

SOME VENEZUELAN EXPERIENCES

By ED LAYTON, '24

Lufkin Foundry and Machine Co.

In June, 1939, I was loaned to the Caribbean Petroleum Company, Shell affiliate, for some special work in connection with oil field equipment in the Lake Maracaibo region of Venezuela. In my seven months' stay in South America, I had time to make many interesting observations, some of the most vivid of which I have attempted to recall in the following article.

Lake Maracaibo, located in the northeastern section of Venezuela, is some 120 miles long by 60 miles wide at its widest point. Open to the Caribbean through a narrow channel at its northern end, and with shifting sand bars at its outlet, the water is brackish in the upper portion. The numerous rivers emptying into the lower half discharge such a tremendous quantity of water during the rainy seasons that its level will actually rise during these periods. The fishing is reported as excellent and is one of main week-end recreations of the foreign (white) oil company employes. Water temperature is 80-85 degrees F. Because it is impossible for ships of more than 12 feet draft to cross the bars, even at high tide, only small or lightly-loaded ocean-going freighters are ever seen on the Maracaibo waterfront. The specially-built tankers of 11 feet draft, which carry crude from the various fields to the immense refineries on the Dutch West Indian islands of Aruba and Curacao, line up in single file to ride the high tides over the bars. Many native craft, almost exclusively sailboats, from small fishing boats to larger freight schooners and passenger boats, ply the lake's surface; and each week-end there is a Star-boat race between sailing enthusiasts among the oil companies' foreign staffs.

The city of Maracaibo, of some 140,000 population, is situated on the western shore at the northern end of the lake, and ranges from the dirt and smells of the typical tropical port to the attractive estates of wealthy upper-class Venezuelans and the well-landscaped grounds of the oil company offices and camps. The surrounding country is desert-like, with relatively little rainfall, and thorn trees and cactus are virtually the only natural foliage. The thorn tree foliage begins about 4½ feet above the ground and appears to have been clipped. This is the "goat line," or the maximum reach of a goat standing on his hind legs. Goats, with a few burros, are virtually the only domestic animals which can forage this area successfully.

TRAFFIC PROBLEMS

Except in the Bella Vista section, the location of the newer and better residences and the oil company camps, the majority of Maracaibo's streets are dirty and very narrow, with most of them for one-way traffic only. Driving, for a foreigner, is a gamble, since the streets are full of cars, mostly in taxi service, which are driven any place in the street which the driver may happen to fancy—either side or the middle. The average native driver appears to handle his car like a new toy, and the more horns the better. All electric horns are taboo in town, and by accepted convention the right-of-way belongs to the driver who toots first. Consequently, all drivers honk continuously, and the bedlam of rubber bulb horns, many of them asthmatic, is terrific. The traffic situation has been complicated recently by the digging of miles of ditch for new water mains—Maracaibo's first—which are left open for weeks, unprotected.

There are almost no street signs or house numbers. Many of the houses are painted in bright colors, most have plastered exteriors, and many have fanciful names posted over their doors. All windows are barred, with solid inside shutters, and almost none have screens. Window glass is unknown except in store windows and the few air-conditioned buildings.

The stores in the business section are hardly recognizable as such to a foreigner. Most are pretty dirty and dusty, with primitive interiors and antiquated fixtures, if any. There are many sidewalk "shops," peddlers, tobacco bootleggers, beggars, and lottery ticket sellers. Prices of everything are very high. The large central produce market is dark, dirty and very smelly. Until recently, meat on the hoof, and other produce was brought from far down the lake in the native schooners, which are slow and unequipped with refrigeration. With the recent extension of the lake road to connect with the Trans-Andean Highway, much of Maracaibo's food is now trucked in and arrives in much better shape. All meat is slaughtered at night and sold the next day because of lack of cold storage facilities.

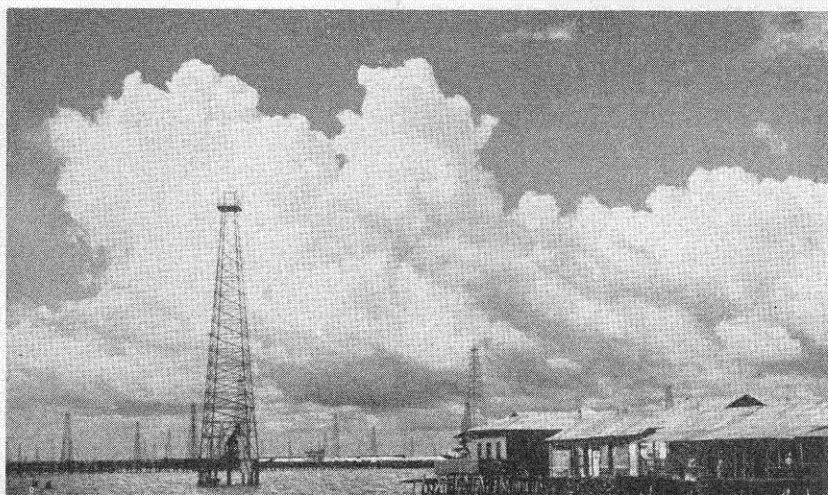
Each Monday a drawing is held in the government lottery. Tickets are peddled by old women and children, and from 1/10 ticket up can be purchased.

Green grass and lawns can be found only in the oil company

LAKE MARACAIBO FROM THE LAKE ROAD.



CORNER OF LAGUNILLAS VILLAGE WITH WHITE-ROOFED V.O.C. CAMP IN BACKGROUND.



camps, due to water scarcity. Beautiful flowering trees, in season, with red, white, yellow or purple blooms, surround some of the larger residences. Coconuts, mangoes, bananas and platanos are occasionally found growing along the streets.

The usual atmospheric temperature range is 85-90 deg. F., with personally observed extremes of 76-95 deg., although it is said that an occasional minimum of 69 deg. has been registered during the early spring rainy season. The humidity is always high, with one personal observation of 80%. Mosquitoes are scarce, but sand flies are abundant.

The people are typical of any tropical Latin-American seaport. Upper class Venezuelans are Spanish or perhaps Spanish-Indian, with an occasional admixture of German, Dutch, or English blood. With the peons—the great mass of the population—there is no color line. They vary from plenty black through brown to the lighter Spanish-Indian. Some oriental mixture is observed. There are many West-Indian negroes. It is not uncommon to see a very blonde baby or child in a much darker family. The typical Venezuelan peon is small of stature, small-boned, undernourished due to the preponderance of starchy rice and platanos in his diet, and with little resistance to disease. Few are legally married, due to the high cost of the Catholic religious ceremony, and illegality of birth is apparently no stigma. Few can read or write, although the school system is being expanded.

Crossing the lake from Maracaibo via modern passenger and automobile ferry, and driving south along the lake road through the oil fields, the country and climate change rapidly. Desert-like country gives way to rank jungle, which becomes very dense before Tia Juana is reached. Obviously the rainfall is much heavier here. A single oiled road, built and maintained by the oil companies, runs south from the ferry terminal at Palmarejo through the oil fields which line the eastern side of the lake and has recently been extended further south to connect with the Trans-Andean Highway at Mototan. Venezuelan Oil Concessions (Shell), Lago Petroleum (S.O. of N.J.), and Mene Grande (Gulf) oil companies, are all represented in Cabimas, Tia Juana and Lagunillas fields. The many wells on dry land are exclusively Shell, with Mene Grande's in the water, within 1000 meters of shore, and Lago's starting 1000 meters out and continuing into the lake to the present drilling limit of five miles. At this distance from shore the water depth is some 60 feet, making drilling operations more difficult, although the best wells are those farthest out.

Each oil company has established a well-equipped camp in each field for its white employes, and in addition one or more camps for native laborers. Complete recreational facilities are provided in all camps. Most of the food used by the white employes is imported from the U. S., and is expensive. It costs about \$1.50 per meal per person to feed the men in a company mess hall.

Each company has its own large steam power plant with transmission and distribution systems, and all three systems are interconnected. V.O.C. generates 2300 V., 60 cycles, transmits at 33 KV., and distributes at 6900 V. with 440V. secondaries, except for a few large 2300-V. drainage pump motors. Most pumping wells are electrically driven, with conversion of older wells from gas engine to electric drive being carried on continually.

With the exception of the town of Cabimas, which is large enough to show a few urban characteristics, all lake shore villages are small and very primitive. Most originated as fishing villages built on piling over shallow water, with houses connected by plank walks; but many have since spread to the shore.

OLD PIRATE BASE

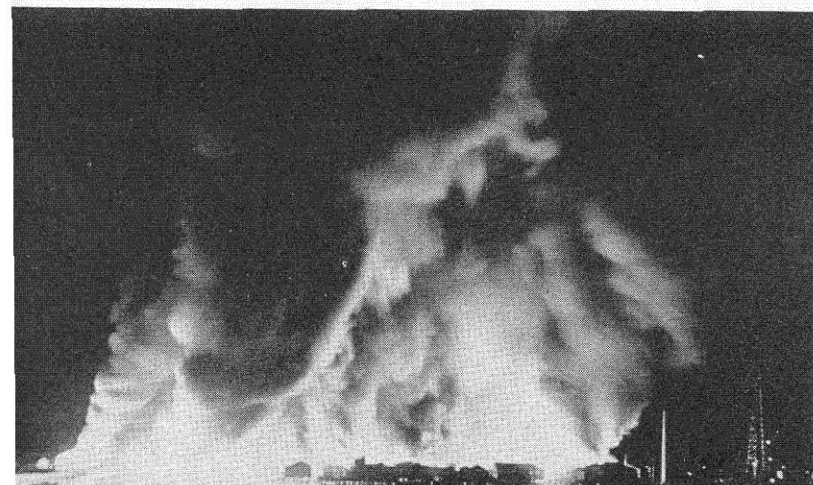
The ancient village of Pueblo Viejo was reputedly used as a repair base for his Caribbean operations by Sir Henry Morgan, the English pirate, and has changed little since.

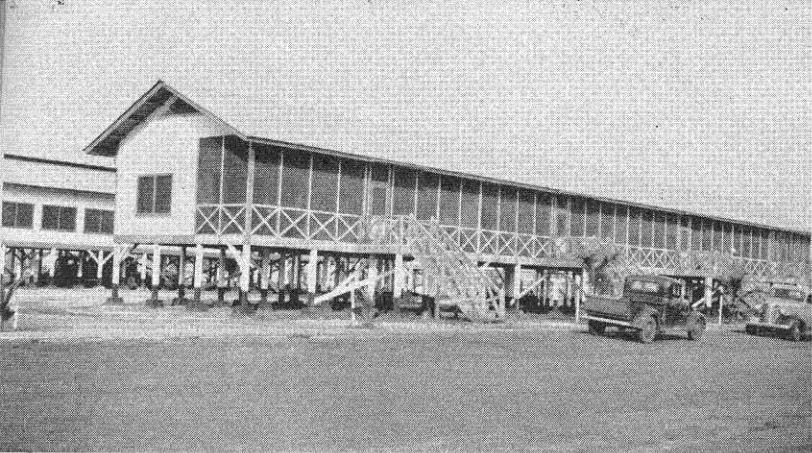
A few small farms have been hewn out of the jungle, their produce being principally corn, beans, and goats. The occasional tiny village in the back country jungle has bamboo-walled thatched huts. The only domestic water supply is from roof drainage. The residents of these jungle villages do practically no farming besides raising a little corn. They pick platanos and fruit in the jungle, keep a few chickens, a pig or two, and perhaps a cow. They shoot small deer in the jungle, hunting at night with spotlights and shotguns, and occasionally get a wild pig. Some of the ancient muzzle-loading long-barreled rifles seen now and then are curious affairs, but the importation of both rifles and small arms has been prohibited for years.

The jungle in many places is impenetrable without a machete. The writer discovered that a bamboo thicket, with its innumerable thorns, is extremely dangerous and can cut a man to ribbons. Ants and mosquitoes, of course, are plentiful. Poisonous and constrictor snakes are numerous but seldom seen. Quiet and apparently lifeless by day, with few birds evident, the jungle wakes up at dusk. Bands of howler and spider

NATIVE PIER VILLAGE OF LAGUNILLAS, NEAR V.O.C. COMP, BURNING, NOVEMBER 13, 1939.

LAGUNILLAS VILLAGE THE MORNING AFTER THE FIRE.





BACHELORS' BUNK HOUSE, V.O.C. CAMP, LAGUNILLAS, ONE ROOM DEEP, EIGHT ROOMS LONG, BUILT ON DRAINED SWAMP.



NATIVE HOUSES IN TINY JUNGLE VILLAGE OF PICA PICA; IN JUNGLE 25 MILES FROM LAGUNILLAS.

monkeys in the trees, and flocks of screaming parrots overhead provide plenty of noise. The jaguar makes good hunting, and the colorful iguana is much prized for its succulent meat.

To a person accustomed to driving a car in the U. S., automobile operation on the lake road appears extremely hazardous. The national speed limit is 45 kilometers per hour—28.5 miles—and for good reason. It is not only necessary to dodge peons, naked children, pigs, burros, chickens and cattle (the many goats are too smart to get hit), but the average native driver holds the middle of the road until forced to move over. And he is likely to suddenly stop anywhere at any time without warning. A large number of native-owned cars have their front wheels toed in at the top. This is apparently king-pin wear, since their owners never give them any attention beyond gas, oil and water, so long as they will run.

A driver's license costs \$50.00, but is good for life. In addition to this document, the foreign driver must have in his possession his passport, vaccination, health and good conduct certificates, a statement certifying that he is not a political agitator, his identification cedula with photographs and fingerprints, and his bill of sale if the car is privately owned.

PETROLEUM PRODUCTION

There are a number of oil fields in western Venezuela, on and near the lake. Two small Shell-owned fields, Concepcion and La Paz, are some ten to fifteen miles west of Maracaibo; each with less than 50 wells producing relatively small amounts of high-gravity oil. Production is pumped to Maracaibo for shipment. A small amount of production is also obtained at Casigua, some 45 miles N.W. of Maracaibo.

The important fields, however, are all located along the eastern lake shore south of Maracaibo. Cabimas has probably 500 wells ranging from 1400 to 3000 feet in depth, producing crude of from 16 to 26 A.P.I. gravity in quantities which would probably average less than 50 barrels per well per day, since this is the eldest field in the region. Many of the dry-land wells are on jacklines operated from central pumping powers. In June of 1939, when these and the following figures were obtained, Shell in this field had 254 wells pumping, 63 on gas lift, and 40 flowing. No figures for the other operators are available.

Tia Juana, south of Cabimas, produces 13 gravity oil, almost exclusively by pumping, from 2400 to 2700 ft. Lagunillas, the largest field on the lake, is only a short distance south of

Tia Juana, and the production figures of both these fields are lumped together. Lagunillas wells are from 2000 to 4000 ft. deep and produce sizeable amounts of crude averaging 16 gravity. Almost all wells come in flowing 400 to 1000 barrels, and some will continue this flow for several years. Shell had 538 producers in the two fields; 215 flowing, 3 on gas lift, and 320 pumping.

The present figure is between 750 and 800 producers, with several drilling strings operating continuously. Total wells for all operators in both fields is close to 1500, with an average potential production per well of some 150 barrels a day.

Lago Petroleum Co., Mene Grande Oil Co., and V.O.C. (Shell) are all represented in each of the foregoing fields, with Shell operating entirely on land and the other two companies dividing the seagoing territory. Shell digs its wells and puts them on production within a week's time; while the other operators, drilling in the lake from barges, require somewhat longer.

Mene Grande field, also exclusively Shell, is some 20 miles east of the lake shore. It had a total of 122 wells bottomed at from 1700 to 5000 ft. and produced crude ranging from 16 to 29 gravity. 51 wells were flowing, 19 on gas lift, and 52 pumping.

Mene Grande crude is pumped to San Lorenzo, on the lake shore, where the Shell has its single Venezuelan refinery, and some of it is refined to obtain a very vile grade of gasoline for local distribution. Apparently they never heard of octane, and only one grade is sold. The remaining crude is carried by tanker to the immense refinery at Curacao—second largest in the world.

Each operating company in each of the other fields has its own loading dock where its fleet of shallow-draft lake tankers are loaded. Lago's goes to their largest-in-the-world refinery on the Dutch island of Aruba, while Mene Grande's oil is transferred to ocean-going tankers at a terminal on the Gulf of Venezuela and carried to their Port Arthur, Texas, refinery, from which most is re-shipped for export.

For almost a year, due to the lack of sufficient convoyed tankers to carry refined products from Curacao and Aruba to Europe, the lake fields have been at least 25% shut in.

Eastern Venezuela has relatively small established producing fields at Caripito and Quiriquire, with others in process of development. Companies represented there are Standard of

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VENEZUELAN EXPERIENCES

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N.J., Socony-Vacuum, Mene Grande Oil, and The Texas Co. The great savannah country of the Orinoco basin has been more or less covered by geophysical crews, but a great deal of exploratory work has been postponed until after the cessation of European hostilities.

HIGH COST OF OPERATIONS

In general, oil operations in Venezuela are carried out only with difficulty. Cheapest oil field labor is 12 Bolivares (\$4.00) per day, and 1000 Bolivares per month (\$330.00) is not uncommon for native foremen, if they can read and write. National law requires that 90 per cent field labor and 75 per cent office help be native, regardless of its efficiency. The companies must provide housing, medical attention, transportation and profit-sharing for all employes. The law also prohibits firing a man, even for cause, without 60 days' severance pay.

Native drillers and crews are used, with American tool-pushers, each of whom looks after three rigs, and has his hands full continually.

Machinery for drilling and production is admitted duty-free; but any imported material competing with the few products in the country is heavily taxed. There is a tiny nail factory in Caracas which cannot begin to supply the oil companies' requirements; but imported nails carry a high duty. Although a certain amount is cut locally, lumber is high because of transportation difficulties. An imported rig floor plank

3 in. by 12 in. by 24 ft. long costs about \$22.50 laid down in Maracaibo. Obviously there are no wooden derricks.

The foreign (white) staff employes of the Lago and Mene Grande Companies are largely American, but there are very few of the latter in the Shell camps, perhaps half a dozen in Maracaibo, and a dozen at Lagunillas. The majority are English and Dutch, but 21 different nationalities were represented at Lagunillas.

The company camps provide good accommodations and a bachelor with subsistence furnished doesn't do too badly. But it costs a married couple with no children the equivalent of some \$300 per month for overhead—if they don't do much entertaining.

Since the lake shore road and the Trans-Andean Highway are the only Venezuelan roads of any consequence, it is virtually impossible to go any place by car. Planes are much in use for getting from one section of the country to another.

R. W. "PARKY" PARKINSON, '13, is Chief Engineer for Caribbean Petroleum, with his office at Maracaibo, and has been in the country some 26 years. During my stay there I saw him every couple of weeks, and he was of much assistance in helping me to meet and work with the various European staff members.

At a dance in Maracaibo one Saturday night I ran into BOB McRAE, '35, who was just in from a several months' stretch of surveying concession boundaries in the southeastern corner of the country, which is Motolone Indian territory. He was the only white man with a crew of a dozen or so natives, and was expecting a recurrence of a bad attack of malaria, which was why he had come to "town." After hanging around Maracaibo for two or three weeks, the attack failed to materialize, so he went back into the bush. Bob attended last year's Seminar session and announced that he had "gone native" to the extent of leaving Shell and acquiring a ranch near the Andes mountains southeast of Lake Maracaibo. He expects to do very well for himself, raising produce for Maracaibo consumption.

MISCELLANEOUS SIDELIGHTS

Because of the bugs, a spray gun is standard equipment in every bedroom in company camps. Most Venezuelans sleep under netting, since window screens are lacking. Due to the high humidity, it is necessary to burn a 100-watt lamp in each clothes closet to prevent the rapid growth of green hair on shoes, leather luggage and wool clothes. Before leaving the States, the writer was warned that a hat and sun glasses were absolutely essential. He used neither, although a hat would undoubtedly be of use during a hard rainy season. Because of the higher concentration of actinic rays in the tropics, an exposure meter is a useful accessory for picture-making. The light fools one.

A "sack of beer" is not a few bottles in a paper bag. The standard shipping package is 60 bottles, each in a straw cone, sewn into heavy jute sacking to make a rectangular package. These sacks are tossed on and off boat and trucks, and are carried through the mountains on burro-back with few bottles ever broken. Retail, beer is 30c per bottle and cannot be purchased cold except in the larger towns or in company camps. Although of higher alcoholic content than our beer, the Mara-

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AN ENGINEER LOOKS AT THE ORIENT

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general ease and luxury. To this effect, witness the goodly number of Americans who live happily in these parts for indefinite years. But for an engineer the glamour wears thin when the realization comes sharply one day that here there is no chance to keep really abreast of new developments and that a few more years will see him cut off forever from the possibility of earning his way in technical pursuits "at home." And for all the Americans I met in my travels even thirty years of residence abroad didn't change the fact that "home" was still the U.S.A.

THE RISE OF NATIONALISM

With war conditions spreading slowly but surely over most of the area there is little chance that many American engineers will be going out to the Orient in the next few years but there will undoubtedly be openings for white engineers after the war is over. It must be remembered that in China and Thailand particularly, the spirit of nationalism is newly risen to great heights. Young China is especially keen on the necessity of providing its own "working" engineers. As an instance, I cite the case of the young Chinese girl, a fellow passenger on the ship on which I returned. She was coming to study engineering—at a California university. She came under protest, at the insistence of her family. She wished to study in one of the Chinese universities near Chungking and when I inquired whether she would teach when she returned, she said, "No, China needs less intellectuals and teachers and more of her own engineers actually on the job. I hope to fit myself to go out and work in the construction of New China."

Although this trend probably means the end of the white man's domination of business and industrial enterprise in the Far East, it may well afford increased opportunity for white engineers to serve as training supervisors during the coming expansion of industrial enterprise. From my own experience this would be an ideal opportunity for American engineers since it would offer a chance to see these foreign countries and yet would not offer the enticement of too permanent employment.

caibo beer isn't bad. The Caracas beer, however, from the capital city, is terrible. Apparently they don't believe in aging it.

Bourbon whiskey is unknown. The much-touted "cheap imported Scotch," of which I heard in the States, was also non-existent. It costs as much as \$12.00 per fifth last December. The only cheap drink is native white rum, plenty powerful, and aged perhaps a couple of weeks. \$1.50 per quart.

White Owl cigars are 50c each. Native cigars, not bad, are 2c each and up. Native cigarettes ("firecrackers" to us) are 15c for 15. U. S. cigarettes are 75c per pack tax-stamped and 50c from bootleggers. There is no Venezuelan-made pipe tobacco. I tired of paying 80c per small tin of P. A., much of it mildewed, and had a pound of my favorite smoking mailed from the States. The import duty was almost \$9.00, and thenceforth P. A. was good enough. No trouble is experienced with tobacco drying out, but quite the opposite. One can tie a knot in a cigar any time.

ACTIVITIES OF CHEMICAL ENGINEERING DIVISION

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phase behavior of naturally occurring hydrocarbon mixtures from specific oil fields has been the objective of two of these projects. This experimental work supplements and expands the program sponsored by the American Petroleum Institute and permits the latter work to be directed toward a study of the more fundamental aspects of the problem.

The direct measurement of the composition of coexisting phases is one approach to the evaluation of the phase behavior of both simple and complex hydrocarbon systems. One Fellowship of the Department has been directed toward the investigation of the composition of the phases of ternary hydrocarbon system throughout the heterogeneous region at temperatures of industrial interest. Furthermore, the refining division of the petroleum industry is becoming increasingly interested in the phase behavior of mixtures of paraffinic and olefinic hydrocarbons and a study of the phase behavior of a binary mixture of n-butane and i-butane is in progress.

Equilibrium is approached only as a limit in many operations encountered in the production and processing of petroleum. A study of the non-equilibrium behavior of these systems, including the formation and growth of bubbles from supersaturated solutions, and material transfer between the phases of heterogeneous systems under a variety of conditions has constituted a part of the objectives of one of these industrial research projects for a number of years. The migration of sand into oil wells has been a source of difficulty in connection with petroleum production operations and the effectiveness of the subsurface placement of gravels to inhibit such movements has been studied in detail.

The personnel of the Department may be divided into two general categories, one embodying students and the other full-time investigators and technicians. The fifth-year students are occupied primarily with laboratory course work relating to the fundamentals of chemical engineering operations while the sixth-year men are associated directly with the industrial research activities of the laboratory. The greater part of the experimental work of the research projects results from the activities of nine full-time research assistants and technicians. It is believed that the close contact between the investigators and fifth- and sixth-year students is a desirable one in that the student is placed in an environment more similar to that encountered industrially than is usually the case in academic laboratories.

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