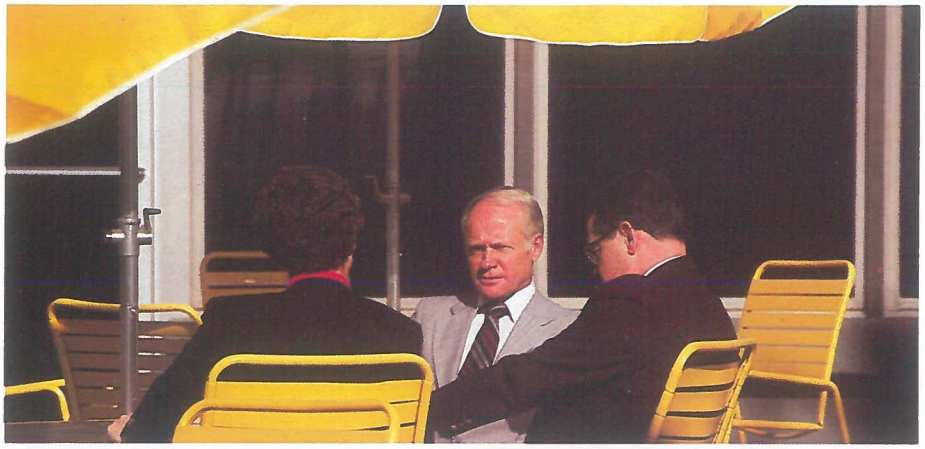
Research

UNION 76

Union Science and Technology Division

Look Us Over



Cloyd Reeg, center, is president of Union's Science and Technology Division.

Union Oil Company of California is challenged each day to provide the basic earth resources needed for conversion into high quality products to energize our nation. Everyone in the Union Oil organization accepts this challenge, and everyone here works hard to meet it with success.

Important steps to meet this ever-present challenge at Union Oil are taken by scientists and engineers of our research staff. Because the need for more energy in the U.S. is clearly evident, the challenges they shoulder today are more demanding than ever before.

We pose the same challenge to you: Bring your newly earned skills to Union Oil where you can become a vital part of a stimulating, hands-on research environment. We invite you to read on and learn more about Union Oil, a leader in the country's mission to provide new sources of energy and to increase domestic energy supplies.

The Union Science and Technology Division conducts the basic and applied research activities for Union Oil Company of California.

Union Oil, one of the major oil companies in the United States, first organized a research department in 1891. Today, the Union Science and Technology Division handles all research and development for all divisions and subsidiaries of the company, including exploration, production, refining, marketing, petrochemicals, geothermal, oil shale, minerals, energy conservation and pollution abatement.

The Union Science and Technology Division is headquartered at the Fred L. Hartley Research Center in Brea, California, where Union Oil's principal research and development activities are carried out. The center was renamed in 1980 in honor of Union's chairman and president, who spent many years here, first in charge of technology sales, then as head of the entire organization for five years.

Organizationally, Union Science and Technology is a division of Union Oil Company of California. The center is situated in a campus-like setting in the rolling hills country of northern Orange County. The scene is suburban, but metropolitan shopping, cultural centers, recreation and advanced schools

A large, replete technical library is available to the research staff.

Research is a people activity at Union where interdisciplinary exchange is encouraged.

are within easy commuting distances. The center is located near producing oil fields, which are part of the oil production that makes Los Angeles one of the nation's major petroleum centers.

Union Oil Company is research oriented. In December 1978, Union's research department was expanded into a corporate division in recognition of its accomplishments and also reflecting the company's desire to move more aggressively into new technology during the 1980s.

The primary objectives of Union Oil's research programs are: (1) to provide new technology to aid in finding and producing a wide range of earth resources and (2) to invent and develop new products and processes to meet mankind's needs while providing a profit to the company.

The Science and Technology Division is a source of innovation for the wide range of company operations. There is a counterpart department, group or section in research for every major operating division in the company. Researchers get involved in a variety of other endeavors, such as control of pollution, prevention of corrosion, computer applications and abatement of noise, for example. In addition, research is responsible for the procurement and management of the company's patents and the licensing of its technical processes to

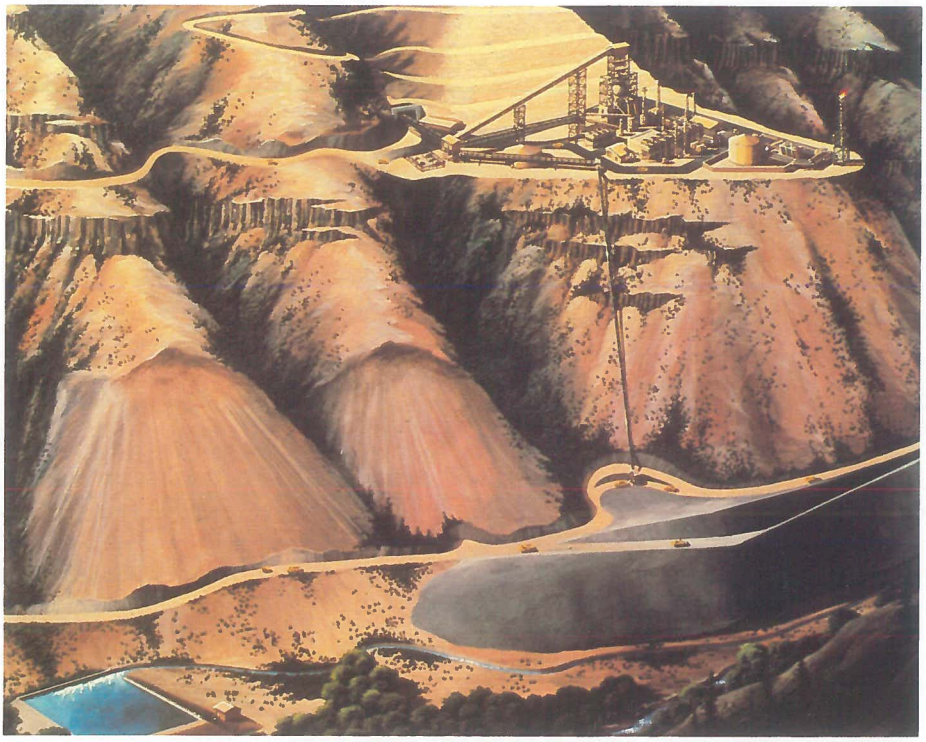
Technically oriented patent attorneys administer patent protection of Union inventions.

other companies throughout the world.

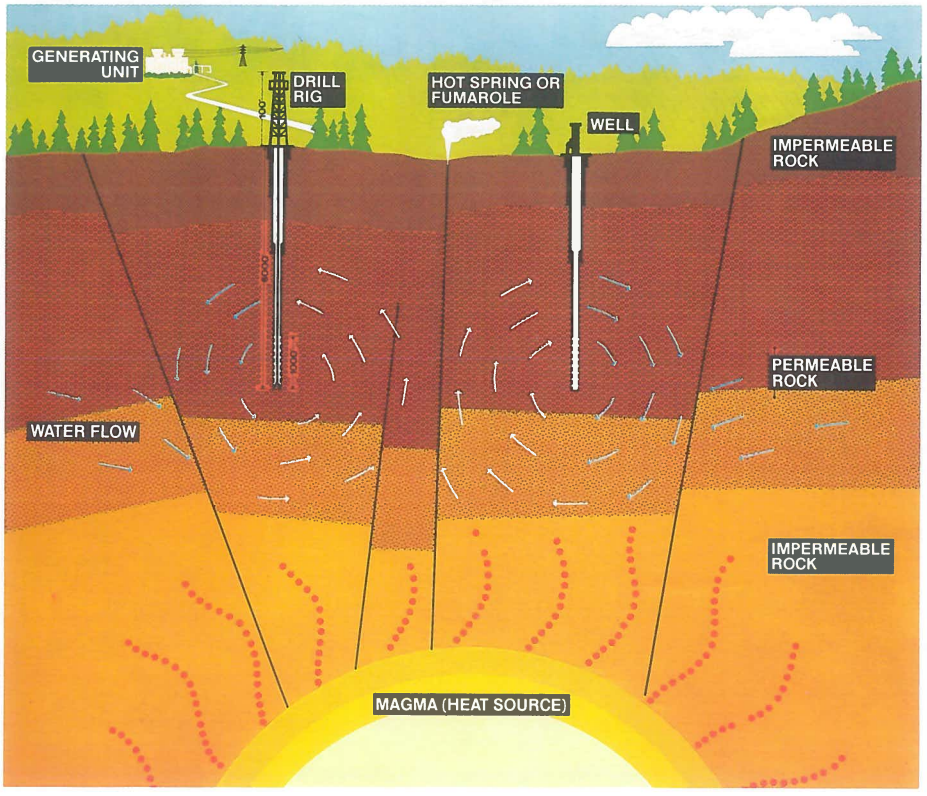
At Union Oil, newly hired researchers with advanced degrees are placed in specific positions for which their training qualifies them. Professional employees with a year or less of graduate training may be placed in an orientation program. Those assigned to this program will work in two or three different assignments during their first two years before being placed on a permanent assignment. Research technicians, programmers and data processors are available to assist the professionals in carrying out their research.

Union Oil researchers are encouraged to attend professional meetings, to take an active role in professional societies and to publish their work. We have a policy of inviting recognized scientific authorities to lecture. Individual researchers are often asked to present their findings to their peers in open forum. Continuing education is emphasized. Many of our engineers and scientists undertake advanced studies in both evening and on-the-job courses at local universities—with a large portion of the expense borne by the company.

Some of our researchers have achieved national and international acclaim. Many have traveled and lectured extensively in the United States and abroad. There is no limit on the growth and development of scientists and engineers who create new ideas and developments. Our most valuable asset is our outstanding staff of people. Through their efforts we hope to improve our society and the profitability of the company. We welcome this opportunity to discuss our work with you, and we hope this brochure will stimulate your interest in Union Oil Company's Science and Technology Division.



Alternative sources of energy for America's future are under scrutiny by research staff scientists. Union has developed its own oil shale retorting process for its extensive holdings in shale-rich Colorado (above) and is the world's leading producer of geothermal energy (below).



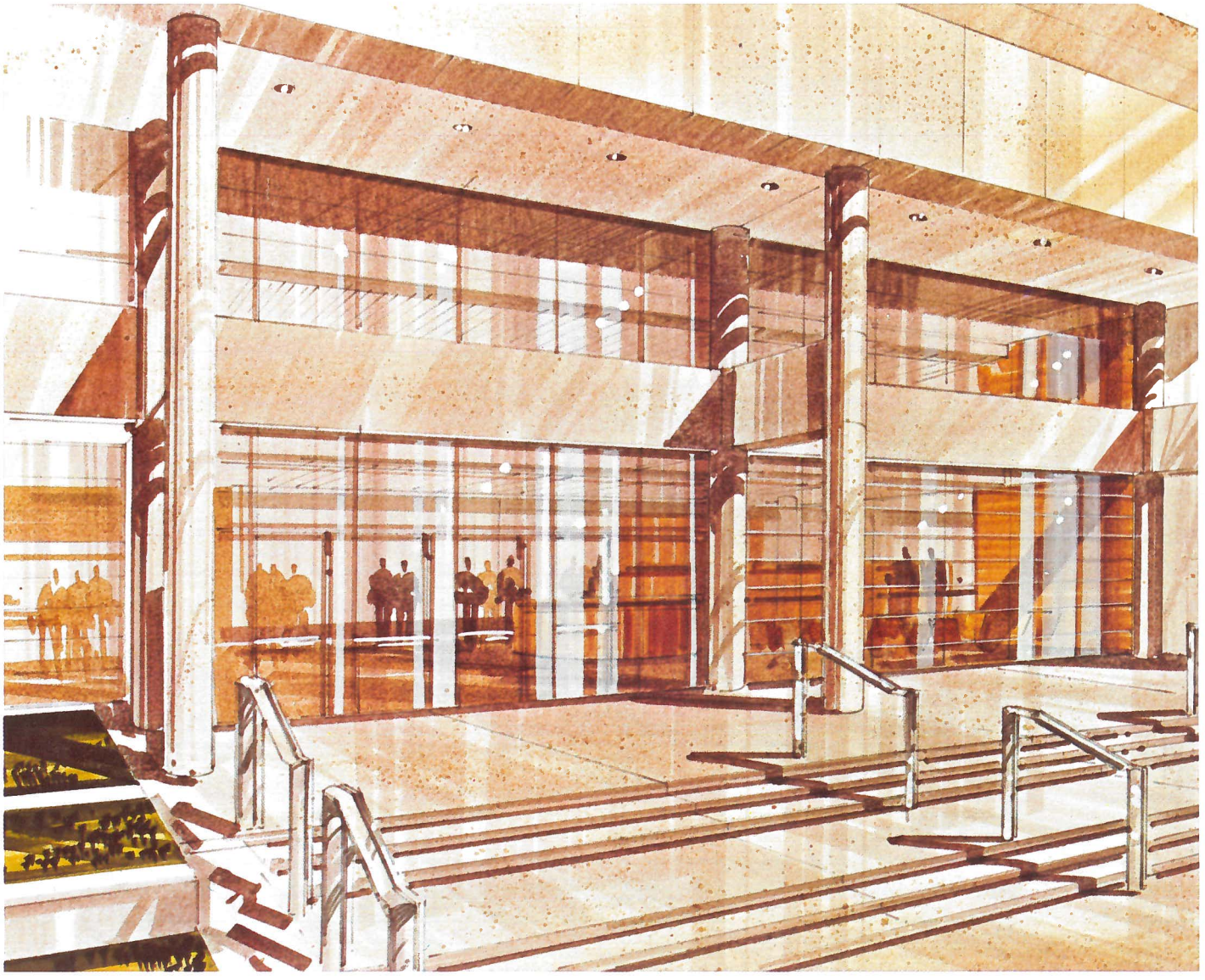
Building For The Future

A multi-million dollar building program is underway at Union's Fred L. Hartley Research Center. It is aimed at doubling existing laboratory and office space to accommodate the dramatic growth planned in the 1980s for the company's Science and Technology Division. The expansion plan includes three new laboratory buildings and a new geological sample process laboratory as well as an addition to the existing bench scale lab.

Expansion plans also call for a new three-story administration building, including a 500-seat auditorium and an employee dining facility with seating designed for up to 500 people.

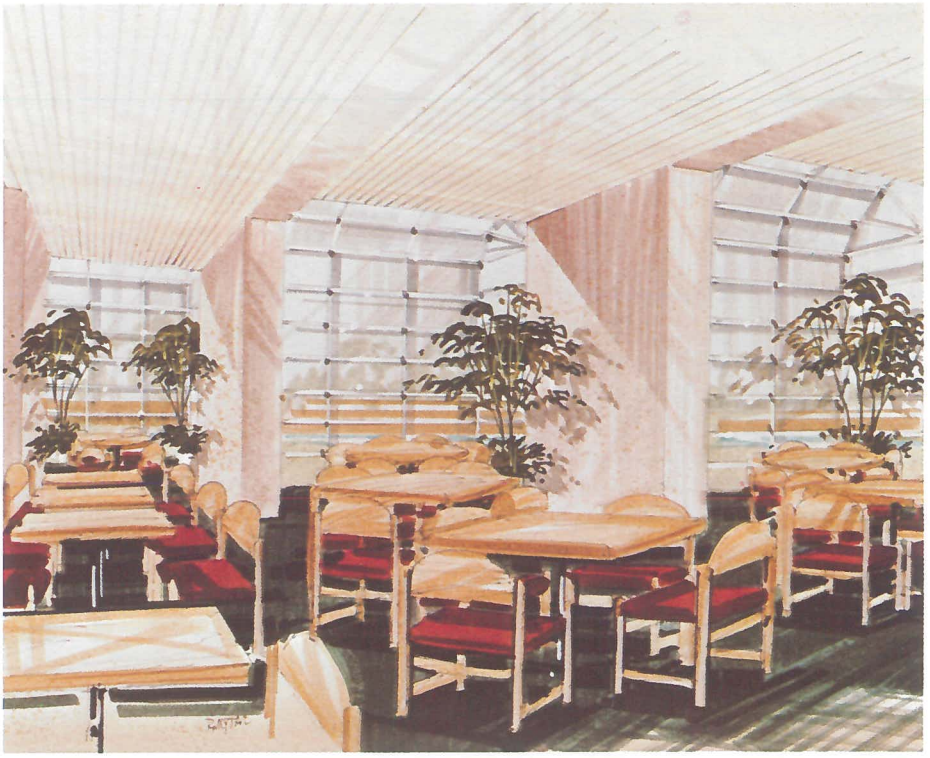
The administration building is central to the new design of the research center. It is a half circle building, which incorporates the auditorium and dining facility, surrounding an outdoor garden area.

The three new laboratory buildings, all single story, will provide new space for the geology and geochemistry and the geophysics sections of the Exploration and Production Research



Department and for the chemicals section of the Refining and Products Department.

Integral to the expansion of the laboratory space will be the installation of modern lab equipment and new furniture. A special feature of the new facility will be an ice bank, which will allow for the most efficient energy use to cool the center during warm months. The ice bank will make and store sufficient ice each night, when the demand for energy is at its lowest, to cool the facility the next day when energy demand peaks.



New facilities for the Science and Technology Division are being built as shown in these renderings. Union's commitment to research and development now means more people doing more scientific research at a more accommodating site.

Exploration And Production

The ability of an oil company to find new accumulations of crude oil and natural gas depends largely on the success of its exploration efforts. Today, success in exploration is increasingly difficult as competition for acquiring favorable exploration areas increases and the number of undiscovered oil and gas deposits decreases. The Exploration Research group seeks answers to these challenges through innovative research and technical service work in geology, biostratigraphy, geophysics, geochemistry and computer methods.

A major part of our research effort is directed toward developing new concepts and methods for finding subsurface geological conditions that result in the formation and trapping of hydrocarbons in commercial amounts. This is a multidisciplinary effort involving all phases of research work. For a geochemist, this might mean a better concept of the origin and migration of crude oil and natural gas, while a geophysicist might be developing a better way of interpreting seismic data.

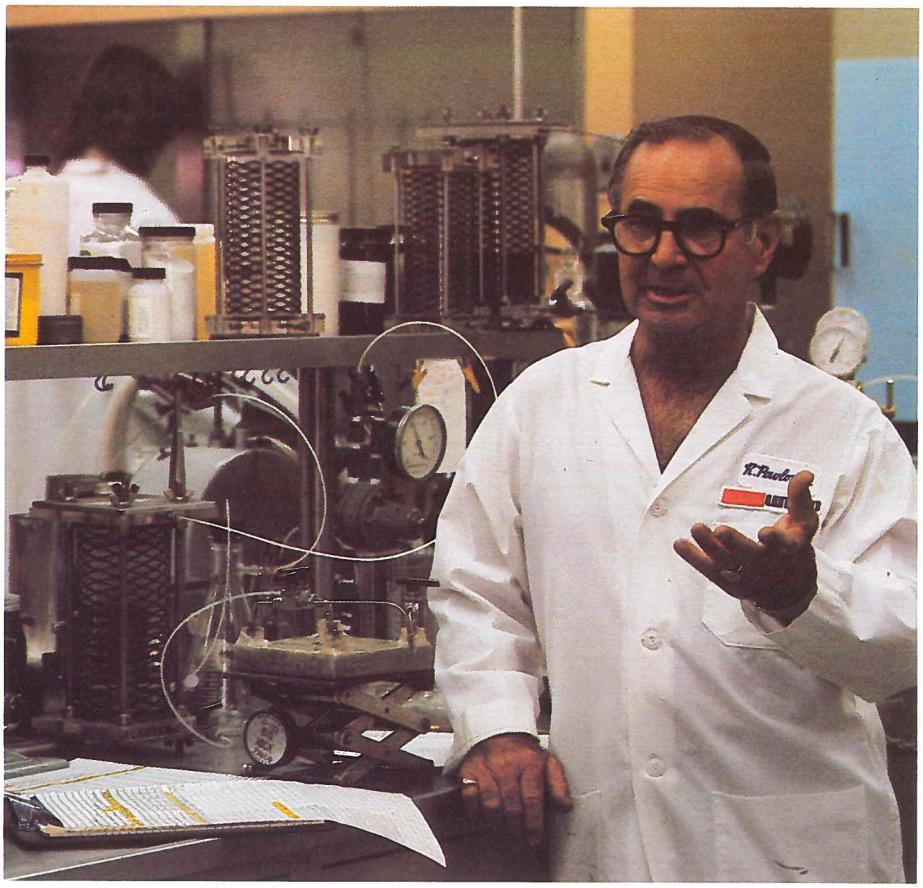
Union Oil researchers are devising new ways of determining the depositional environments and reservoir quality of sandstone and carbonate rocks. Our research programs in well log interpretation and micropaleontology are designed to find better, more accurate ways of correlating sedimentary rocks and determining their paleoecology and geological age.

Of course, all of these disciplines benefit greatly from the recent introduction of the computer, with its capability to process large amounts of data. The application of computerized data handling methods to exploration problems is a very important part of our research program.

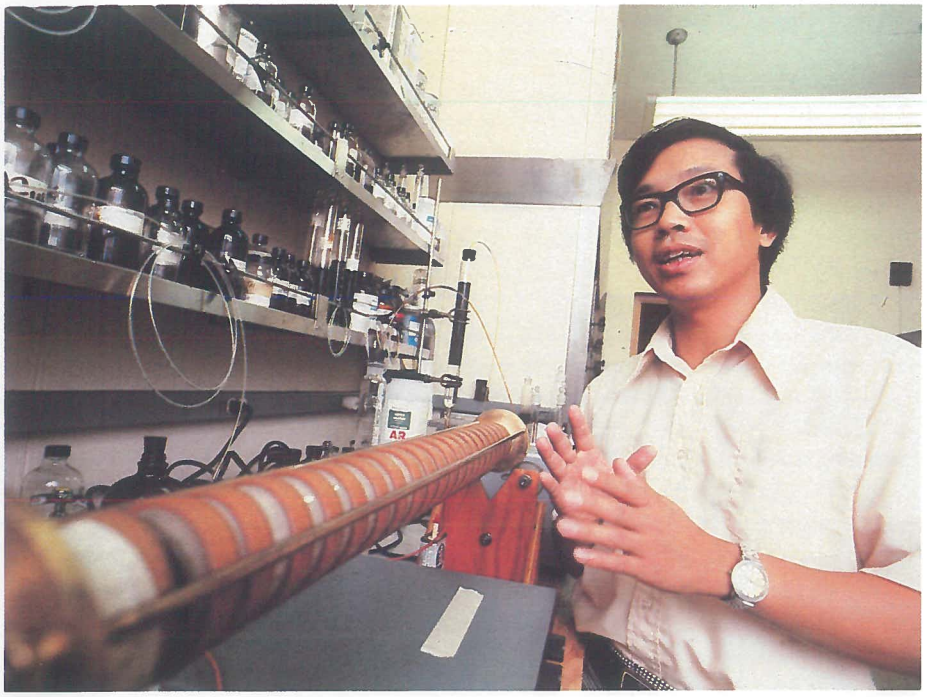
Our research program in geophysics is also designed to produce new or better techniques with which to locate subtle hydrocarbon traps in the deep subsurface. This will require new and better ways of generating, recording, processing, and interpreting geophysical data. Major areas of research include data processing, geophysical modeling, and seismic stratigraphy. These studies are supported by an excellent computer facility designed for advanced research in geophysical data processing.

The geophysical staff works closely with the geological research staff and with field operations. The need for increasing effectiveness of geophysical methods in locating and evaluating oil and gas prospects prior to drilling insures a continuing high priority for research in this field of earth science.

Equally important in maintaining the company's recoverable reserves and its production rates at high levels is



Drilling for and producing hydrocarbons in increasingly challenging geological environments is made easier through the efforts of research staffers who continually upgrade and monitor the effectiveness of modern techniques.



our ability to increase production efficiency. Engineers and chemists in our Production Research group are seeking constantly to achieve this—by development of new methods, materials and techniques, and by improvement of conventional practices. Continuing efforts are made to develop better and less expensive methods of drilling and completing wells, minimizing damage to producing formations, stimulating low permeability and partially plugged formations, and minimizing oil well corrosion.

Other investigations aim at improvement of secondary recovery processes and development of new "enhanced oil recovery" processes. This requires theoretical and experimental studies to acquire knowledge of the characteristics of reservoir rocks, the properties and behavior of native and injected fluids at reservoir conditions, and the changes in flow behavior that can be induced by injection of enhanced oil recovery fluids.

Still other important functions of production research include the development of better techniques for reservoir analysis and prediction of future reservoir performance. Physical and mathematical models are developed and used to study reservoir behavior and the effects on production of changes in the applied recovery processes. From these models, computer programs can be developed to simulate past performance of specific reservoirs and to predict future performance under various conditions of operation.

In addition to studies related to production of crude oil and natural gas, our production research scientists are deeply involved in developing new and improved techniques for production of geothermal energy, for production of minerals by in-situ leaching methods and for unusual operations in offshore and arctic areas of the world.

Refining And Products

This department is made up of two groups, Refining and Products Research. The Products Research group is concerned primarily with the kinds and qualities of petroleum products needed now and in the future to keep Union Oil at the forefront of the industry. The main function of Refining Research is to find new and improved catalysts and processes for making valuable petroleum and chemical products from crudes and syncrudes at the quality levels required, and for converting alternative sources of energy to transportation fuels. On the basis of current and projected future needs, Products Research sets up targets and Refining Research explores and invents processes for making the products economically.

The Refining Research group has played a prime role in establishing the excellent reputation that Union Oil enjoys in the industry as a developer of unique, economically attractive petroleum refining processes. Over the past two decades, Refining Research has contributed basic inventions leading to the development of several new processes that have been put into commercial practice. Two of these processes, Unionfining and Unicracking, enjoy widespread use in the Union Oil Company and in the petroleum industry. The scientists and engineers of the Refining Research group are engaged in fundamental and applied studies of catalysts and reactions, and in the practical applications of their findings.

The Products Research group works closely with the marketing, refining and distribution departments of the company in order to keep abreast of product demands, requirements and problems. The productive efforts of this group have helped the company establish and maintain a strong position as a producer and marketer of high quality petroleum products. In addition to developing new and improved fuels, lubricants and allied products, Products personnel also conduct economic and engineering studies on new uses for existing and future petroleum products. These new products include fuels, lubricants, industrial oils and waxes that are designed, developed and evaluated by this group.

Today's and tomorrow's challenges combine the efforts of all the Refining and Products Research people. They appear, for example, as research for satisfactory alternative fuels and chemicals from such sources as residuum, oil shale, coal, solar, geothermal and biomass; the search for new anti-knock and octane lowering compounds for use in modern catalyst-equipped cars; the utilization in new products and catalysts of rare earth elements, of which Union Oil is the world's largest producer; and the conception of new catalysts and processes for refining fuels and manufacturing petrochemicals.

Union Oil is a leader in the development, testing and installation of pollution control equipment. Refining and Products Research, in conjunction with other departments of the company and the industry, are developing new products, new processes and methods for controlling and measuring emissions of polluting vapors from oil and gas field installations, the refineries, the marketing terminals and our service stations.

Union's reputation for top quality refined oil products is guarded and enhanced by careful and inventive research scientists.

Chemicals

The Chemical Research Department comprises three different groups conducting chemical research, and it is staffed mainly by organic, inorganic, physical and analytical chemists.

Chemicals Research Group

The Chemicals Research group conducts research and provides technical service to support the three operating groups of the Union Chemicals Division, the Carbon group, the Nitrogen group and the Petrochemical group.

For the Carbon group, studies are carried out to convert petroleum coke to the more valuable forms of carbons and graphites having improved properties and, thus, higher commercial value. Research support also is provided for Poco Graphite, a wholly-owned subsidiary producing a highly specialized line of graphites.

For the Nitrogen group, methods are sought to convert the basic nitrogen plant foods it manufactures and sells, such as ammonia, urea and nitric acid, into specialty products for agricultural uses. In addition, agricultural chemists study ways to formulate and apply materials containing sulfur and other minor nutrients into high performance products that will enhance the yield and quality of the harvest from agricultural crops.

The Petrochemical group sells polymer emulsions, hot melt adhesives and solvents. All of the research, development and pilot plant work required to provide a wide variety of polymer emulsions and hot melt adhesives is done at the research center. Plant start-up assistance and technical service for these products also are provided as required. Some technical service also is provided in support of solvent sales.

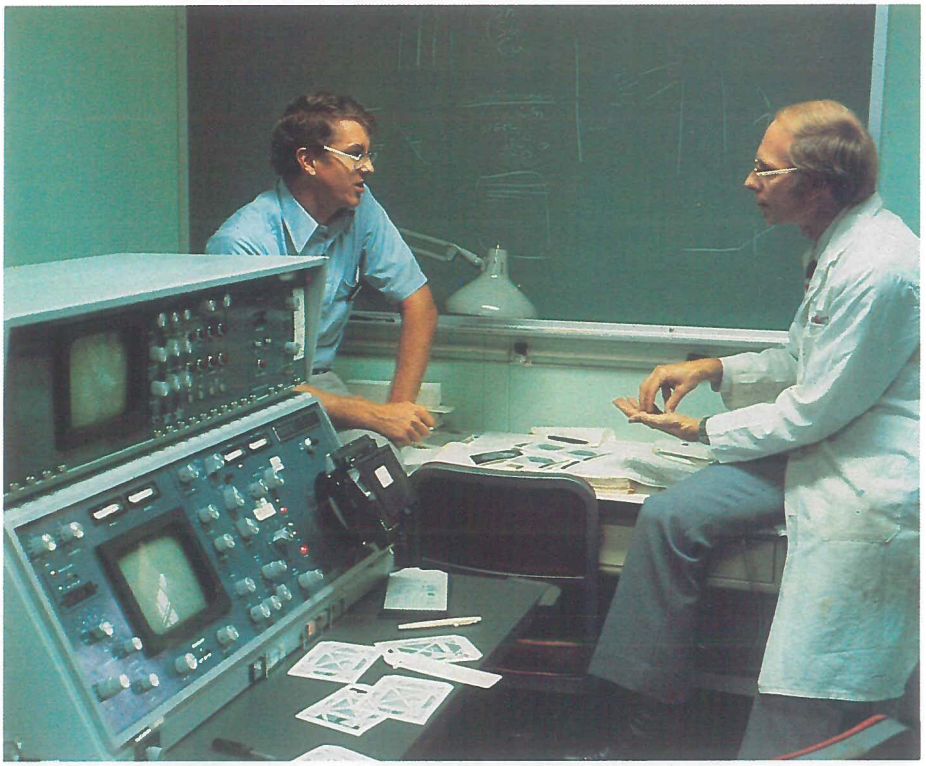
Analytical Research Group

The Analytical Research group provides general analytical service for all the departments of the Science and Technology Division as well as special analytical support for many of the operating divisions of the company. Analytical research is undertaken to improve existing methods or provide new ones to meet ever changing demands. Research in wet chemical, physical-chemical, instrumental and spectroscopic analysis is required. A knowledge of how to apply computers in the laboratory as well as programming skills is needed for many of the analyses made with sophisticated instruments.

Corrosion Research Section

Corrosion, the uncontrolled reaction of metals and alloys with their environment, occurs in many phases of the petroleum industry. It can cause an expense burden of millions of dollars per year in a company the size of Union Oil.

In the Corrosion Research section, chemists, metallurgists and engineers study and recommend methods for controlling corrosion inhibitors, cathodic protection, and special alloys. The researchers also handle welding problems, and they analyze equipment failures in order to prevent a recurrence. The solution of corrosion problems often involves a laboratory study of complex surface reactions and electrochemical phenomena.



This scanning electron microscope is one of the modern research tools utilized by staff scientists and engineers at the Fred L. Hartley Research Center.

Engineering And Development

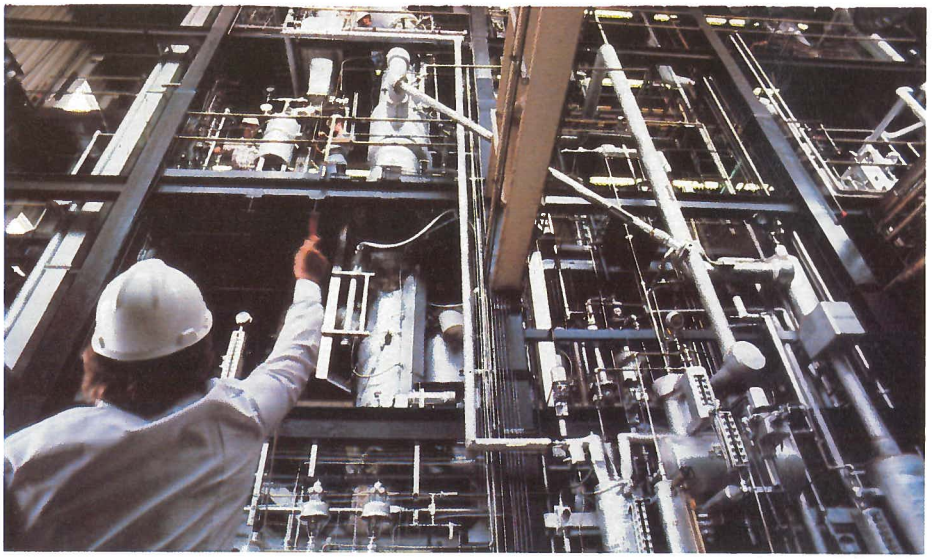
The Engineering and Development Department is involved in the application of chemical and engineering principles to petroleum refining, petrochemicals manufacture, technology for alternative energy sources, and maintenance of environmentally acceptable operations. Special studies include development of processes for supplying energy from sources other than crude oil, such as oil shale and geothermal reservoirs.

The Process Development group obtains, evaluates and correlates process data for use in engineering design of commercial processing plants. Engineering responsibilities include planning of experimental tests, supervision of the operation of pilot plants, statistical evaluation and correlation of resulting data, and communication of information and ideas to officials within the company. New processes may require invention and design of new reactors or other special equipment. The engineer may design and operate special experimental units to study chemical engineering problems in heat transfer, gas-liquid mixing and phase equilibrium.

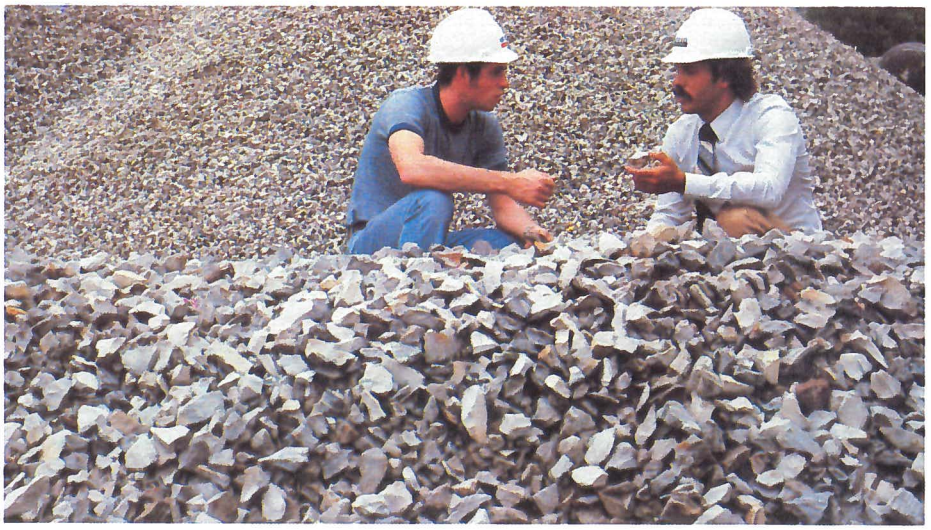
The Process Engineering group translates the experimental data and correlations into design bases for new commercial plants. These bases define process flow and operating conditions and provide the engineering contractor with the information needed to build a successful plant. Close contact is maintained during design, construction and startup with contractor and customer, who may be either an operating department or subsidiary of Union Oil or another industrial company.

Service facilities at Union's research center enable the engineer to do a successful job of development and design. Detailed analyses of process streams with mass spectrometer, chromatograph and other techniques by the analytical group enable the engineer to study reactions taking place in a process and calculate heats of reaction and phase distribution. A computer is available to store analytical data pertaining to pilot plant tests, calculate material balances and assist in preparing design bases. Linear programming and process simulation are computing techniques also used by the engineer.

Since Union Oil is a major licensor of a number of processes, there is continual activity in the development and engineering design of process units.



Oil shale, the historical "burning rock," (below) is used in Union's pilot retort (above) where refinements are made in Union's unique upflow oil shale retorting process.



Technology Sales And Patents

Union Oil conducts an active program of licensing its patents and expertise to other oil companies and other industries. The Technology Sales Department administers this highly successful licensing program. The activity creates income that increases the company's return from its research. It also provides broader experience, which adds to the usefulness of Union's developments in the company's own operations.

Union Oil's refining and production technology has been sold widely throughout the world, with hundreds of refineries utilizing Union's inventions and knowledge. For many years the company has been a recognized leader in the use of hydrogen in catalytically refining petroleum. This field includes Unicracking (hydrocracking), Unionfining (hydrotreating), Unicracking/HDS (resid desulfurization), Unisar (aromatics saturation), and BSRP (sulfur plant tail gas desulfurization) processes. Union is also a recognized leader in the development of processes for enhanced oil recovery. The sale of these processes is growing and will be a major activity as world oil supplies continue to tighten. Licensed plants and oil field installations provide outstanding opportunities for technical personnel to work on and to manage the design of plants and enhanced oil recovery facilities, and to travel worldwide as consultants in the startup and operation of new plants and facilities.

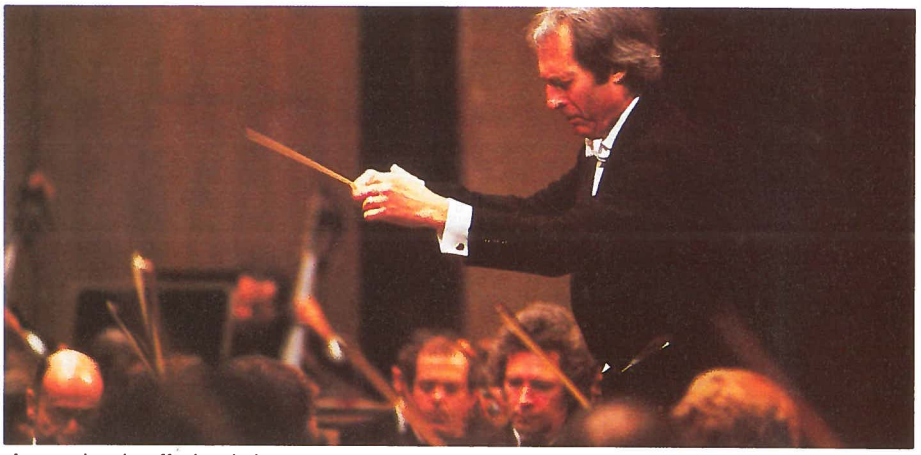
Good ideas, not only those generated by members of the Science and Technology Division, but also those produced by any technical or supervisory employee in any field of the company's activities, are reported directly to the Patent Department. Here technically trained patent lawyers arrange to utilize them to the best advantage, either through exclusive use by the company or by licensing to others. Usually this involves securing U.S. and foreign patents, or maintaining the idea as a trade secret. The company owns about 1,500 U.S. and foreign patents pertaining to all facets of the company's activities. Since people in other companies also have good ideas, the Patent Department is also responsible for avoiding infringement of other people's patented concepts. Incidentally, the ratio of licenses granted to licenses taken is well over 10 to 1. All patent and know-how license agreements, whether granting rights to others or obtaining rights from others, are negotiated and drafted by Patent Department personnel, whose unique combination of technical and legal training is essential.

Administrative Services

As an aid to the creative scientist to perform most effectively, Administrative Services provides:

- ☐ One of the finest industrial technical information centers in Southern California, with a professionally trained staff available for assistance in information retrieval.
- ☐ A modern computer center.
- ☐ Engineering support including the design, construction and maintenance of research center facilities, pilot plants, experimental equipment and instrumentation.
- ☐ Purchasing, warehousing and sample storage services.
- ☐ Accounting and office services.
- ☐ Industrial relations functions and the services of a medical department.

Cultural Activities



A symphonic offering is just one sampling on the area's musical menu.

The list of cultural and entertainment attractions in Southern California is almost endless. During a typical month, it is possible to see a different play every night, attend several free concerts a week, or see major motion pictures whenever you choose.

Theater ranges from Broadway shows to little theater productions, and name stars can be found appearing on stage in the most lavish and the most modest shows.

Southern California is the home of television, and tickets are available to the filming of popular shows. Studio tours are fascinating looks behind the scenes of Hollywood's magic.

Every music form can be found in performance in Southern California. There are symphonies at the Hollywood Bowl, pop concerts on stage, jazz ensembles in local bistros, country and western and much more.

There are magnificent art galleries to visit, but you may also be surprised to find an art exhibit on display at your local shopping mall.

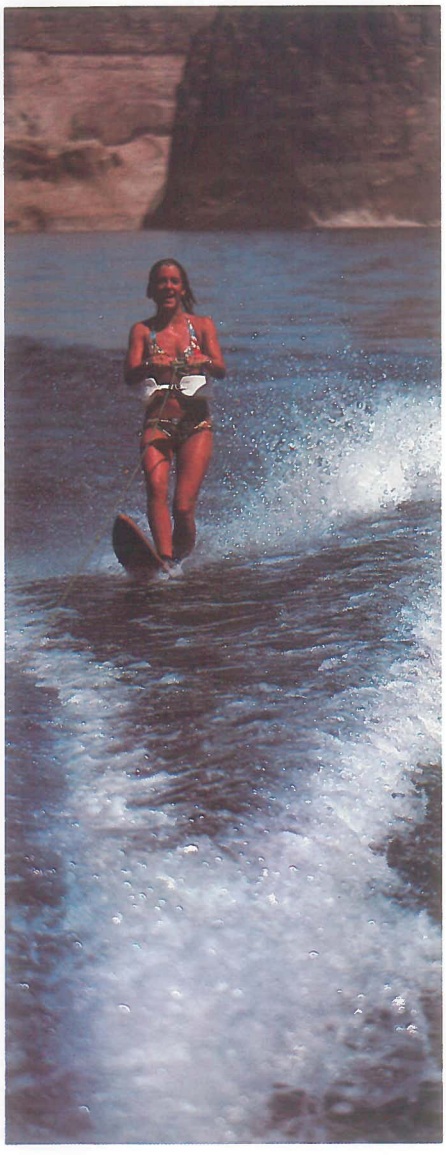
The world famous Music Center is host to theater, opera, ballet and other outstanding live performances of note.

Sports And Recreation

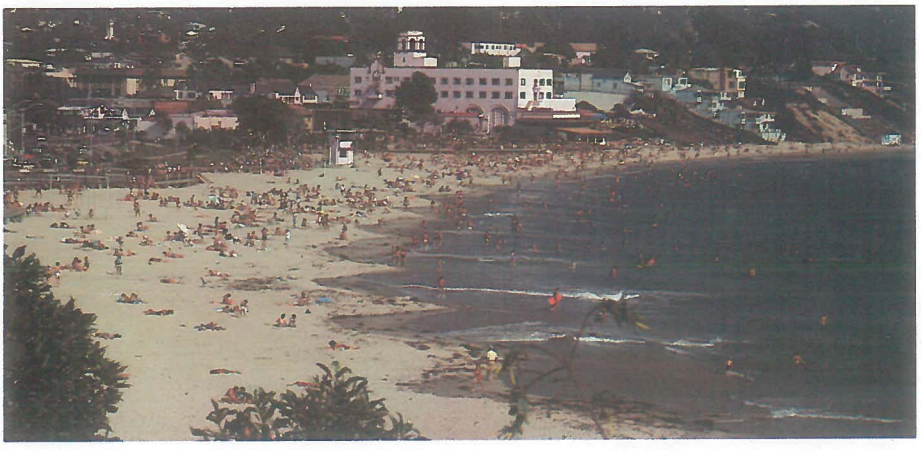
Southern California is the nation's sports and recreation capital, an all-year, all-weather playground for the outdoors person and spectator alike. Surfing, sailing, swimming and skin diving in the Pacific Ocean and hiking and skiing in the nearby mountains are favorite pastimes.

Fishermen have a choice of mountain streams, placid lakes or deep sea fishing. Hunters can find a variety of game. Golf courses and tennis courts, as well as racquetball clubs, are open all year and can be found in nearly every community. If you're an auto racing buff, the Riverside Raceway, or several famous drag strips are within easy driving distance from Brea. These tracks and others, plus the Long Beach Grand Prix, offer a complete array of auto racing.

Of course, Southern California is also widely known for its major league lineup of teams: the Angels and Rams (both in Orange County) and the Dodgers, Lakers, and Kings. And there's also soccer, horse racing and college sports of the highest caliber.



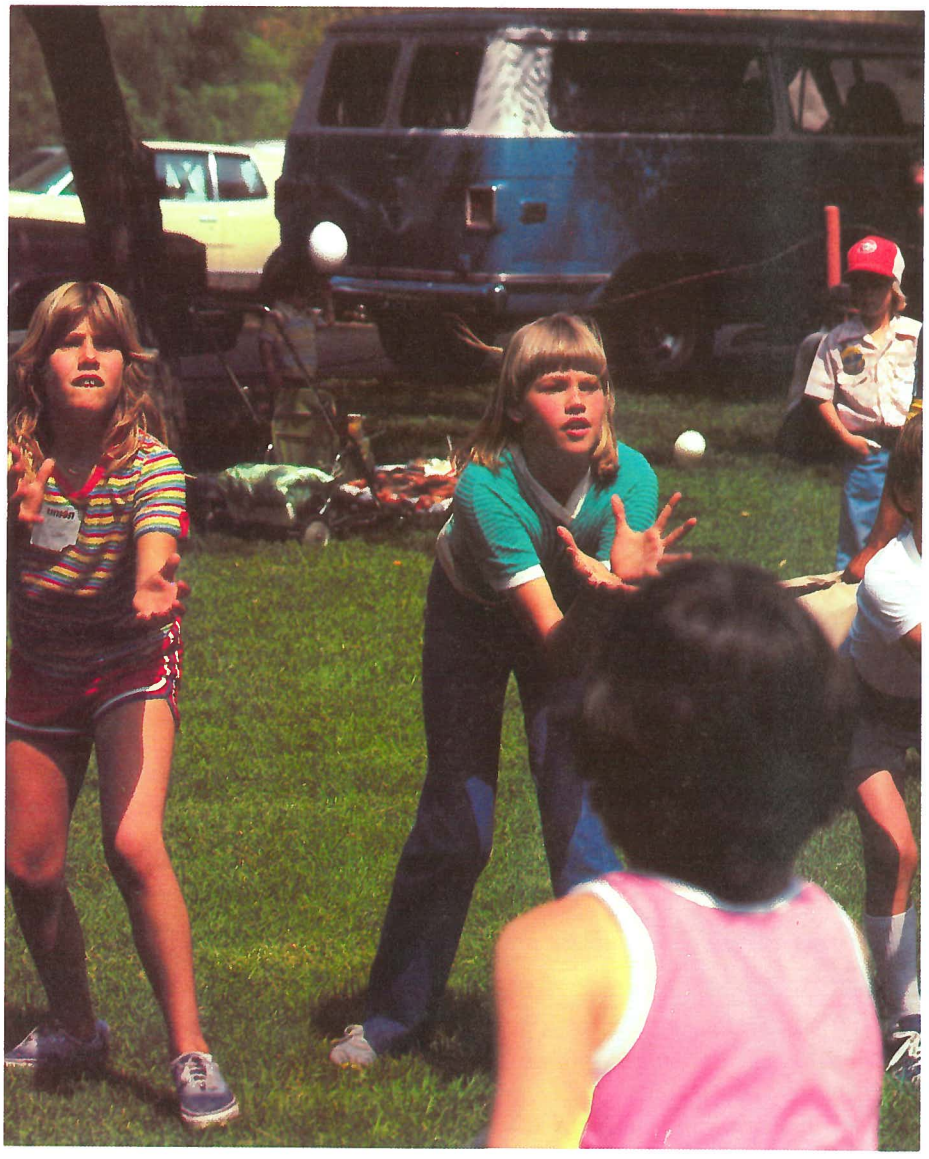
Slicing through America's largest desert, lying placid high in nearby mountains or splashing on sun-bathed beaches, water plays a central role in Southern California recreation.



Employee Recreational Activities

The scientific staff at the Fred L. Hartley Research Center is small enough that everyone can become acquainted. The people are friendly and enjoy the spirited competition and involvement of company recreational clubs. During the lunch period, members of the chess club can be found studying the next move of a thoughtful game. The golf club and the summer twilight golf league enjoy the advantages of many well-manicured courses in the area. The new photography club is attracting a large following; in fact, some of the pictures in this brochure are contributions from club members. Company sponsored bowling leagues, a softball team and basketball team set the pace during the various seasons of the year. Employees' families may enjoy an annual picnic at the company's nearby A. C. Rubel Park as well as a summer beach party. The benefits of the associations made through club and sporting activities can be rewarding professionally as well as socially.

A would-be Babe Ruth has his day in the sun, while a company picnic brings Union Oilers together for fun, part of the varied recreation program serving employees.



Advanced Studies

University of Southern California

Life in Southern California is intellectually stimulating. It is a renowned center for research in aeronautics, aerospace, medicine, biology, petroleum, oceanography, astronomy, and a hundred other scientific pursuits. In Southern California, your neighbor mowing the lawn may be a respected astronomer or biochemist.

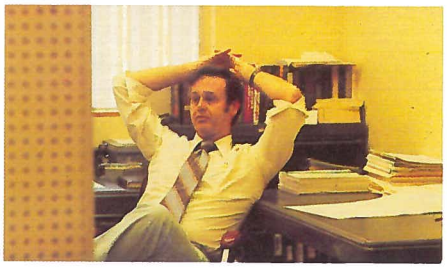
Among the challenges to the technical and scientific community is maintaining and enhancing the skills of our researchers in this day of information explosion. So that technical employees may benefit from the expansion of knowledge in their fields, Union Oil Company offers an educational policy that provides for reimbursement of up to 100 percent of tuition, book and fee costs.

When the request for additional study comes from the company—as it frequently does—other expenses are also paid in full. Many employees in the Science and Technology Division attend courses at recognized universities at company expense.

The Los Angeles area is well equipped with universities for advanced studies. Among them are California Institute of Technology, California State University at Dominguez Hills, California State University at Fullerton, California State University at Los Angeles, California State Polytechnic University at Pomona, Chapman College, Claremont College, Harvey Mudd College, Loyola-Marymount University, Northrop Institute of Technology, Occidental College, Pepperdine, Pomona College, Scripps College, University of California at Irvine, University of California at Riverside, University of California at Los Angeles, University of Redlands, University of Southern California and Whittier College.

California State University, Fullerton

University of California, Irvine



Benefits

It is the policy of Union Oil Company to compensate all employees on a fair and equitable basis for the work which they perform.

Promotional opportunities and salary increases are based on capability and demonstrated work performance rather than seniority.

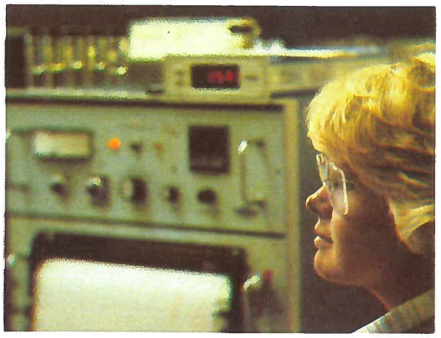
Union Oil's benefits plan program is designed to provide a balanced competitive program of protection and security for employees and their families.

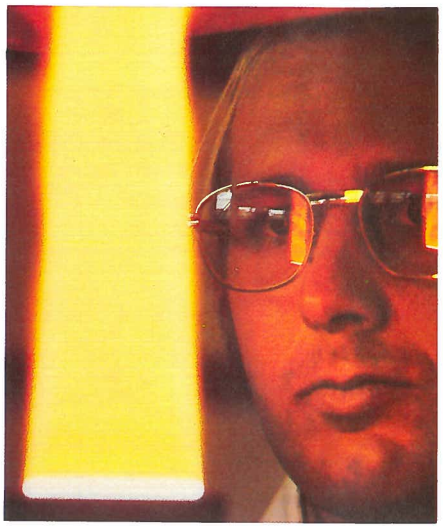
The program offers a wide range of benefits intended to meet varying individual needs at minimum cost to participants.

Primary plans include:

- Annual Vacations and Paid Holidays
- Profit Sharing and Stock Ownership
- Retirement Income
- Medical Insurance
- Dental Insurance
- Sick Pay and Disability Income Protection
- Life, Accident and Survivor Income Insurance
- Educational Aid

Additionally, the company provides military service or training leaves, paid funeral leave, and paid time off for jury duty, as well as other benefits intended to meet basic employee needs.





For further information, write:

Office of Professional Placement
Union Oil Company
Science and Technology Division
376 Valencia Ave.
Brea, CA 92621

3/81