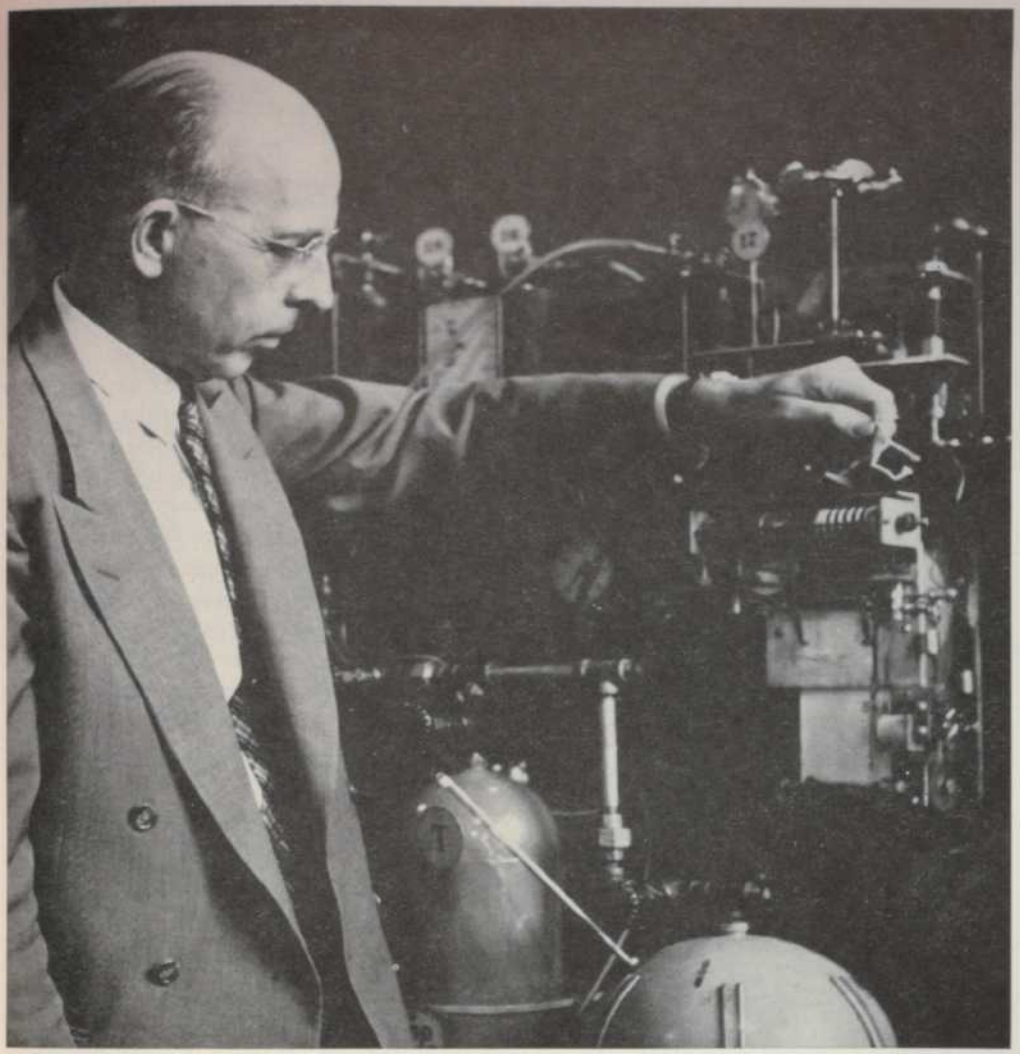


William Cory, mechanics professor, tackled the problem of response of a pressure control system to sinusoidal variation of the input pressure. This equipment formed the basis for his experiment.

Scientific research has been accelerated in recent years and today has reached something of a peak, because

Man Wants to Know

Research: Careful search; a close searching. Studious inquiry; usually, critical and exhaustive investigation or experimentation having for its aim the revision of accepted conclusions, in the light of newly discovered facts.—Webster.

WHAT'S HAPPENING in research at the University of Oklahoma? Plenty. Perhaps never before has research seemed so vital a thing in higher educational institutions, or anywhere for that matter: sharp awareness of the importance of new discoveries in the scientific medium has gripped America's imagination. Mass attitudes alter under the advance of years and change in political situations.

For example, when the first plastics appeared they were looked on with amusement, considered something of a fad. Today new plastics emerge from stepped-up research not for the manufacture of toys and picnic forks, but because they may be needed to form a vital part of a missile or perform functions in a rocket to the moon.

Oil was once the butt of jokes: "Now that you've found it, what are you going to use it for?" No more. Not only has the search for petroleum been intensified, but careful measures are taken to cut the wasting of it, to separate it from water, to hang onto as much of it as possible. And finally, development of countless products, through research, from the basic crude oil.

New industrial power and methods of transportation depend on what research finds in atomic power. Lives depend on the study of cancer, tuberculosis, polio, heart disease and even Asian flu.

The University is interested in all these fields, and many, many more. Man wants to know. He wonders about a multitude of subjects. What protection does a filter give smokers? Did Shakespeare really write all those plays? Those fossils found in the rocky Arbuckles—what do they indicate? And what about the whole scientific picture? How are we doing in the race against other world powers?

The fact is, if the American public once regarded universities as only "great storehouses of the wisdom of the ages," as Clarence Darrow put it, then the public has changed its conception. Campuses no longer are regarded as little worlds where professor and student spend years of isolation, studying findings and sayings of the past and thinking beautiful thoughts about the same. It seems finally to have occurred to just about everyone that a university's job is progress. Schools everywhere are turning out young men and women who must determine the future, a future which now seems to be bearing down upon us at terrific speed.

It little matters whether college graduates return to school or go into government or private laboratories to take up research.

William Upthegrove heads the University's new School of Metallurgical Engineering. His consideration of grain boundary diffusion in metals went from notebook to IBM 650 high speed computer.

What does matter is that research goes forward.

The "forward look" is present at Oklahoma. One need only consider the school's projected Research Industrial Park to realize this. More obvious is that which is happening today in different departmental labs.

One of the best examples is basic research in petroleum sciences during the past year. In that time about 50 projects were initiated in the petroleum sciences field alone, said C. M. Sliepcevich, associate dean of the College of Engineering.

Commenting on the accomplishments of the 50, Sliepcevich said: "I am pleased with the performance. A lot of hard work and long hours went into getting these research projects off the ground."

Research is practically impossible without some sort of financing. Nine of the faculty members who engaged in the petroleum sciences research each received an $1,800 grant from the University of Oklahoma Foundation. Designed to stimulate basic research in this field, the grants did even more. "The degree to which this objective was realized exceeded our expectations," said Sliepcevich.

ONE OF THE FACULTY worked on two projects. This is John M. Campbell, associate professor and chairman of the School of Petroleum Engineering. His project number one was an investigation of factors affecting the optimum—or, most favorable—storage pressure of hydrocarbons.

In order to make his investigation, Campbell set up a lab-size storage unit essentially duplicating a lease set-up. The tank is a 100 cc unit. Sample liquids put into it are synthetic and made from pure samples of normal paraffins, including propane, n-butane, n-petane, n-heptane, and n-octane. By using these components one is able to control composition, thereby isolating its effect.

Composition, of course, is only one factor affecting optimum storage. Retention time and pressure on the storage of the hydrocarbons must also be considered.

Campbell set up his own unit because he found that existing calculation tools couldn't do the job accurately. His findings should be complete in June.

Though all research doesn't require the building of a tangle of tanks, tubes and the like, this apparatus is the observer's best clue when he attempts to locate research activity. In labs across the campus such clues point to evidence of the continuous search into the unknown carried on by faculty after classroom sessions have ended for the day.

Campbell's second project dealt with a determination of the settling surface needed for the gravity separation of oil and water. Water settling tests were made on five different natural hydrocarbon samples, with gravity, viscosities and water contents varied. Both static and dynamic tests were conducted and then the results correlated. The final correlation provides estimates of water knockout velocities when the properties (gravity, viscosity, water content) of the hydrocarbon mixture are known.

Measuring vapor pressure and vapor composition as a function of liquid composition was the interest of Sherril D. Christian, assistant professor of chemistry. However, he needed a new type of apparatus in order to do it, so he designed two types of experimental equipment and then constructed them.

One type, a surface tension balance, measures surface properties of various mixtures. The other is used to study the thermodynamic behavior of various mixtures; the apparatus determines vapor pressure, liquid and vapor composition free from contamination.

Christian's research, complete, inspired a paper which has already been published in the *Journal of Physical Chemistry*.

Frank W. Cole studied the role of wettability in oil recovery. Cole, assistant professor of petroleum engineering, developed a technique for determining the degree of wettability of reservoir rock. Since it is important in oil recovery to know to what degree reservoir rock (a porous, permeable material) is oil-wet or water-wet, Cole imbibed a liquid into the rock and measured the degree of wetting by a so-called contact angle.

William Cory, professor of theoretical and applied mechanics, studied the response of a pressure control system to sinusoidal variation of the input pressure. "The economy of the petroleum industry in the future is largely dependent upon the effective utilization of the most advanced techniques in automatic control or servomechanism techniques," Sliepecevich said of Cory's problem. "Heretofore, available control instruments were attached to process equipment with little attention being given to the response characteristics of the system. Recent studies by a number of investigators of the more fundamental and theoretical aspects of control systems indi-

cates that radical developments in the design of both process equipment and control instruments are forthcoming.

"This study consisted of a mathematical analysis of the response of a tank containing air under pressure for sudden changes in the air pressure. Experimental measurements were then taken and the results were found to be in excellent agreement with theory. Studies of this kind will provide a more systematic and rational basis for specifying control systems."

The fifth man, Orrin K. Crosser of the Chemical Engineering School, built a system for studying heat transfer and pressure drop of propane in the near super-critical region. Preliminary work on the subject so interested the National Science Foundation that the organization awarded $13,000 so that Crosser might continue. Another organization, United Engineering Foundation, awarded an additional $3,000 for the same purpose.

The remaining four projects touched into different departments.

John B. Giever, mathematics, studied a general theorem and its proof in algebraic topology. Giever wondered just how necessary is the present limitation of the Cartan-Leroy Theory to precompact spaces. Another question: What is the essential algebraic core of the theory? An excessively technical job, the study still is going forward.

Bruce V. Ketcham, aeronautical engineering, is concerned with the cyclonic flow in combustion chambers. After designing and building his equipment, Ketcham made tests which showed that cyclonic flow action produces low wall temperatures and high rates of heat release. Further research must be done before he will know whether or not this type of flow should be incorporated in our jet aircraft.

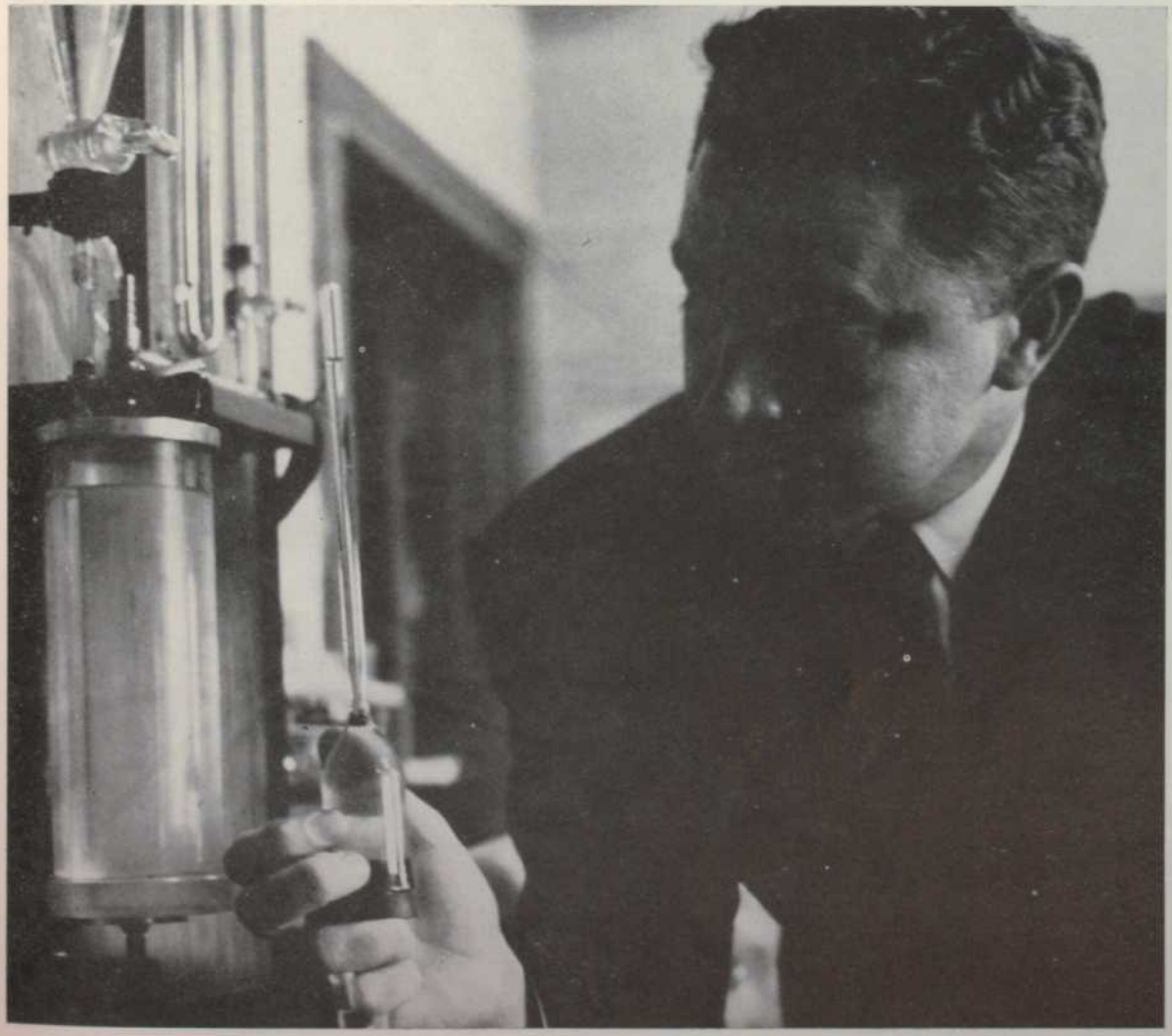
Colin A. Plint, physics, is studying chemical reactions at high temperatures and high altitudes. This deals with infrared spectra of molecules in excited electronic states.

William R. Upthegrove took on the task of a theoretical consideration of grain boundary diffusion in metals. Because of limited facilities for experimental work in the new School of Metallurgical Engineering, of which Upthegrove is chairman, the project is also necessarily limited.

Discussing Upthegrove's progress, Sliepcevich said: "A critical review of the literature on grain boundary diffusion, migration, and energy was made. Deficiencies in the theory proposed by Turnbull and Hoffman were discovered, and a new theory which fits experimental data better was developed. Further work in checking this theory with the aid of the IBM 650 (high speed computer) is currently underway."

The foregoing make up a small portion of the overall research picture at the University. If one were to make a tour from department to department, inspecting each project, then one would be tied up for days, and the days would be filled with charts and graphs and detailed drawings, with page upon page of equations and formulas, with valves, tanks, plugs, compressors, tubing and all sorts of paraphernalia. No child's play this, but rather a reshuffling of the present in order to find the future.

Man wants to know.



Frank Cole developed technique to determine degree of wettability of reservoir rock.