research Center is more than an efficient center for studying energy-related problems. It also provides an aesthetically pleasing environment.

The new administration building, auditorium and cafeteria surround a

delightful central park which anchors the facility.

Currently, the research center has 29 buildings and occupies 77 acres of a 125-acre parcel.

The dedication ceremonies included the unveiling of a bust of Hartley. The sculpture is now located in the lobby of the administration building.

Hartley was also presented with a plaque, mounted on a piece of oil shale, commemorating the fact he was the the first person to drive the demonstration shale car.

On the second day, additional business associates toured the center, followed by groups of financial and security analysts on the third and fourth days. The week was wrapped with an all-day open house for Union employees, their families and friends who toured the grounds where many energy-related demonstrations were held.

The new research center is a fitting tribute to the more than 1,000 Union scientists, engineers and technicians who are hard at work inventing the future there. As Hartley said during the dedication ceremonies, "We eagerly await more magnificent accomplishments in the years ahead." 76

John L. Duir, manager of process development at Brea, explains the workings of Union's Colorado oil shale operations with the help of a scale model to visiting oil analysts (above). *Union employees and friends tour the facilities* (facing page) *and another group listens to an explanation of products such as hot melt adhesives developed at the Research Center.*

"TRUTH CONQUERS ALL"

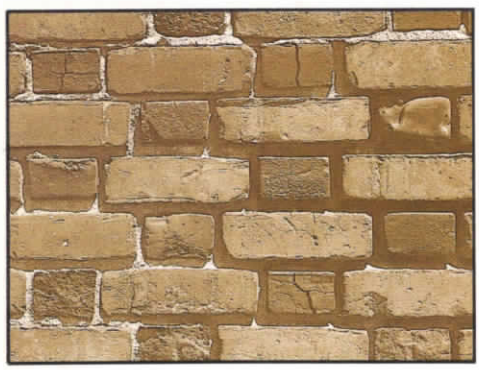
"It has been said that the only certain thing about the petroleum industry is the uncertainty, and this is particularly true of research in that industry. We do not know this year what the pressing problems of next year will be, and it is therefore difficult to make plans for the specific requirements of the future."

Those words appeared in a 1924 issue of *The Bulletin*, Union Oil's company magazine at the time. They were written by R. E. Haylett, then manager of research and development, in an article celebrating the second year of occupancy of the first Union Oil facility dedicated exclusively to research.

His words are as appropriate today, with the opening of the expanded Fred L. Hartley Research Center in Brea as they were 58 years ago.

The two-story brick facility, which now serves as a storage building in Wilmington, Ca. on the grounds of the Los Angeles Refinery, still bears the motto *Veritas Omnia Vincit* (Truth Conquers All) above its arched main entrance "to remind us that all research constitutes searching for and using the truth," wrote Haylett.

What was then considered state-of-the-art equipment for conducting various distillation tests, asphalt testing, flash and fire determinations, and chemical inspections, was housed in this 40,000 square-foot building. One laboratory was a photographic and microscopic darkroom. Four basement laboratories were used for heavy



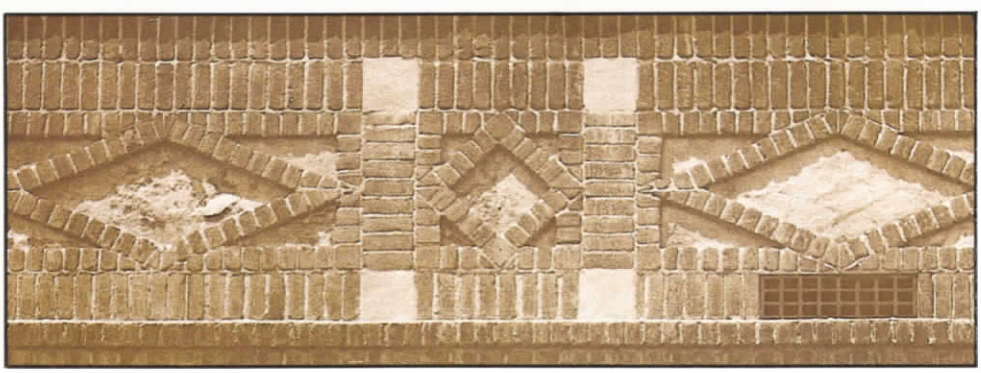
equipment such as the electric dynamometer which tested motors and performance of fuels and lubricating oils. There was a fully equipped emergency hospital "for first-aid services and for the needs of the company surgeon who visits the refinery each day."

In his article, Haylett boasted of the large research library "containing 1,000 books and bound volumes."

Three rooms were occupied by the patent division, "engaged in the classification and study of the many thousands of patents relating to the petroleum industry and allied arts."

The building also housed the refinery's administrative offices and the resident engineer's office.

The Wilmington facility might have been a wonder to Dr. Frederick Salathe who, in 1891, dedicated his research to producing a water-white kerosine from California crude in Union Oil's first laboratory—a single room at the Santa Paula Refinery. Haylett would surely be astonished with the sophisticated technology destined to be a product of Union's newest research center.



In the refining field, Union Oil has long been synonymous with innovative and revolutionary ideas. Units such as those on the opposite page were first tested and studied at the company's research facilities.

Industry Innovations Sprout at Research Center

Charles Franklin Kettering, the great American engineer and inventor, was fond of saying that "Research is an organized method for keeping you reasonably dissatisfied with what you have." Nowhere is this more evident than at the Union Science and Technology Division, where the difficult task of finding new and more efficient applications to benefit modern society is the first order of the day.

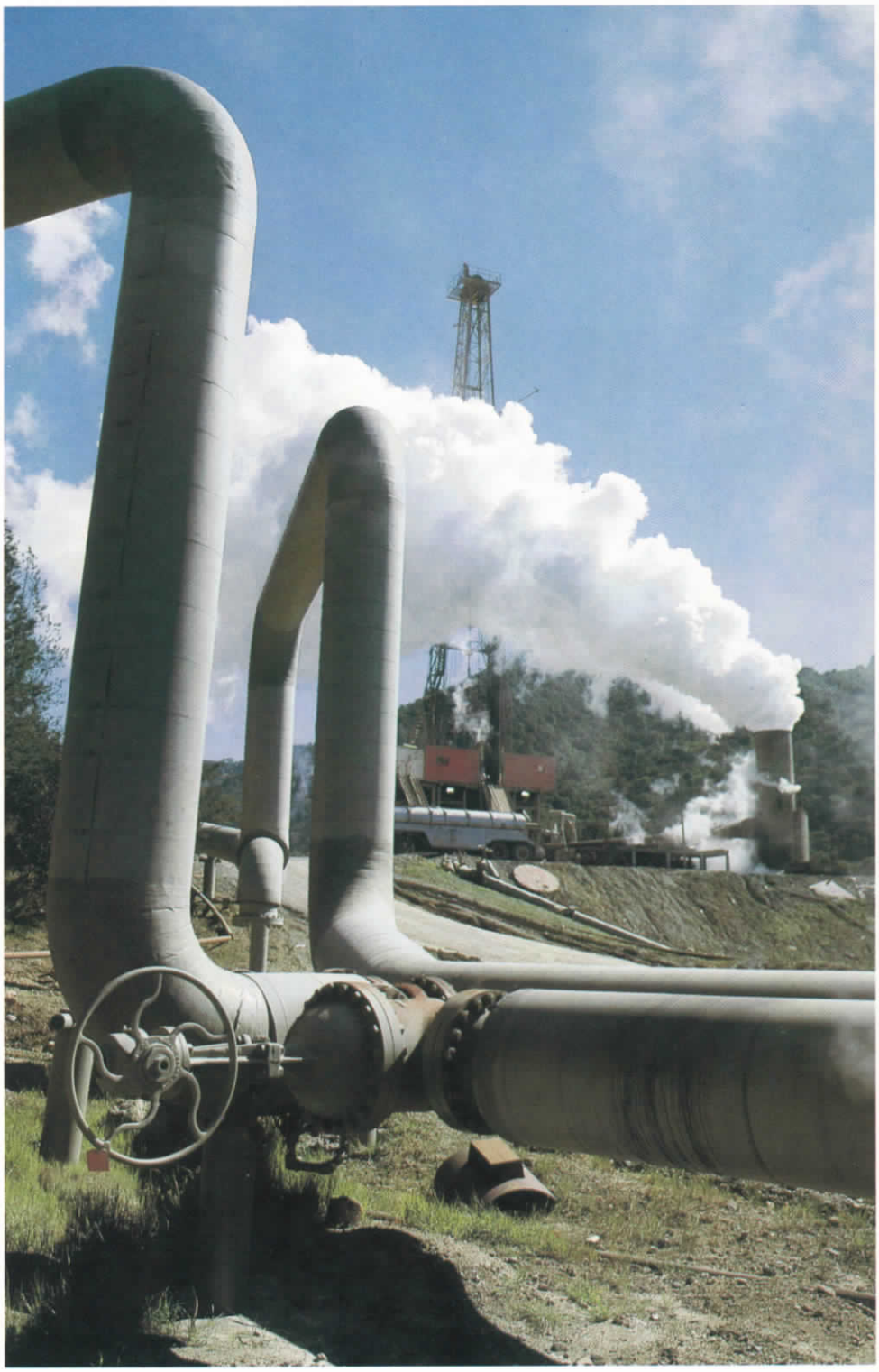
It is within this facility in Brea in southern California where the basic and applied research activities of the company are conducted.

Research is not a new activity for Union—a company long associated with innovations and know-how. Its research activities date back to 1891 when the Board of Directors of the foundling company first decided to establish a laboratory in Santa Paula to find a way to make crystalline, non-smoking kerosine from the heavy, foul-smelling California crude prevalent in the area. It may seem a humble beginning, but that small laboratory in the basement of what is today the California Oil Museum, was the first facility of its type in the West.

Today, the Union Science and Technology Division—after brief stops in sites as varied as a brick building on the grounds of the company's Los Angeles Refinery (See page 8) and, later, in a 50's-style complex in Brea—is headquartered at the modern and exquisite Fred L. Hartley Research Center also in Brea.

There are some 1,000 scientists, engineers and technicians at the center who are engaged in as many earth resource research projects. Their goals are clear: to benefit today's society and to keep Union Oil at the

The primary aim of the research center is to develop new technology for finding, producing and using a wide range of earth resources (above). *In geothermal energy* (right), *Union first pioneered the development of special muds and cements needed to withstand the tremendous heat encountered when drilling geothermal wells.*



forefront of technological innovations—a position the company has long enjoyed.

The Fred L. Hartley Research Center clearly reflects the scale of Union's commitment to research. It is a 430,000 square-foot facility, double its former size. Additional installations include three new laboratories, an enlarged pilot plant building, a 480-seat auditorium, a new cafeteria, modern executive offices, and a new rock sample processing laboratory for storage and analysis of core samples taken from Union's drilling operations throughout the world.

The company's research teams provide the many operating divisions with a steady flow of significant processes, techniques, designs and products. Union's reputation of being one of the most innovative energy companies owes much to their expertise and hard work.

The primary aim of the research center is to develop new technology for finding, producing and using a wide range of earth resources.

Union's research has come a long, long way since that first team of scientists found a way to improve kerosine.

The know-how and determination of the company's research team of scientists, engineers and technicians have enabled Union Oil to remain at the forefront of technology in many areas, such as:

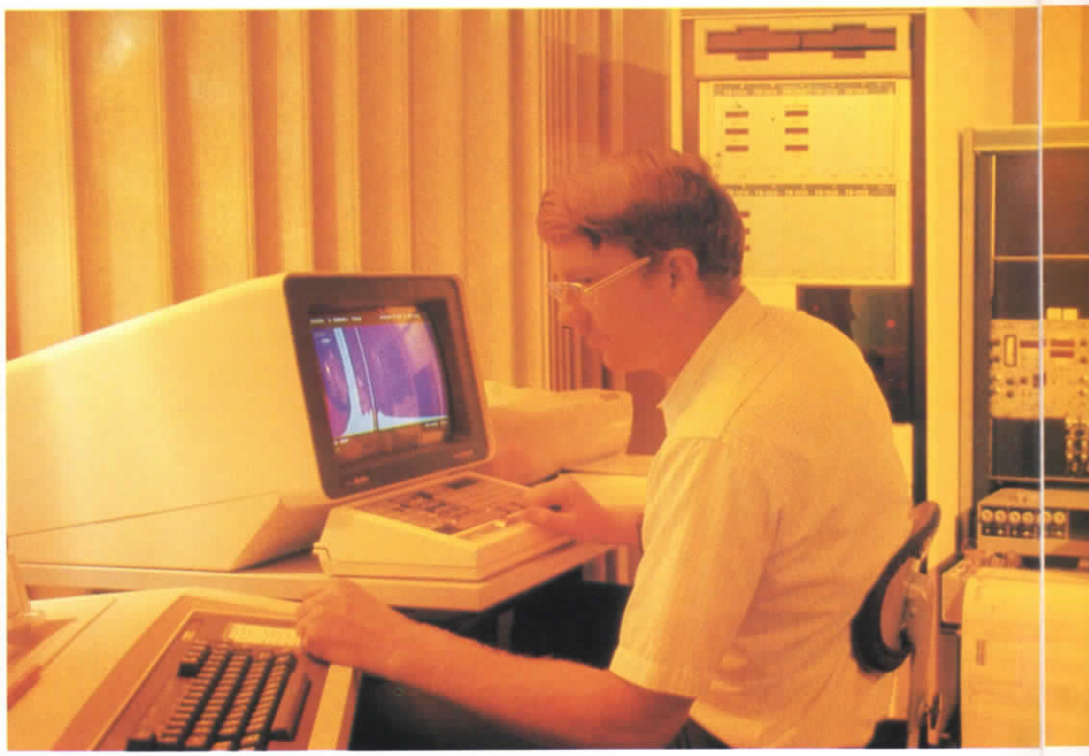
- Being one of the leading developers of modern refining processes and catalysts used in the manufacture of a wide range of petroleum products.
- Working hand in hand with the company's Geothermal Division to develop techniques for finding and producing geothermal energy and thus elevate the company to its present position as the world's largest producer of geothermal energy.
- Perfecting new methods of finding oil and gas reserves and developing processes for increasing the yields of existing oil fields.
- Developing the retorting, oil upgrading and environmental protection system being used by the company in the country's first commercial shale oil project.

Union Oil's interests go far beyond energy. The Fred L. Hartley Research Center is a virtual cornucopia of ideas and new concepts. On any given day, one is apt to find a team of scientists working to develop or improve a petrochemical for industrial applications. A few yards away, another team may be studying new combinations of inorganic chemicals for agriculture. In another place, a team of horticulturists might be looking at the effects of certain pollutants on a species of plants.

These and myriad other projects, ranging from studying the properties of graphite to the uses of some rare earths for electronics, help maintain Union's leadership in both science and technology.

But no matter how the research facilities expand or what new goals are accomplished, the company's aim remains the same: enable Union Oil

In the production of oil and gas, some first-of-their-kind projects first saw the light of day within the confines of Union's Science and Technology Division in Brea, California.



Michael Bell, senior research chemist at Union's Research Center, works with an electron microprobe, a tool that enables scientists to conduct chemical analyses on small areas of mineral, catalyst and corrosion samples. The corrosion studies conducted at Brea have enabled plants such as Union's gas treatment facilities in Chunchula, Alabama (above), *to work more efficiently.*

to grow through innovation, to prosper as a company and to serve vital public needs.

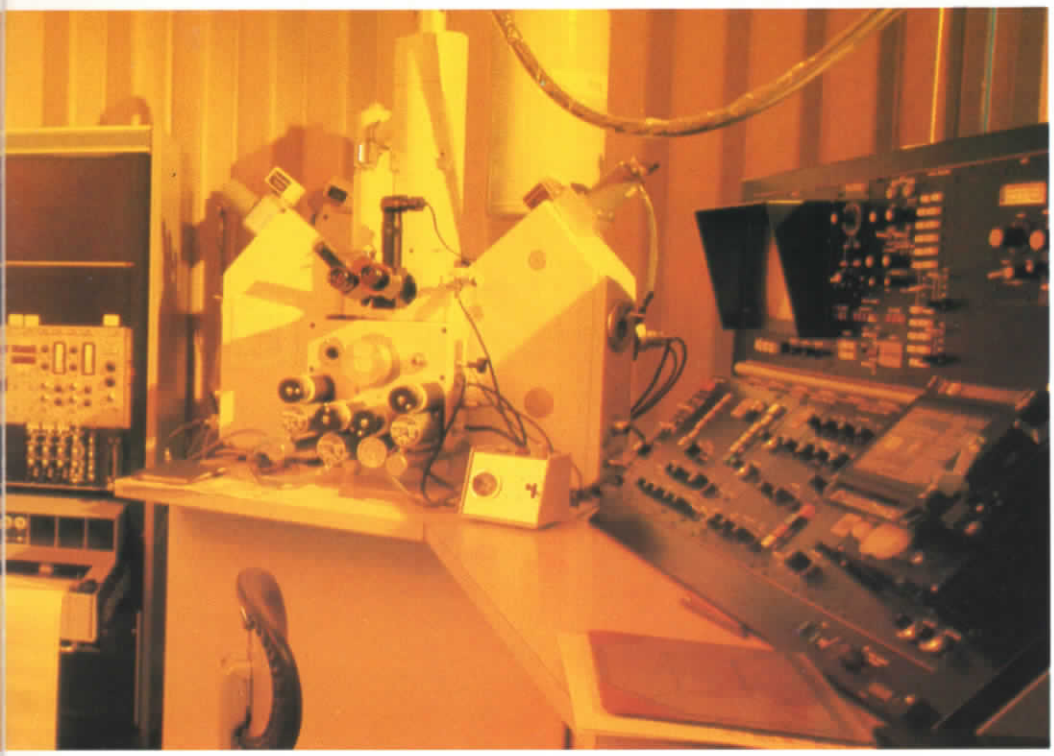
In the 91 years that have ensued since the company decided to embark on a long, long trip into research and technology, many accomplishments took root in Union's research laboratories.

Still, oil and gas-related research projects have top priority—for example, roughly one-half of the Fred L. Hartley Research Center laboratories and more than 35 percent of the Science and Technology Division's budget is devoted to developing highly-sophisticated methods for finding and producing oil, natural gas, geothermal and mineral resources.—Union has consistently increased its efforts to develop new exploration and production techniques. The research teams at Brea have developed a new geo-chemical "sniffer system" that also employs seismic surveys.

This is a technique that measures gases and light hydrocarbons seeping from the ocean floor and simultaneously acquires seismic data and provides a better picture of the subsurface structures.

In addition, the division has developed new software for geophysical and geological works to enhance the efforts of the operating divisions.

At the Fred L. Hartley Research Center, extensive facilities are committed to increasing the company's expertise in exploration and techniques.



In the production of oil and gas, some first-of-their-kind projects first saw the light of day within the confines of the Science and Technology Division.

The concept of drilling a well from a grounded, man-made ice island using a patented procedure was conceived by a Union research team and developed with operations.

These and hundreds of other innovations ranging from platform designs, well protection technology, developing new drilling muds, pioneering new techniques for enhanced oil recovery, developing special emulsions that break down oil field sludge into crude oil, perfecting special corrosion inhibitors such as Unisteam keep the scientists who deal with oil and gas problems studying new and interesting projects on a daily basis.

But all the efforts of the "brains of the company"—as a past chief executive once called the research teams—are not devoted entirely to oil and gas. In refining, Union has long been synonymous with innovation and revolutionary projects. The company, with its Unicracking process, is the world's leader in hydrocracking technology. Forty-eight Unicrackers are in use throughout the globe with a total capacity of processing 986,000 barrels of oil per day.

Union, in addition, has developed an extended range of special catalysts for synthetic crudes. These include Uniwax, which reduces the oil's pour point; Soar 100, a catalyst that removes arsenic and Unimeth which produces methane from coal and

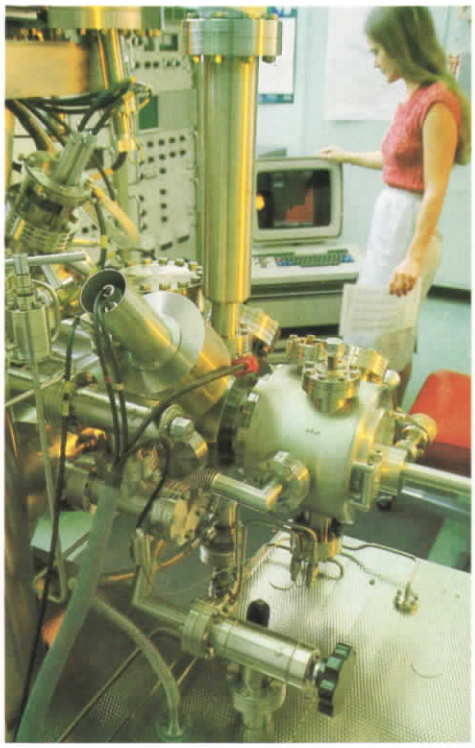
synthetic gas. These are just some of the many products that have made Union the world leader in catalytic technology.

In other related fields, Union is involved in constant research activities. In the Fred L. Hartley Research Center, studies are currently being conducted into photocatalysis. Rather than looking into solar energy to produce heat, Union scientists are developing catalysts which react with sunlight to split water molecules and produce hydrogen. This process would be important in upgrading hydrocarbons to fuels and petrochemicals.

In the area of rare earths, the company has developed a rare earth compound as a replacement for molybdenum disulfide which can be used as an anti-wear component in the grease used in machinery.

The Division has also developed a new oil additive called boramids, which will be tested this year. Boramids use non-heavy metals that offer higher lubricity and are particularly suitable for automobiles equipped with catalytic converters. Union has also developed a patented process for in situ leaching of uranium from deposits not suitable for conventional mining.

In chemicals, among the many projects originated at Brea, Union has developed a patented process to manufacture needle coke needed to convert scrap metal to steel. Engineering work is currently underway at Union's Chicago Refinery on a needle coke manufacturing facility.



Dr. Carol S. Hemminger, research chemist, works with an electron spectrometer, a sophisticated piece of equipment used to study the atomic layers of catalysts, engine deposits and corrosion. The electron spectrometer is one of many high-technology tools found in the Fred L. Hartley Research Center.

In addition, Union is a leading marketer of latexes used in water-based paints and other products.

The company's Poco Graphite subsidiary relied heavily on research findings to manufacture a superior quality graphite with unique properties such as those needed in the electrical discharge machining industry, nuclear reactors and even artificial heart valves.

Union has also rapidly become one of the leading producers of specialty latex emulsions.

Then there are many applications of various agricultural products such as popcorn sulfur that raises the soil acidity; Union's Dian, a specially-blended fertilizer for use on lettuce crops; Zero-Biuret urea developed for direct spraying on citrus trees and the many special fertilizers that have been developed for use in drip irrigation systems.

In alternative energy development, a long-standing company interest, Union research is preeminent. Research efforts have borne fruit especially in geothermal and in shale, where Union Oil is the recognized leader in both industries.

From both the technological and commercial standpoints, Union leads the way throughout the world. The company produces enough geothermal energy to power more than 1.3 million kilowatts of electrical generating capacity, more than half of the world's total electric power production from geothermal energy.

It is in geothermal energy that Union first pioneered the development of special muds and cements

The many faces of research (right and left) *and the man hours of analyzing and studies have kept Union Oil on the forefront of the industry innovations and also have helped facilities such as the company's Chicago Refinery* (above) *conduct safe and efficient operations.*

needed to withstand the tremendous heat encountered when drilling geothermal wells. It also was the first company to harness the heat energy of the geothermal fluids so prevalent in California's Imperial Valley by using the flash steam method. Union also has the highest ratio of successful wells in both dry steam and hot water geothermal fluids in the industry.

In shale, Union Oil's Parachute Creek project will be the first commercial shale oil project in the United States. Union Oil has the leadership in retorting technology as well as in the ability to upgrade raw shale oil into premium quality syncrude.

In 1891 when Union was exclusively an oil company, three men made up its research team. In 1951, when the research department moved to Brea from the old quarters at the Los Angeles refinery, 225 professionals made up the research staff.

Much has changed today, but the principal objective—that of providing new technology for today's changing world—remains essentially the same.

The new Fred L. Hartley Research Center stands as a symbol of that ever-expanding commitment. ⑯

Mention the Science and Technology Division, or the Fred L. Hartley Research Center, and most people conjure up instant images of chemists creating new compounds, engineers perfecting a new refining process or geologists analyzing core samples.

All of these images are valid, of course. But some of the most valued and productive members of the division's professional staff take no direct part in laboratory research. Their jobs are to protect the company's exclusive rights to its own inventions and to sell this proprietary technology to others.

When Union's scientists, engineers and technicians are completing a successful research project, the work of the patent and technology sales departments is often just beginning.

It is exacting work and the payoff is sometimes long in coming. Although the average span between the application for, and issuance of, a patent is two to three years, the complex process can take considerably longer in some cases. "We've had as many as 20 years elapse before receiving a patent," notes Dean Sandford, chief patent and license counsel.

William Baral, the division's vice-president for technology sales, also has some anecdotes to tell. "We closed one contract for the sale of a Unicracker to a major oil company exactly ten years after I made my first call to them about the project," he recalls. "You need persistence in this business. And patience, too."

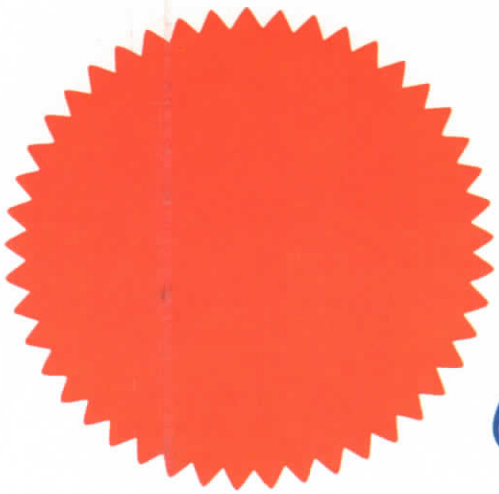
Still, the satisfactions are great. Much of Union's lofty reputation for technological innovation rests on its more than 1400 active patents and substantial technology sales.

The patent department, when founded over half a century ago, was the first corporate patent department west of Chicago. Now, that small original office has expanded to a dozen attorneys. All are either chemical engineers or chemists and many have master's or PhD's in addition to their law degrees.

In an average year, Sandford estimates, Union will be issued some 50 patents in the United States, perhaps 60 to 70 worldwide, and will file new applications for at least as many more.

"Normally, we file in the U.S. first," he explains. "Then, if the invention has licensing potential abroad, or if having a foreign patent might assist Union's operations in a foreign country, we may file in one or more other countries as well."

The federal government's power to issue a patent—which gives the inventor the right to exclude others from making, using or selling the patented process, machine, manufacture or material—derives from article 1 section 8 of the U.S. Constitution and was



Patents Protect New Ideas

designed to "promote the progress of Science and Useful Arts."

That purpose is achieved in three ways. The arrangement encourages the patentee by granting him a limited, 17-year exclusive right to his discovery. It helps other firms, which may wish to purchase and employ this new technology. And it assists other inventors who may study the published patent and use it as a grist for their intellectual mills.

In the early days of the Republic, Secretary of State Thomas Jefferson, himself a notable inventor, examined every application personally. Even as late as 1915, when Union received its first patent for a crude oil still, the patent process took only six weeks from start to finish.

Nowadays, the U.S. Patent and Trademark Office, a wing of the Commerce Department, scrutinizes every application with microscopic care. "However, a large percentage of them are rejected," Sandford points out, "either because they do not represent an advance over the prior art, they are obvious to one skilled in the field or on other more formal grounds, such as improper preparation of the application or inadequate description of the invention."

At Union's Science and Technology Division, the procedure begins when one or more research staffers—or field employees from another division—prepare a notarized document known as a "disclosure of invention" and file it with the patent department. These documents are reviewed on a monthly basis by a committee made up of the various vice presidents of the research departments, Sandford, Baral and Cloyd Reeg, division president.

"In each case, we judge the potential commercial merit, examine how far along the project is and then classify it with a priority. Then our patent attorneys go to work, beginning with the top priority cases," Sandford explains.

"The first step is to review the prior art, reading relevant patents and literature and so on. The invention must be new, unobvious and useful. If the attorney concludes that it is patentable, he then cooperates with the inventor in preparing and filing a patent application containing a detailed description of the invention explaining why it represents an advance, such supplementary materials as drawings and claims which define the scope of the patent protection sought.

"The patent office, in turn, conducts its own search. If the application is rejected, we have an opportunity to amend the claims, make additional arguments and submit additional evidence which supports our arguments. We can also appeal to the courts," Sandford adds.

At any given time, a Union patent attorney may be handling 25 to 35 U.S. and an equal number of foreign applications. Meanwhile, department members are also working to protect existing Union patents against infringement by others and to assist the technology sales departments in preparing and negotiating licensing contracts. The patent department also assists Union's other divisions in negotiating technology-related contracts in which a patent attorney's particular skills are needed.

"They're busy people," Sandford agrees.

Most patent attorneys launch their careers in technical or scientific posts, later seeking their legal training at law schools. Sandford is a prime example of such ambition and drive. He joined Union in 1951 with a University of Southern California chemical engineering degree, spent 12 years at the San Francisco Refinery, while studying for a Golden Gate University law degree at night and joined the patent department in 1963.

"Patent work provides a chance to combine a background in a broad technical field with legal expertise," Sandford summarizes. "It's exciting work because it utilizes and develops all your skills."

Not every Union invention appears in a patent application. Some remain carefully guarded trade secrets. Conversely, not every patent finds worthwhile application. "The value of a patent is tested by the years," Sandford stresses. "The true merit of an invention emerges in the marketplace and that process often takes time."

Taking Union inventions to the marketplace is the job of Bill Baral and his eight colleagues in technology sales. They, too, boast scientific or engineering backgrounds—with one interesting exception.

Lisa Bowden, a Chinese language specialist with a business minor degree, was hired temporarily to assist in Union's negotiations with the People's Republic of China. "She has stayed on as a regular staff member and is now helping to coordinate the training of 25 Chinese refinery people in the operation of a Unicracker," Baral declares.

The results of these negotiations were also pleasing. To date, Union has sold the Chinese licenses for four Unicrackers and one Unionfiner, contracts worth millions of dollars.

Those contracts, however, are only a drop in the barrel of the company's refinery technology sales. Some 600 planned or operating plants, located in 26 countries, incorporate Union process technology of one kind or another.

Some of the leading examples:

The work of Cleveland R. Williams, patent attorney, and June M. Bostich, patent engineer, at the Fred L. Hartley Research Center, revolves around protecting Union-developed technology such as the Unionfiner (left) *at the Chicago Refinery and the Unicracker at the company's San Francisco Refinery which is dependent on the heat exchangers* (below).

- Unicracking, a highly efficient hydrocracking process yielding high quality transportation fuels from lower value, heavy oils that would otherwise be burned as fuel oil.
- Unionfining, a hydrogenation process designed to remove sulfur, nitrogen and other contaminants from a variety of petroleum products.
- Unicracking/HDS, removing sulfur and metallic contaminants from heavy, residual fuel oils.
- Numerous gas desulfurization processes, from BSRP to Unisulf, which maintain air quality by forestalling emission of pollutants.

But refining inventions represent only one category of the technology sales effort. The largest single technology sale in Union history, concluded only a few months ago, involved a license for the company's patented upflow shale retorting process. It authorizes the three oil companies participating in the White River Shale project near Vernal, Utah, to construct a single Unishale B retort with a capacity of 10,000 barrels a day. The process utilizes the same technology as that now being installed at Union's own oil shale project in western Colorado.

Baral expects Union's pioneering work on alternative energy sources to achieve even wider recognition in the near future. "I'm very bullish on the future of oil shale," he enthuses.

How does a company find a market for its exclusive processes?

"We go about it in a number of ways," Baral explains. "First, we make direct sales calls on refinery management personnel throughout the world. We encourage our scientists to write technical articles about our processes. What a store achieves by advertising, we get through technical journals. We also attend numerous technical society meetings, getting to know the people in the petroleum and chemical industries and talking to them about our technology. We exhibit at technical trade shows. We do a limited amount of advertising in the trade journals and magazines. And we get a lot of unsolicited inquiries thanks to word of mouth. Union's reputation for technological innovation is a tremendous asset."

The history of the technology sales department has much to do with its success. It was launched, during the early 1950s, by Fred L. Hartley, who may well be the only example of a licensing executive rising to the presidency and chairmanship of a major American corporation.

"By the time I took over in 1959, this was already a fast moving shop," Baral allows. "And Mr. Hartley has always continued to encourage this type of activity."

Union's deeply rooted research tra-

Among the many innovations developed by Union scientists and researchers are the Unisar process (far left) *which removes aromatics from jet fuels and solvents, the shale retort facilities under construction on the bench in Colorado* (middle) *and Popcorn sulfur which is used to convert alkaline soil into fertile farmlands.*

dition and productive laboratories provide the wherewithal. "You've got to have the product to sell," Baral emphasizes. "Still, that isn't the whole story. "We were in partnership with another company for eight years selling Unicrackers. But although we shared the same technology during that period, we sold 18 and they only sold one."

Union's philosophy of technology sales is another part of that story. "First of all, we strongly believe that a successful research organization should increase the company's return from its research investment by generating substantial cash income through royalty payments by others. For us, this has varied from 10 percent to as much as 30 percent of research costs," Baral explains.

"We also believe that technology sales provide management with dramatic proof that development is on the right track. Sales of our intellectual products are made against strong competition.

"There are other aspects, too. An active licensing program spurs our scientists and engineers by providing foreign travel and wide ranging contacts with experts from other companies. We are able to assist company managers in other divisions by keeping them in touch with industry trends. Finally, this department is also a place where future research executives can be given valuable training in business and market judgment."

Baral's own training began at the University of Minnesota, where he studied chemical engineering. Before and after a World War II Navy hitch, he worked in process development research at the Los Angeles Refinery. One project he worked on in the late 1940s was the oil shale retorting pilot plant.

With the completion of the Fred L. Hartley Research Center, Union's patent attorneys and licensing executives are now comfortably ensconced on the upper floors of the center's sweeping, paneled administration building. There are many ways to measure their achievements as they go about their tasks in these comfortable new quarters.

The high percentage of Union's successful, and ultimately profitable, patent applications and issuances is one way. The burgeoning annual volume of technology sales is another.

But perhaps the most telling single indicator is the company's technological "balance of payments." For every license to a patented process Union purchases, the company sells ten. ⑦⑥

The little plants with giant jobs

Within the sprawling, modern Fred L. Hartley Research Center in Brea, California, engineers, scientists and technicians wrestle with projects of futuristic magnitude and complexity.

It is in parts of this center that the seeds of innovation are sown and nurtured: innovation which will help direct Union's operations in the decades ahead.

At first look an important step in the nurturing process is pilot plant development: testing small scale versions of new processes and techniques.

Initally, the pilot plant building at Brea seems to be a cross between a Jules Verne dream and an outtake from *Star Wars*. But to the process engineering researchers themselves, the rows of experimental and highly-sophisticated machinery represent the means for developing and testing ideas and applications which could solve not only today's, but tomorrow's energy problems.

Pilot plants simulate, on a small scale, how their industrial-sized offspring will do on a much larger scale sometimes involving hundreds of acres and millions of barrels of oil.

If, for example, a new refining method is needed, science and technology personnel first design a miniature plant capable of processing maybe only a few gallons per day.

In other words, the pilot plant fills the middle gap between an invention and its eventual application. New uses for existing technologies have also been discovered through experiments with pilot plants.

"The shale operation (at Union Oil's Parachute Creek facilities in western Colorado, where the company will begin operations next year) is a good example of how we fit in as part of the company's development of research," explains John H. Duir, vice president of the engineering and development department. "All the processes currently being used in Colorado were originally developed and tested on a small scale here at the research center."

The shale retort pilot plant at the Fred L. Hartley Research Center produces three barrels of shale oil per day. In addition to the retorting process, all of the upgrading processes that will see use in Colorado—from treating the gases, de-ashing the oil and even the eventual refining, have been simulated in one way or another at the shale pilot plants of Brea.

But that isn't all. The pilot plants have been used to train the future operators of the Parachute Creek facility. This was a necessary step because the only people familiar with the pioneering production process were the research center's pilot plant personnel.

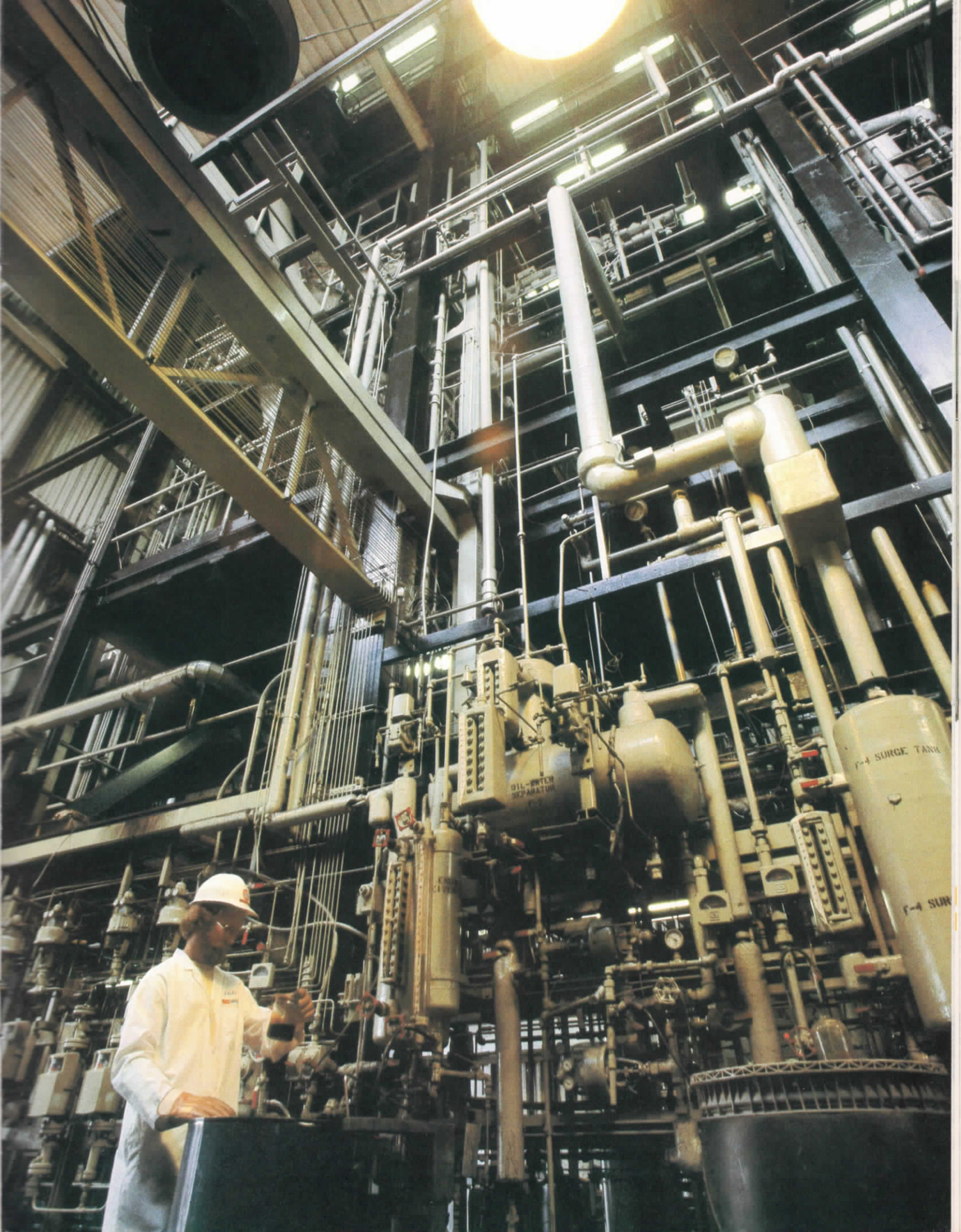
"We are basically dependent on the scientists and other research personnel who come up with new ideas. New technology generally comes to us from other groups, but we are also inventors," says Duir. "We take ideas and apply them in such a way as to gather the information so that plants can be designed, built and operated."

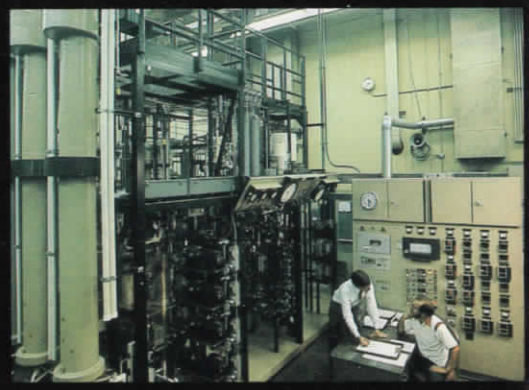
Rick V. Bertram, supervisor of process development operations, oversees the pilot plants involved in all aspects of shale retorting and other alternative energy sources. His group also works with pilot plants that contribute useful data to control air emissions.

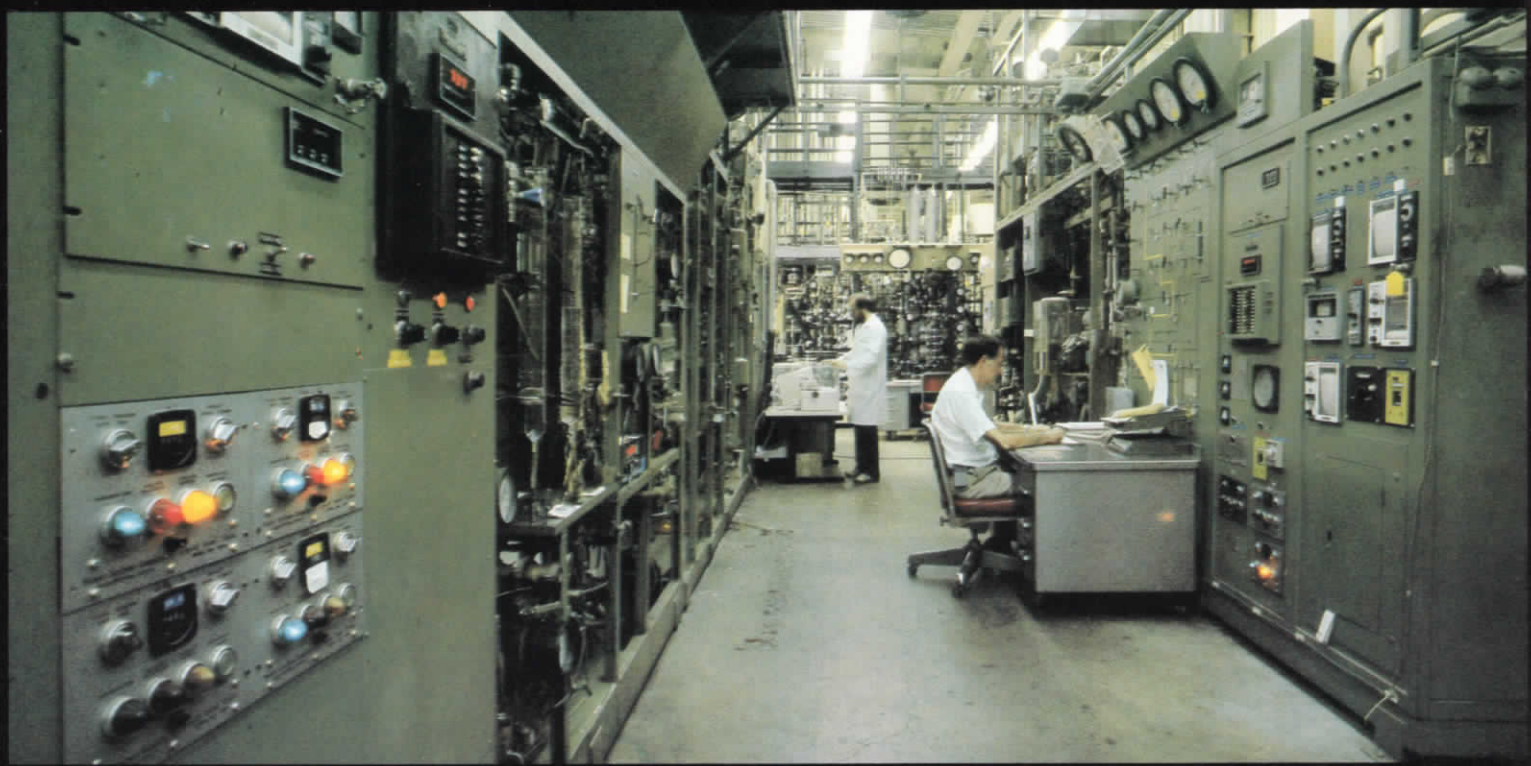
Most of the company's highly respected refining processes have evolved from these miniature plants. Without the experience of a pilot plant, for example, the Union-developed Unicracking process might not have seen the light of day. Other processes, such as Unisar, would have taken additional years of study and experimentation to develop.

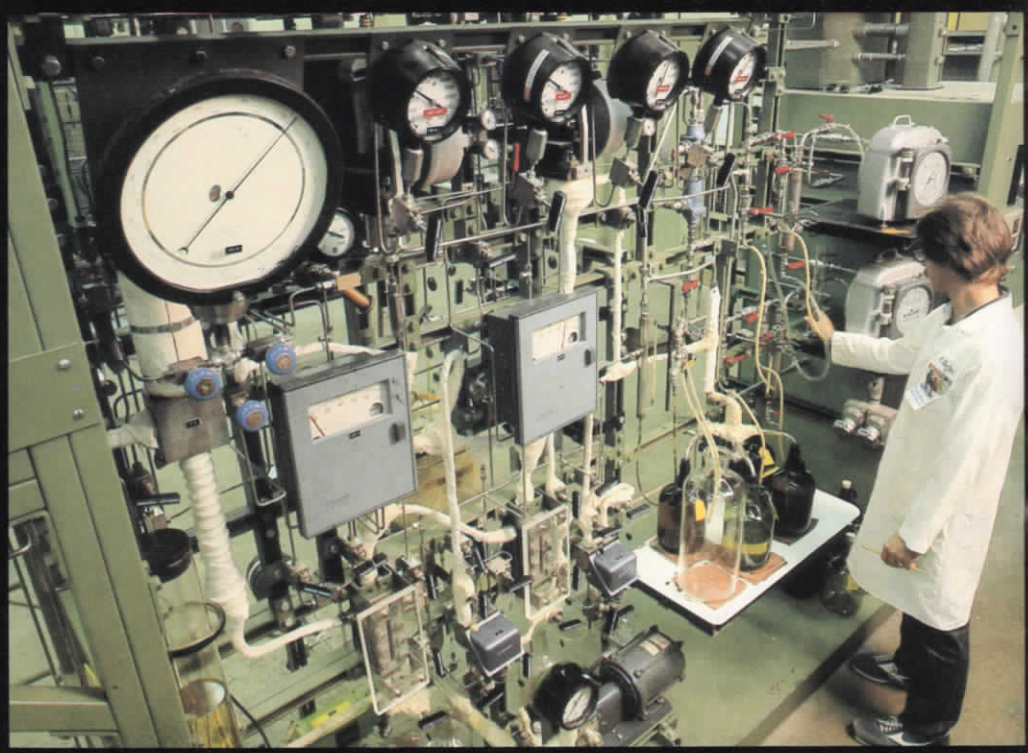
(Unisar is a Union Oil process which saturates aromatics to improve the burning quality of turbine fuels.)

In addition, a Unisulf process, used for removing sulfur from gases, is currently being tested on gas from the shale retort pilot plant. This process will be used at the Colorado shale oil facility. The Unisulf pilot plant has provided important information for application in various facilities and projects, including refineries, oil and natural gas fields and even geothermal fields. Unisulf can be applied anywhere sulfur gases need to be abated. In fact, Union is currently working on application of this technology to a coal gasification plant.

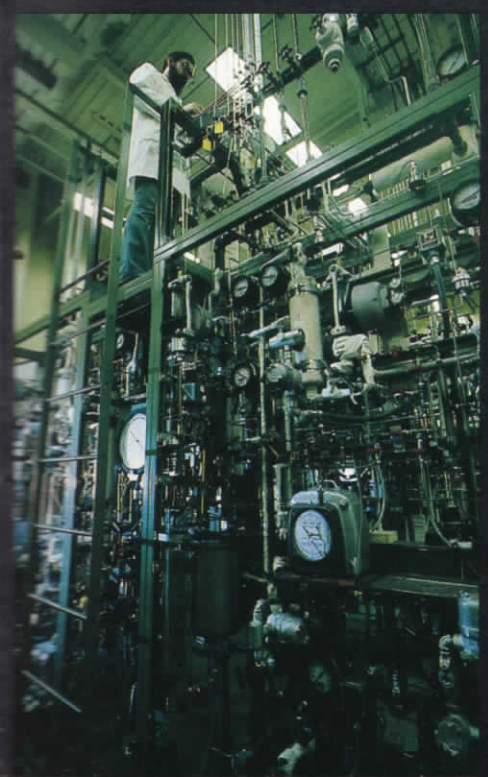

F-4 SURGE TANK







Many of Union's full-sized facilities including the Colorado shale retorting plant and the geothermal facilities were patterned after these pilot plants developed at the Fred L. Hartley Research Center in Brea, California.



Another area where pilot plants are being used to solve emission (and other) problems is at The Geysers Geothermal Field in northern California and in California's Imperial Valley, where Union operates geothermal projects at Brawley and the Salton Sea.

"The Imperial Valley is where we concentrate most of our geothermal work," says William Lieffers, supervisor of development engineering, who deals mainly with geothermal research. "There's a lot of geothermal resource in the Imperial Valley, but it's much more difficult to produce than at The Geysers where the resource is dry steam.

"In the Imperial Valley the reserves are highly saline geothermal fluids which create tremendous corrosion and scale problems. We've been working to find ways of producing these fluids efficiently for many years," he explains.

Lieffers and his staff have provided major input into all the Union developed geothermal technology and will continue to do so in the future.

They are continuously working at the geothermal fields with portable pilot plants small enough to be loaded on trucks and taken to the sites rather than conducting the experiments at the research center.

"We cannot duplicate the complex fluids in the laboratory. If we bring the actual fluids to the laboratory, they cool down, age and change chemically," Lieffers adds. "To get the ultimate test we must go to the field to prove our processes will work as well as we expect them to."

Milan Skripek, supervisor of process development operations, and his group are able to conduct much of their work—dealing with petrochemical processing and refining—right at the research center.

"We have both isothermal and adiabatic pilot plants. The isothermal pilot plants are on the order of one hundred-thousandth of the size of a commercial plant," explains Skripek.

"The five larger, adiabatic pilot plants, which simulate what occurs in a commercial refinery, are closer to one ten-thousandth the size of the real thing and can produce two barrels each day," Skripek adds.

The pilot plants are used to quantify and develop data used to make mathematical models of processes. They are also used for final evaluation of new processes.

Says Skripek, "There are many different crude oils and they all require different processing. With the mathematical models we can often estimate performance of commercial units for various feeds and process configurations with minimal or no experimentation. This is a very important part of our work.

"During development of the shale oil upgrading processes and the Unicracking process we extensively used both the isothermal and the adiabatic pilot plants," says Skripek.

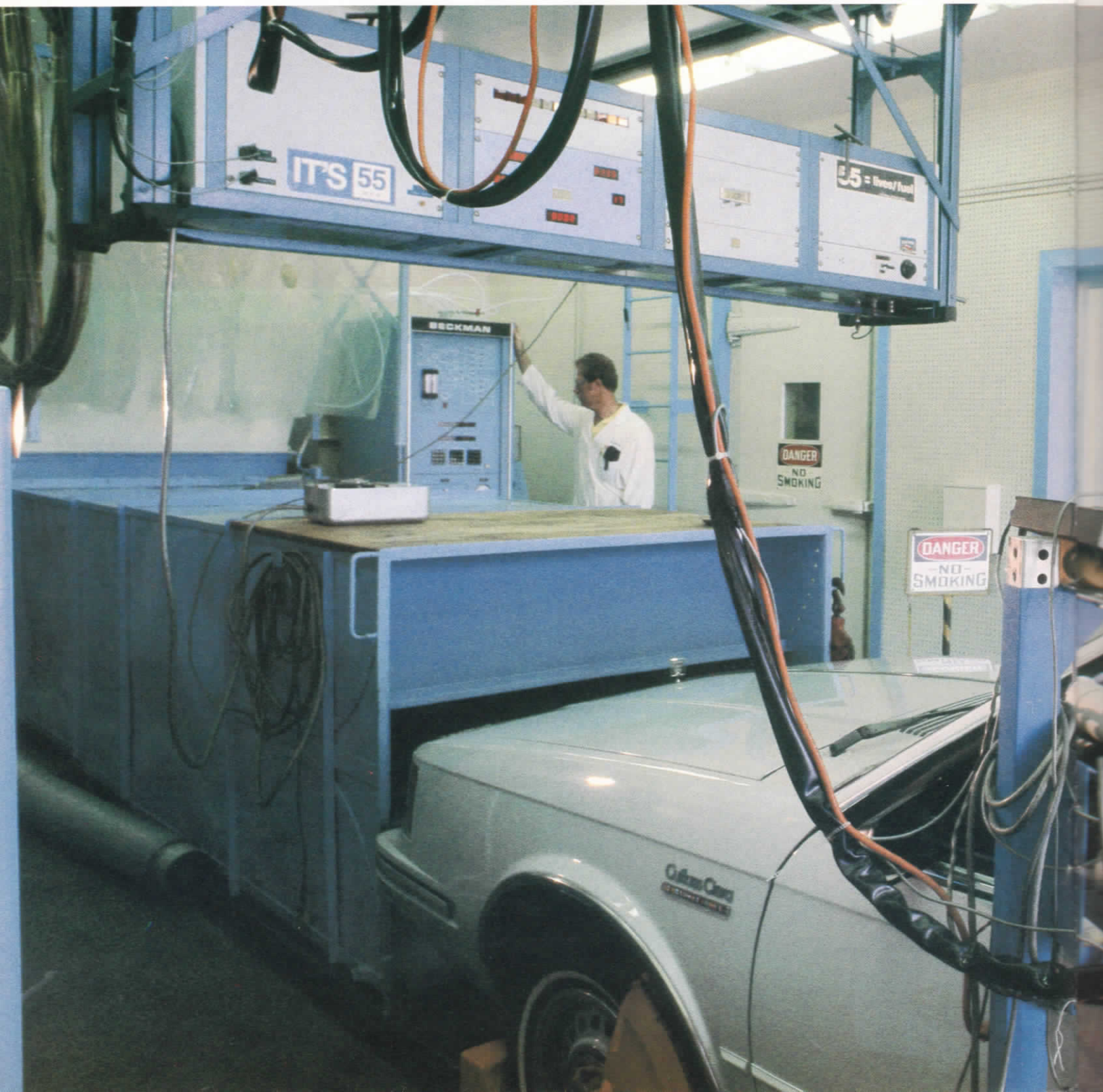
Today Union is a world leader in hydrocracking technology. Unicracking is a refining process that makes it possible to convert heavier oils into useful products. Unionfining is used to remove sulfur from feedstocks. Pilot plants played a big part in the development of both these highly successful refining technologies.

"We have a whole family of technologies which are used throughout the company as well as worldwide," says Duir. "Frequently, we're called upon to use the pilot plants to demonstrate technology to a new client. We have a very active sales department."

Another significant petrochemical process developed with the use of several pilot plants is the Union needle coke process. Construction will begin next year on a 130,000 ton per year complex at Union's Chicago Refinery. Needle coke is a solid residue left after refining selected byproducts of petroleum refining and is used to make high-quality graphite electrodes for production of steel in electric arc furnaces.

The pilot plants are in continuous use to further the industry's achievements. "They are prized possessions of which we're very proud," Skripek concludes. (76)

TESTING AUTOS ON AN INDOOR HIGHWAY



An automobile engine can run non-stop for thousands of miles, in climates that might be as different as a scorching, parched desert or a bitter-cold winter mountain—all without leaving the confines of "W" building at the Fred L. Hartley Research Center in Brea, California, where Union Oil's weatherized chassis dynamometer is found.

"An indoor highway is one of the best descriptions of a chassis dynamometer I've ever heard," says Tim Wusz, a Union research engineer who has spent many years working with the sensitive devices used for various kinds of exacting research.

It is with this "indoor highway" that Union's product evaluation group, supervised by Don Clark, is able to conduct a variety of tests with true-to-life accuracy without actually taking to the road. "When you drive a car down the road it must overcome friction and wind resistance. When you accelerate it must cope with the inertia of its weight," says Clark. "A dynamometer has a sophisticated control system that can absorb this power exactly as it would be expended on the road."

Ten engines run noisily, hour after hour, in the research center's "K" building.

These are the engine dynamometers—the most simple type of dynamometer used. Shafts attach different kinds of engines to dynamometers, sophisticated control systems provide the cycles the engines follow.

"A dynamometer has a sophisticated control system that can absorb this power exactly as it would be expended on the road."

A flow of cooling water carries the engines' power away in the form of heat, while a computer records the engine temperatures, speeds, work loads and other factors to a T.

These engines run unattended for hundreds of hours and are only stopped when a change of oil or other maintenance is required.

"The engine dynamometers are also used to evaluate Union's fuels and lubricants. We use these for long-term testing because it's very difficult to change them. You've got to do a tremendous number of things to hook them up," explains Clark.

These engines run unattended for hundreds of hours...

Tests are also conducted on two more sophisticated chassis dynamometers.

Cars are placed on these two dynamometers so that the drive wheels sit on large steel rolls.

As the car's wheels roll, so do the rolls which are attached with a shaft to the dynamometer.

The newer chassis dynamometer is completely weatherized and has humidity and temperature controls. "We can simulate, within some limits, just about any conditions. We've run it as low as 40 degrees (F) and as high as 130 degrees," says Wusz. "We've done a lot of exhaust emission work to evaluate both vehicles and fuel additives on this dynamometer because the environment must be held constant."

"We try to find out why certain things happen."

The older chassis dynamometer, which was built in the early 1950s, is not weatherized. Both chassis dynamometers are equipped with huge motorized blowers capable of producing 100 mph gales. The wind speed is matched to the roll speed of the wheels, just as if the car was actually traveling down the road.

In recent years Union's dynamometer facilities have been heavily used for fuel economy oil testing. "Fuel efficiency oil tests really require a chassis dynamometer," explains Clark. "You must be able to control the conditions, and to be able to come back to those same conditions time after time. This would be impossible to do on a road where it's cool in the morning, hot in the afternoon, and has varying amounts of traffic."

"We can simulate, within some limits, just about any conditions... as low as 40 degrees (F) and as high as 130 degrees."

The dynamometers are frequently used to measure vehicle octane requirements and have also been useful in solving vapor lock problems.

In addition, the fuels, lubricants and other products developed at the research center often require dynamometer testing.

An ongoing project for Clark and his group is helping the California Highway Patrol solve special problems.

"The Highway Patrol operates its vehicles under some severe conditions, so we have to come up with some innovative and interesting tests to solve troubles for them," says Clark.

Both chassis dynamometers are equipped with huge motorized blowers capable of producing 100 mph gales.

Most of the Highway Patrol's problems are related to vehicle octane requirements. "In some of the desert areas where it's over 100 degrees and very dry, with repeated heavy accelerations from a dead stop to 100 mph, the octane quality just isn't enough to satisfy the engine," explains Wusz who conducts most of this type of test.

The dynamometers are being used more and more for what Clark considers a pure research function. "We try to find out why certain things happen," he explains. "For example, we've done a fair amount of diesel work, focusing on why we get soot out of diesel engines. People have already gone to the laboratory shelves and poured everything they could find into an engine to find all the things that might work. There are no easy answers to the problems we're looking at today." (76)

An ongoing project for Clark and his group is helping the California Highway Patrol...

SHALE CAR: A GLIMPSE INTO THE FUTURE.

Fred L. Hartley and Richard J. Stegemeier are the first persons to take the Union Oil shale car for a drive during the dedication of the Fred L. Hartley Research Center.

It seems only fitting that during the week-long dedication festivities at the Fred L. Hartley Research Center in Brea, California, the namesake of the impressive complex was chosen to be the first driver of the Union Oil shale car—the world's only modern automobile completely fueled and lubricated with products derived from shale oil.

The diesel fuel, multi-purpose grease, crankcase oil, and even the power steering and automatic transmission fluids used in the 1982 Oldsmobile Cutlass Ciera LS were manufactured at the research center.

The retort pilot plant at Brea produces only three barrels of raw shale oil per day, but it was instrumental in the development of the retorting technology which will be used in the company's Parachute Creek, Colorado project. The full-scale facility will pro-

duce 10,000 barrels of shale oil syncrude per day when it is completed next year.

Union's researchers have been searching for economically feasible methods to produce shale oil for nearly 40 years. All of the technologies that will be used at the Colorado project, the first commercial shale oil operation in the nation, were developed by the Union Science and Technology Division.

In 1920 Union Oil Company began buying oil shale properties. Today, the company holds 20,000 acres of western Colorado land which geologists estimate contain 1.6 billion barrels of recoverable shale oil. This rich piece of land, part of the Green River formation, could yield 100,000 barrels of shale oil per day for more than 40 years.

Shale oil comes from a marlstone rock containing kerogen, a complex organic compound. When heated to 700 to 900 degrees (F) in a retort, hydrocarbon vapors and liquids are released from the rock. When cooled and condensed, crude shale oil is formed. The shale oil is upgraded into syncrude and ready to be fractionated.

Shale oil syncrude is an excellent feedstock for producing jet and diesel fuels. A Colorado refinery will convert Union's Parachute Creek shale oil syncrude into such products. Additional processing is required to produce gasoline with shale oil feedstocks. Conventional refining facilities are also capable of processing a full line of high-quality lube oils from shale oil syncrude.

Shale oil products meet all of the requirements set forth by automobile manufacturers. Diesel powered cars will perform the same with diesel fuel from shale oil as with conventional fuel. Shale oil lubricants perform just the same as those derived from crude oils, as well.

The idea of commercially producing fuels from shale has become a reality. In the years to come Union's shale car may become less and less of a novelty. 76

Historical Posters Offered

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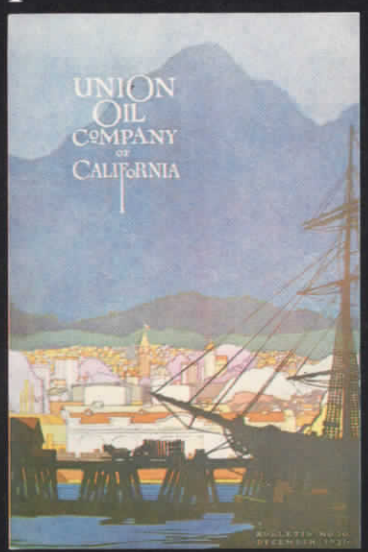

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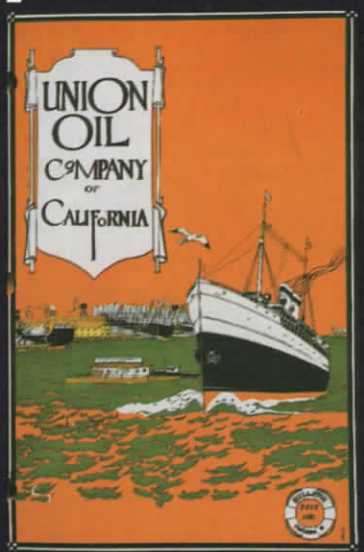

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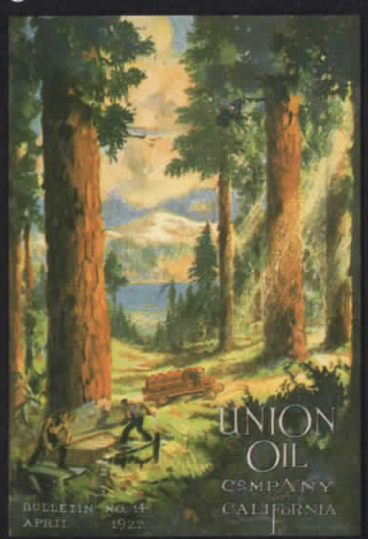

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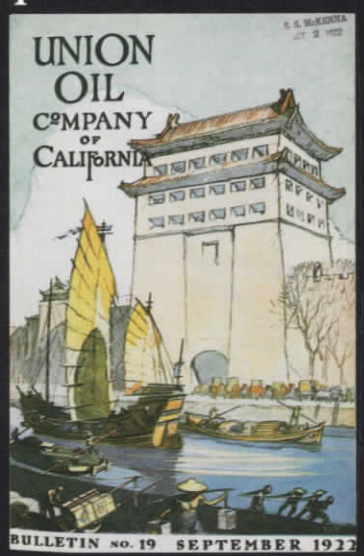

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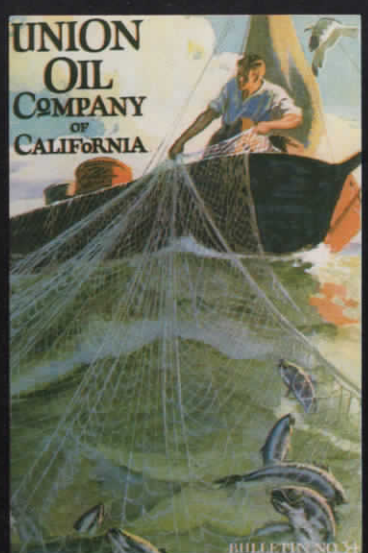

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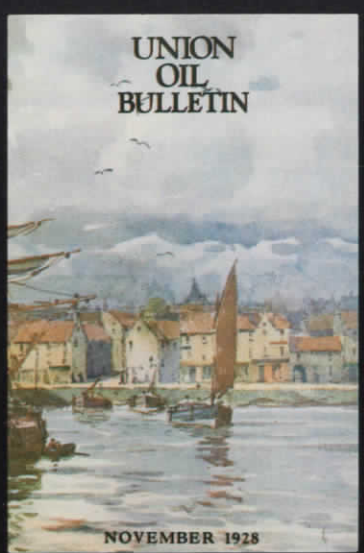

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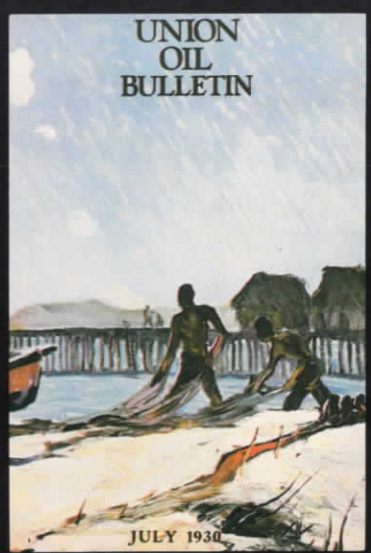

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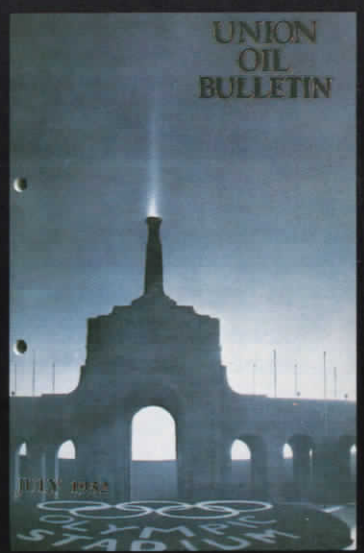

Due to an overwhelming demand from readers of **Seventy Six** Magazine wanting reprints of the **Bulletin** covers that appeared in the July-August issue, we have printed a limited number of them and are making them available to our readers.

These 18 x 24-inch posters can be obtained by sending $1.00 for each one along with your name and address to Union Oil, Corporate Communications, Union Oil Center, Los Angeles, CA 90017. Please send checks, no cash and indicate which poster you desire. The entire set of eight is also available.

Service Awards

UNION 76

CORPORATE

September 1982

35 YEARS **Edmund P. Coony,** Union Oil Center
Richard C. Neuman, Seattle, Wa.

25 YEARS **Joseph B. Jenkins,** Parachute, Co.
D. H. Richardson, Midland, Tx.

15 YEARS **Phillip J. Hammer,** Union Oil Center
Elaine L. Novak, Schaumburg, Il.
Christina L. Perez, Union Oil Center
Charles M. Pogue II, Union Oil Center
Carolyn C. Tellez, Union Oil Center

5 YEARS **Dennis E. Butler,** Houston, Tx.
Richard R. Myers, Midland, Tx.
Charles H. Saito, Union Oil Center

October 1982

45 YEARS **Thomas R. Jones, Jr.,** Union Oil Center

30 YEARS **John Flynn,** Union Oil Center
Donald A. Solberg, Union Oil Center

20 YEARS **Earl L. Robles,** Union Oil Center

15 YEARS **Paul L. Dunn,** Schaumburg, Il.
Ronald E. Jenkins, Union Oil Center

10 YEARS **Don L. Hartley,** Coalinga, Ca.

5 YEARS **Marylou Barrett,** Schaumburg, Il.

UNION SCIENCE AND TECHNOLOGY DIVISION

September 1982

15 YEARS **Robert G. Alex,** Brea, Ca.
Gary C. Graham, Brea, Ca.
Gaylen M. Knutson, Brea, Ca.
Mildred E. Smith, Brea, Ca.
Marcia R. Spriggins, Brea, Ca.

5 YEARS **William C. Allen,** Brea, Ca.
Joseph P. Gee, Brea, Ca.
Ted S. Hallen, Brea, Ca.
Rex N. Morris, Brea, Ca.
George E. Robinson, Brea, Ca.
Jeanne M. Shores, Brea, Ca.
Clay W. Totten, Brea, Ca.

October 1982

30 YEARS **Gordon B. Poucher,** Brea, Ca.

20 YEARS **Darryl L. Jones,** Brea, Ca.

15 YEARS **Kenneth M. Piel,** Brea, Ca.
Richard L. Sloggy, Brea, Ca.

10 YEARS **Michael J. Tuffley,** Brea, Ca.

UNION REAL ESTATE DIVISION

September 1982

15 YEARS **Leroy E. Green,** Union Oil Center
Robert A. Hawkins, Union Oil Center

UNION 76 DIVISION

September 1982

40 YEARS **Philip J. Bebar,** Chicago Refinery
Warren L. Darnes, Columbus, Oh.
Phyllis M. Garcia, San Francisco, Ca.

35 YEARS **Eric I. Fredholm,** Brea, Ca.
Murray Hamilton, Los Angeles Refinery
George A. Perolio, Beaumont Refinery
Roy George Perry, Los Angeles Refinery
John P. Schlesser, Jr., Schaumburg, Il.
Maynard Strader, Los Angeles Refinery
Waymond E. Townsend, Midland, Tx.

30 YEARS **Daniel Barra,** Los Angeles Refinery
Ralph C. Becker, Chicago Refinery
Edwin Benedict, Miami, Fl.
Harry F. Campbell, Los Angeles, Ca.
Helga Chapman, San Francisco, Ca.
Richard F. Coward, Beaumont Refinery
Bobby L. Deal, Los Angeles Refinery
William M. Elam, Miami, Fl.
Norman Forcum, San Francisco Refinery
Duane B. Haugan, Los Angeles Refinery
Yayeko Iwasa, San Francisco, Ca.
Denver C. Mixon, Savannah, Ga.
John L. Munich, Chicago Refinery
Oliver B. Netterville, Jr., Beaumont Refinery
Glenn S. Park, Beaumont Refinery
Billy A. Riley, Beaumont Refinery
Betty Shea, San Francisco, Ca.
Edward J. Slibeck, Wilmington, De.
Jack Steinberg, Richmond, Ca.

25 YEARS **Roy T. Chalfont,** Schaumburg, Il.
Robert J. Christensen, Schaumburg, Il.
John C. Keith, Oakland, Ca.
Bruce W. MacMurray, Birmingham, Al.
Joseph W. Pourciau, Pure Transportation Co., Houma, La.
Robert G. Winter, Schaumburg, Il.

20 YEARS **Kenneth L. Barry,** Seattle, Wa.
Billy J. Waller, Beaumont Refinery

15 YEARS **Rita J. Buritz,** Schaumburg, Il.
Patricia O. Campion, Schaumburg, Il.
Lewis H. Cooke, Nederland, Tx.
Frederick A. Devereux, Honolulu, Ha.
John M. Ferrara, Richmond Terminal
R. Charles Gagnon, Schaumburg, Il.
William A. Hill, Atlanta, Ga.
Eleanor M. J. Matzl, Schaumburg, Il.
John F. McNeely, Schaumburg, Il.
Gail McWhorter, Schaumburg, Il.
Thomas P. Mitchell, Beaumont Refinery
John J. Pavlik, Nederland, Tx.
Les W. Schalla, Schaumburg, Il.
Asa T. Taylor, Nederland, Tx.
Constantine V. Toulios, Chicago Refinery

10 YEARS **Randolph Amos,** San Jose, Ca.
Ann L. Aschenbrenner, Schaumburg, Il.
Warren L. Burrell, Los Angeles, Ca.
Chi H. Chang, San Francisco, Ca.
Peter M. Cowper, San Diego, Ca.
Paul N. Dobay, Jr., Los Angeles Refinery
Griffin J. Dyer, Beaumont Refinery
Wilfredo L. Febres, San Francisco Refinery
Samuel S. Fujinaka, San Francisco Refinery
Alfred F. Gilman, San Francisco Refinery
Eleanore L. Greig, Los Angeles, Ca.
Frank D. Haynes, Beaumont Refinery
Charlotte E. Head, Atlanta, Ga.
Herman G. Hebert, Beaumont Refinery
Debbie A. Hofmann, Schaumburg, Il
Estela F. Ihlenfeldt, Los Angeles, Ca
Edward A. Listander, Richmond, Va.
Felix F. Lopez, Beaumont Refinery

James R. Mack, Los Angeles, Ca.
Robert B. Murtagh, San Francisco, Ca.
Norman M. Nakamura, Sacramento, Ca.
Glen N. Netz, Seattle, Wa.
Huey Reaux, Beaumont Refinery
Shirley M. Sadowski, Schaumburg, Il.
Walter S. Schwartz, San Francisco Refinery
Ernest F. Seward, Nederland, Tx.
Dorothy T. Stokes, Savannah, Ga.
Linda G. Trost, Schaumburg, Il.
Ethel J. Vogel, Schaumburg, Il.
Thomas Wright, Savannah, Ga.

5 YEARS
Carol A. Bobbe, Schaumburg, Il.
Ronald W. Bock, Los Angeles Refinery
Vernon L. Brookins, Schaumburg, Il.
Gilbert Cota, Los Angeles Refinery
Carey A. Czarnik, Chicago Refinery
Sheila A. Frusolone, Schaumburg, Il.
Mary A. Gaspard, Beaumont Refinery
Kenneth Howes, Los Angeles, Ca.
Earl A. Hutchinson, Los Angeles Refinery
Allen J. Kwiatkowski, Chicago Refinery
Bruce P. Lain, Chicago Refinery
Nathaniel E. Lynn, Chicago Refinery
Irene C. Malloy, Los Angeles, Ca.
Ronald E. Minters, Los Angeles, Ca.
Pelayo Mazorra, Miami, Fl.
Edward C. Morgan, Cincinnati, Oh.
Yesenia Ortega, Los Angeles, Ca.
Richard G. Rodgers, Nederland, Tx.
Dennis M. Rogers, Los Angeles, Ca.
Elizabeth A. Rojek, Schaumburg, Il.
Larry D. Ross, Los Angeles, Ca.
Luis M. Sanchez, Nederland, Tx.
Harold W. Schrank, Chicago Refinery
Jeffrey G. Simmons, Cincinnati, Oh.
Tommy J. Slater, Pure Transportation Co., Patoka Il.
Ralph R. Stanard, Pure Transportation Co., Moab, Ut.
Ronald C. Stephens, Santa Maria Refinery
Roger L. Strong, Los Angeles Refinery
David L. Warfield, Wildwood, Fl.
Jeremy White, Los Angeles, Ca.

October 1982

45 YEARS
John B. Anderson, Chicago Refinery

40 YEARS
Margaret C. Bence, Memphis, Tn.
Margaret Cargo, San Francisco Refinery
Dennis L. McCormick, Dayton, Oh.
John C. Skyko, Los Angeles Refinery

35 YEARS
Ralph W. Chapin, Los Angeles Refinery
Marvin N. Craig, Charlotte, N.C.
John C. Gibbs, Jr., San Francisco Refinery
Milton J. Guidroz, Beaumont Refinery
James E. Howell, Beaumont Refinery
John R. Jones, Atlanta, Ga.
James B. Kelly, Los Angeles Refinery
John H. Link, Schaumburg, Il.
Ronald B. McDonald, Los Angeles Refinery
James A. Ogden, Schaumburg, Il.
Joseph E. Sewell, Birmingham, Al.
Thomas G. Sparks, Beaumont Refinery
Vernon E. Weltz, San Jose, Ca.

30 YEARS
Floyd K. Bryan, Beaumont Refinery
Billy B. Carroll, Beaumont Refinery
Frank F. Duffy, Los Angeles Refinery
Howard D. Edwards, Beaumont Refinery
Geneva L. Fletcher, San Francisco, Ca.
Charlie P. Folse, Beaumont Refinery
James W. Harrison, Beaumont Refinery
Hoyt E. Kilgore, Orlando, Fl.
George J. Luke, Beaumont Refinery
James E. Ramsey, Honolulu, Ha.
Paul F. Schwab, San Diego Terminal
Bryce H. Scrivner, Los Angeles Refinery
Walter J. Stern, Los Angeles Refinery
Alexander J. Wilson, San Francisco Refinery

25 YEARS
C. B. Evans, San Francisco, Ca.
William W. Fox, Schaumburg, Il.
John E. Pippitt, Schaumburg, Il.
James H. Pochini, Richmond Terminal
Robert E. Schmoldt, Schaumburg, Il

20 YEARS
Janet A. Brunner, Cincinnati, Oh.
Freddie C. Spaulding, Beaumont Refinery

15 YEARS
Jerry A. Brandon, Avenal, Ca.
Michael I. Campbell, Columbus, Oh.
Lois M. Chittenden, Portland, Or.
James D. Daily, Schaumburg, Il.
Anna L. Doone, Schaumburg, Il.
Robert A. Dowd, Minneapolis, Mn.
Roger L. Folda, San Jose, Ca.
John Laborn, Schaumburg, Il.
John Ontiveros, San Francisco, Ca.
Janet K. Scharff, San Francisco, Ca.
Danny L. Tennant, Atlanta, Ga.
Frank K. Vesperas, Honolulu, Ha.
Ronald D. Villa, Los Angeles Terminal

10 YEARS
Norma J. Abrams, San Francisco, Ca.
Yolonda C. Beasley, San Francisco, Ca.
Richard D. Demartile, San Francisco Refinery
Robert G. Hamaker, Forest View, Il.
Roy M. McGlathery, Forest View, Il.
Benita Menas, Richmond Terminal
Lawrence J. Morrison, Seattle, Wa.
Wilfred T. Orosco, San Francisco Refinery
Steve M. Preciado, Los Angeles Refinery
Wayne A. Perez, Avila Terminal
Amos W. Prince, San Francisco Refinery
James T. Williams, Santa Maria Refinery
Dawn E. Windholz, Schaumburg, Il.
Melvin T. Yoon, San Francisco Refinery

5 YEARS
Feliciano Alvarado, Los Angeles Refinery
Dan G. Atkinson, Coalinga, Ca.
Mary R. Dauzvardis, Chicago Refinery
Frank R. Esperanza, Fresno, Ca.
Martin A. Gibula, Schaumburg, Il.
Daniel Hernandez, Los Angeles Refinery
Richard J. Jordan, Avenal, Ca.
Varut Komalarajun, Los Angeles Refinery
Jess T. Medina, Avenal, Ca.
Charles W. Middough, Jr., Los Angeles Refinery
Dorothy L. Petrizze, Schaumburg, Il.
Lonnie E. Pilcher, Rome, Ga.
Jeannette S. Regione, Schaumburg, Il.
Richard F. Ross, Los Angeles Refinery
Roseanne M. Rother, Los Angeles, Ca.
Barbara S. Sanchez, Los Angeles, Ca.

UNION OIL AND GAS DIVISION

September 1982

40 YEARS
Archie M. Pettry, Casper, Wy.

35 YEARS
John D. Dyess, Midland, Tx.

30 YEARS
W. L. Bradford, Los Angeles, Ca.
Frederick H. Govreau, Houston, Tx.
Raymond L. Hazard, Santa Fe Springs, Ca.
C. R. Marshall, Santa Paula, Ca.
Joseph Eugene Navarre, Jr., Houma, La.

25 YEARS
Bren Clark Dehn, Los Angeles, Ca.
M. C. Metz, Orcutt, Ca.
Harry L. Simon, Lafayette, La.

20 YEARS
Adolph A. Anders, Houston, Tx.
Harry J. Arnold, Taft, Ca.
Roy H. Baker, Bakersfield, Ca.
David S. Crawford, Los Angeles, Ca.
Janet A. Lane, Los Angeles, Ca.
Julian L. White, Oklahoma City, Ok.

15 YEARS
Robert G. Beason, Moab, Ut.
W. E. Horrisberger, Bakersfield, Ca.
Dalton L. Hudson, Ardmore, Ok.
Betty B. Isham, Midland, Tx.
Diana Morales, Los Angeles, Ca.
Benita J. Sellers, Midland, Tx.
Ronald L. Spratt, Houston, Tx.
Fred D. Tuttle, Orcutt, Ca.
Quentin W. Van Camp, Ventura, Ca.

10 YEARS	**Willie J. Bland,** Orcutt, Ca. **Ana Maria Elizondo,** Los Angeles, Ca. **August T. Fernandez,** Orcutt, Ca. **S. Allen Jackson,** Lafayette, La. **Jesse Ruiz,** Orcutt, Ca.
5 YEARS	**John Alvara,** Orcutt, Ca. **Nancy A. Brewster,** Ventura, Ca. **Edward Castillo,** Orcutt, Ca. **Jan A. Dyckes,** Ventura, Ca. **Tim J. Espinosa,** Santa Fe Springs, Ca. **Stephen L. Heiter,** Ventura, Ca. **Johnny S. Johnson,** Taft, Ca. **Billy P. Leonard,** Lafayette, La. **David R. Lomenick,** Moab, Ut. **Chester E. Newman,** Lafayette, La. **Donald L. Podsednik,** Orcutt, Ca. **Alan W. Satterfield,** Ventura, Ca. **Harvey E. Wetzel,** Andrews, Tx. **Richard E. Williams,** Ventura, Ca.

October 1982

35 YEARS	**George Penny,** Ventura, Ca. **H. Schlotthauer,** Ventura, Ca.
30 YEARS	**Lawrence F. Sprague,** Coalinga, Ca. **Lloyd F. Thompson,** Midland, Tx.
25 YEARS	**William Coats,** Woodward, Ok. **Shirley M. Koehn,** Los Angeles, Ca.
20 YEARS	**Herbert J. Adams, Jr.,** Houma, La. **Malcolm P. Clark,** Orcutt, Ca. **Chester E. Haase,** Orcutt, Ca. **Paul Legendre,** Houma, La. **Kenneth L. Mon,** Brea, Ca. **J. P. Openshaw,** Orcutt, Ca. **Wade E. Sanders,** Orcutt, Ca.
15 YEARS	**Louie J. Abney,** Coalinga, Ca. **Susan D. Bond,** Midland, Tx. **Sharon J. Hitt,** Houma, La. **John E. O'Neil, Jr.,** Orcutt, Ca. **James M. Overman,** Lovington, N.M. **Murray W. Scott,** Taft, Ca. **Judy L. Winder,** Los Angeles, Ca.
10 YEARS	**Robert M. Garrett,** Orcutt, Ca. **Donald J. Gaspard,** Lafayette, La. **Dianna F. Lecompte,** Houma, La. **Manuel H. Nunez, Jr.,** Orcutt, Ca. **Norris L. Proctor,** Moab, Ut.
5 YEARS	**Robert W. Ball,** Olney, Il. **James A. Foster,** Santa Paula, Ca. **Gustavo G. Garcia,** Taft, Ca. **Tony R. Martinez,** Taft, Ca. **Justin P. Matthews,** Lafayette, La. **John D. Mayhew,** Ventura, Ca. **Saul A. Navarro,** Taft, Ca. **Michael P. Nelson,** Ventura, Ca. **Dixon A. Oriola,** Ventura, Ca. **Yolanda Perez,** Houston, Tx. **Ester B. West,** Ventura, Ca.

UNION GEOTHERMAL DIVISION

September 1982

10 YEARS	**Leland J. Hale,** Big Geysers, Ca.
5 YEARS	**Paul G. Atkinson,** Santa Rosa, Ca. **Daniel L. Brown,** Big Geysers, Ca. **William B. Cumming,** Santa Rosa, Ca. **Brian Curran,** Big Geysers, Ca. **Glenn G. Melosh,** Santa Rosa, Ca. **Rose M. Wagner,** Santa Rosa, Ca.

October 1982

10 YEARS	**James E. Allison,** Santa Rosa, Ca.

UNION CHEMICALS DIVISION

September 1982

25 YEARS	**Jack Sandell,** Union Oil Center **Glenn R. Seese,** Wichita, Ks. **Gordon Taylor,** Wilmington, Ca. **Clifford J. Walker,** La Mirada, Ca.
20 YEARS	**Dolores J. Stevens,** La Mirada, Ca.
15 YEARS	**Claire B. Arnett,** Schaumburg, Il. **Edward Brooks,** Kenai, Ak. **Emgard A. Burns,** Rolling Meadows, Il. **Gordon Gifford,** Kenai, Ak. **Jon D. Stanley,** Cleveland, Oh. **Marion M. Wellner,** Schaumburg, Il.
10 YEARS	**Edmundo G. Cabrera,** La Mirada, Ca. **Avery Dale Coley,** Charlotte, N.C. **Gus J. Cottros,** Schaumburg, Il. **Howard L. Cress,** Charlotte, N.C. **John Loosli,** Kenai, Ak. **James Parry,** Brea, Ca. **Paul W. Stewart,** Dallas, Tx.
5 YEARS	**Theresa A. Affeldt,** Conshohocken, Pa. **Edward Aisenbrey,** Kenai, Ak. **Ronald L. Albitz,** Conshohocken, Pa. **Thomas Bedunnah,** Kenai, Ak. **John Davis,** Kenai, Ak. **William Egbert,** Kenai, Ak. **Nathaniel Forte,** Charlotte, N.C. **Russell J. Frank,** Schaumburg, Il. **Nolan Hermens,** Kenai, Ak. **Randall Knowles,** Kenai, Ak. **John Landua,** Kenai, Ak. **Keith Laurie,** Kenai, Ak. **Dennis Merkes,** Kenai, Ak. **John Overway,** Kenai, Ak. **Maynard Probst,** Kenai, Ak. **John White,** Kenai, Ak. **Norman Witalec,** Kenai, Ak.

October 1982

35 YEARS	**Leroy A. Dunham,** Charlotte, N.C.
25 YEARS	**Richard R. Culp,** Clark, N.J. **James Martin,** Brea, Ca. **Denzel S. Weaver,** Schaumburg, Il.
20 YEARS	**David A. Gauler,** Tampa, Fl.
15 YEARS	**Harold Flood,** Kenai, Ak.
5 YEARS	**Carol Anderson,** Kenai, Ak. **Marilyn Bingham,** Brea, Ca. **Thomas Burg,** Kenai, Ak. **James Cooper,** Kenai, Ak. **Kenneth Cox,** Kenai, Ak. **Timothy Elder,** Kenai, Ak. **Rodney Geske,** Kenai, Ak. **Patrick Grimes,** Kenai, Ak. **Theodore Jackson,** Bridgeview, Il. **Robert Kay,** Kenai, Ak. **Thomas R. Kintner,** Charlotte, N.C. **Jerry Lamb,** Kenai, Ak. **James Lindgren,** Kenai, Ak. **Florence O'Connor,** Bridgeview, Il. **Mark Powell,** Kenai, Ak. **Richard Ray,** Kenai, Ak. **Chance Rewolinski,** Kenai, Ak. **Wayne Zeringue,** Kenai, Ak.

UNION INTERNATIONAL OIL DIVISION

September 1982

25 YEARS	**Martha Kawa,** Los Angeles, Ca. **John N. Turk,** Jakarta, Indonesia
10 YEARS	**Robert L. McCollom,** Los Angeles, Ca.
5 YEARS	**Patrick A. Cox,** Aberdeen, Scotland

October 1982

5 YEARS	**John G. Baines,** London, England **Patricia A. Butler,** Los Angeles, Ca. **Kathleen S. Gonta,** Los Angeles, Ca. **David C. Kent,** London, England

UNION OIL COMPANY OF CANADA LIMITED

September 1982

15 YEARS	**Joyce Johnson,** Calgary, Alberta
10 YEARS	**Keith Hillaby,** Calgary, Alberta **Allan Solberg,** Calgary, Alberta
5 YEARS	**Eugene Archambault,** Ft. St. John, B.C.

October 1982

10 YEARS	**Tina Wickenheiser,** Calgary, Alberta
5 YEARS	**Anne Cowman,** Calgary, Alberta **Richard Blood,** Calgary, Alberta **Allen Smith,** Calgary, Alberta

UNION ENERGY MINING DIVISION

September 1982

5 YEARS — **Joe C. Drake,** Rawlins, Wy.
David R. Martinez, Rawlins, Wy.

October 1982

5 YEARS — **Donna J. Guay,** Union Oil Center

MOLYCORP, INC.

September 1982

30 YEARS — **Leon Abraham,** Washington, Pa.
Marilyn Eakland, Union Oil Center

20 YEARS — **Adeline Camperi,** Union Oil Center

15 YEARS — **Joe Jeantette,** Questa, N.M.

10 YEARS — **Gilbert Davis,** Union Oil Center
Dennis McBride, Mountain Pass, Ca.
Gloria Sanchez, Questa, N.M.
Edward Snyder, York, Pa.
Ricky Trujillo, Questa, N.M.

5 YEARS — **Gary Cooper,** York, Pa.
Robert Graham, Louviers, Co.
Herbert Roush, Mountain Pass, Ca.
William Zavalick, York, Pa.

October 1982

35 YEARS — **Theodore Burk,** Washington, Pa.

15 YEARS — **Louis Duran,** Questa, N.M.
Lucille Gonzales, Questa, N.M.
Daniel Hackett, Pittsburg, Pa.
Robert Martinez, Questa, N.M.
Richard Smith, Questa, N.M.

10 YEARS — **Ruby Gonzales,** Questa, N.M.

5 YEARS — **Jim Espinoza,** Mountain Pass, Ca.
Fred Keienburg, Louviers, Co.
David Schaller, Mountain Pass, Ca.

POCO GRAPHITE, INC.

September 1982

10 YEARS — **Robert Shawn,** Decatur, Tx.
Frankie Tolbert, Decatur, Tx.

5 YEARS — **Sally Freeman,** Decatur, Tx.
Charlotte Lamb, Decatur, Tx.
George Roberts, Jr., Decatur, Tx.
Ricky Slimp, Decatur, Tx.
Shelia Thomason, Decatur, Tx.

October 1982

5 YEARS — **Nancy Cowley,** Decatur, Tx.
Leroy Jones, Decatur, Tx.

THUMS

September 1982

35 YEARS — **Donald E. Craggs,** Long Beach, Ca.

JOBBERS AND DISTRIBUTORS

September 1982

25 YEARS — **Norcom Oil Co.,** Burlington, N.C.

20 YEARS — **Davis Oil Co., Inc.,** Forest City, N.C.

15 YEARS — **Fralin Oil Co., Inc.,** Bent Mountain, Va.
K. E. Stein, Joseph, Wa.

15 YEARS — **Clemens Oil Co.,** Springfield, Oh.
Inland Oils, Inc., Ft. Wayne, In.
Carrigan Oil Co., Buffalo Lake, Mn.

October 1982

55 YEARS — **Pierce Oil Co.,** Chamblee, Ga.

50 YEARS — **Echols Oil Co., Inc.,** Greenville, S.C.

20 YEARS — **Pruitt Oil Co.,** Winder, Ga.

15 YEARS — **Burlile Oil Co.,** Gallipolis, Oh.
Sanford & Charles, Newport News, Va.

10 YEARS — **Key Petroleum, Inc.,** Gulfport, Ms.
Key Petroleum, Inc., Ft. Payne, Al.

5 YEARS — **Lyons Oil Co.,** Plainview, Mn.

RETIREMENTS

June 1982

Edgar F. Hylton, Union 76 Division, Western Region, Sunset Beach, Ca. January 22, 1954

George R. Mertens, Union 76 Division, Eastern Region, Orlando, Fl. June 1, 1947

July 1982

Stanton M. Billings, Oil and Gas Division, Augustine, Fl. July 1, 1950

Fred A. Clutter, Molycorp, Washington, Pa. March 23, 1948

Morgan H. DeForest, Union Chemicals, Kenai, Ak. August 19, 1968

Herbert M. Huls, Union 76 Division, Eastern Region, Lockport, Il. May 4, 1936

Robert T. Kidwell, Union 76 Division, Eastern Region, Lake Panasoffkee, Fl. February 23, 1969

Willard J. Langenohl, Union 76 Division, Eastern Region, Milwaukee, Wi. November 20, 1952

Judson Minard, Union Chemicals, Yorba Linda, Ca. February 11, 1954

Oscar Morgan, Oil and Gas Division, Houston, Tx. June 11, 1934

Elmer G. Neely, Oil and Gas Division, Dundas, Il. March 25, 1936

Walter T. Parker, Union 76 Division, Eastern Region, Burkeville, Tx. March 11, 1948

Merl E. Powers, Oil and Gas Division, Basin, Wy. June 9, 1947

Robert M. Quirke, Oil and Gas Division, Midland, Tx. October 16, 1946

Jack M. Sandell, Union Chemicals, Tarzana, Ca. September 9, 1957

Aaron V. Sattler, Union 76 Division, Eastern Region, Port Neches, Tx. February 7, 1945

Coyle E. Singletary, Oil and Gas Division, Midland, Tx. February 2, 1953

Harold R. Smith, Union 76 Division, Western Region, Long Beach, Ca. August 31, 1956

Julian E. Vandemoortel, Union 76 Division, Western Region, Long Beach, Ca. November 21, 1952

Tommy J. Wainwright, Oil and Gas Division, Broussard, La. September 1, 1941

August 1982

Howard L. Boothe, Union 76 Division, Eastern Region, Beaumont, Tx. July 17, 1952

James B. Bunn, Union 76 Division, Western Region, Pasadena, Ca. November 20, 1947

Roland G. Cardinal, Union 76 Division, Western Region, Longview, Wa. July 19, 1949

Charles W. Cary, Corporate, Marble Falls, Tx. November 11, 1949

Henry O. Cook, Union Chemicals, Great Falls, Mt. August 8, 1955

Roy C. Davidson, Union 76 Division, Western Region, Phoenix, Az. November 1, 1944

William R. Doss, Union 76 Division, Eastern Region, Vidor, Tx. December 12, 1949

Walter H. Ellis, Oil and Gas Division, Bakersfield, Ca. August 3, 1943

Ralph E. Evans, Oil and Gas Division, Colorado City, Tx. June 10, 1969

Clarence J. Gibby, Union 76 Division, Western Region, Cool, Ca. October 18, 1954

Francis R. Keating, Union Chemicals, Hoffman Est., Il. October 4, 1953

James L. Keller, Science and Technology Division, Fullerton, Ca. May 25, 1948

Lester J. Larson, Union 76 Division, Eastern Region, Lockport, Il. July 8, 1947

Billy G. Moran, Union 76 Division, Eastern Region, Elkhart, Tx. October 16, 1950

Delbert H. Norton, Union Chemicals, Earp, Ca. March 9, 1959

Clarence G. Prichard, Union 76 Division, Eastern Region, Harbour Heights, Fl. April 1, 1952

Alfred F. Ponnwitz, Union Chemical, Lincoln Park, N.J. July 17, 1958

Joseph Rosio, Union Chemicals, Homeland, Ca. May 21, 1951

Sam G. San Filippo, Union 76 Division, Western Region, Daly City, Ca. July 24, 1958

Donald E. Schneller, Union 76 Division, Western Region, Parker, Az. April 29, 1963

Jack M. Scott, Union 76 Division, Western Region, Burlingame, Ca. December 18, 1950
Lois L. Tait, Corporate, Corona, Ca. July 5, 1955
Helmut Vorster, Union Chemicals, Sierra Madre, Ca. October 14, 1974
William H. Wright, Union Chemicals, Yorba Linda, Ca. March 10, 1954

September 1982

William S. Biggers, Union 76 Division, Eastern Region, Beaumont, Tx. April 16, 1946
Norman L. Caney, Union Chemicals, Buena Park, Ca. September 28, 1959
Alfred S. Crawford, Union 76 Division, Eastern Region, Port Neches, Tx. August 25, 1962

IN MEMORIAM

Employees

Anthony Aquino, Union Chemicals, Anaheim, Ca. June 15, 1982
Marion E. Hale, Oil and Gas Division, Morton, Tx. June 19, 1982
Guy R. Hall, Energy Mining, Rawlins, Wy. June 7, 1982
Robert G. Hearn, Oil and Gas Division, Grand Saline, Tx. July 16, 1982
Robert D. Jones, Union 76 Division, Western Region, Long Beach, Ca. May 27, 1982
Michael K. Manion, Molycorp, Mountain Pass, Ca. June 1, 1982
Andalesio T. Ortiz, Molycorp, Questa, N.M. May 4, 1982
John C. Skyko, Union 76 Division, Western Region, San Pedro, Ca. July 11, 1982
Anthony A. Tavernelli, Union 76 Division, Western Region, Ventura, Ca. July 5, 1982
Ranold W. Tolfe, Union 76 Division, Western Region, Cypress, Ca. June 15, 1982
William R. Williams, Molycorp, Questa, N.M. July 6, 1982
Jean C. Wojtyla, Union 76 Division, Eastern Region, Berwyn, Il. July 3, 1982

Retirees

Adaline M. Asbury, Union 76 Division, Western Region, Glendale, Ca. March 17, 1982
Floyd T. Beckett, Union 76 Division, Eastern Region, Mt. Pleasant, Mi. June 30, 1982
Russell S. Blanchett, Union 76 Division, Eastern Region, Venice, Fl. June 4, 1982
Ralph S. Church, Union 76 Division, Eastern Region, Winston-Salem, N.C. May 15, 1982
Benjamin C. Cotton, Union 76 Division, Eastern Region, Port Neches, Tx. July 24, 1982
James E. Cunningham, Oil and Gas Division, Olney, Il. June 21, 1982
Harry E. Datisman, Union 76 Division, Eastern Region, Elgin, Il. June 1, 1982
Hugh C. Derby, Union 76 Division, Western Region, Lakewood, Ca. June 9, 1982
Howard L. Dieter, Union 76 Division, Eastern Region, Chicago, Il. July 6, 1982
Noble E. Hardwick, Oil and Gas Division, Ben Wheeler, Tx. June 9, 1982
Lewis Jeanis, Union 76 Division, Eastern Region, Beaumont, Tx. July 26, 1982
George F. Jordan, Oil and Gas Division, Nowata, Ok. June 21, 1982
Marvin Keeney, Union 76 Division, Eastern Region, Groves, Tx. June 30, 1982
Ralph C. King, Oil and Gas Division, Marietta, Ok. June 19, 1982
Frank P. Kucera, Union 76 Division, Eastern Region, Westmont, Il. July 24, 1982
Nelson F. Leo, Arapahoe Pipeline, Ft. Morgan, Co. June 5, 1982
Vernon M. Luman, Union 76 Division, Western Region, Long Beach, Ca. July 15, 1982
Leo W. Lund, Union 76 Division, Western Region, Arlington, Wa. June 6, 1982
George Mathis, Union 76 Division, Eastern Region, Windsor, N.Y. May 29, 1982
Olen Matheny, Oil and Gas Division, Oblong, Il. April 16, 1982
Francis H. McCullough, Union 76 Division, Eastern Region, Covina, Ca. May 21, 1982
Donald R. McDonald, Union 76 Division, Eastern Region, Princeton, Ky. May 20, 1982
Michael E. McGee, Union 76 Division, Eastern Region, Oregon, Oh. July 4, 1982
Uriah V. McMahon, Union 76 Division, Western Region, Roseville, Ca. June 30, 1982
Eugene L. Neff, Union 76 Division, Eastern Region, Hilliard, Oh. April 15, 1982
Jack C. Parker, Oil and Gas Division, Victoria, Tx. July 22, 1982
Carl A. Petersen, Union 76 Division, Eastern Region, Eustis, Fl. May 13, 1982
Vera Peterson, Union 76 Division, Eastern Region, Chicago, Il. July 4, 1982
Harmon Leroy Pitts, Oil and Gas Division, Healdton, Ok. June 10, 1982
Albert B. Pounds, Molycorp, Washington, Pa. June 8, 1982
Ralph G. Rasco, Oil and Gas Division, Van, Tx. May 31, 1982
Ralph R. Rector, Oil and Gas Division, Newark, Oh. May 2, 1982
Clarence E. Rode, Sr., Union 76 Division, Western Region, Lynwood, Ca. July 7, 1982
Jessie J. Sloan, Union Chemicals, Toledo, Oh. May 31, 1982
Benney T. Steffey, Oil and Gas Division, Dundas, Il. June 25, 1982
Chester L. Stevens, Union 76 Division, Eastern Region, Nederland, Tx. June 22, 1982
Erza W. Stevens, Union 76 Division, Eastern Region, Smithfield, N.C. July 19, 1982
Nellie M. Stevenson, Union 76 Division, Eastern Region, Richmond, In. July 8, 1982
Clarence F. Thomas, Union 76 Division, Western Region, Escondido, Ca. July 8, 1982
James F. Till, Oil and Gas Division, Yucaipa, Ca. June 8, 1982
Fred W. Vidal, Oil and Gas Division, Orcutt, Ca. June 13, 1982
Casper J. Weir, Jr., Union 76 Division, Western Region, San Luis Obispo, Ca. July 20, 1982

UNION OIL COMPANY OF CALIFORNIA
P.O. Box 7600
Los Angeles, California 90051

GARY L FOY
16823 LIGGETT STREET
SEPULVEDA CA 91343

SEVENTY SIX
UNION OIL COMPANY OF CALIFORNIA

VOLUME LXI, NUMBER 5
SEPTEMBER/OCTOBER, 1982

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COVER: The recently dedicated Fred L. Hartley Research Center in Brea, California, is one of the most advanced research facilities in the country and it is here where Union has earned its reputation for innovation and research. Story on page 3. **Photograph by Bob Shultz.**

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