The Month at Caltech

New Chairman for Geology Division

Barclay Kamb

Barclay Kamb, professor of geology and geophysics, will become chairman of the division of geological and planetary sciences on July 1. He succeeds Eugene Shoemaker, who has been head of the division since January 1969. Shoemaker, a Caltech alumnus (BS '47, MS '48), is resigning the chairmanship to devote full time to teaching and to his research on the origin and history of the moon, the geology of the Grand Canyon area, and paleomagnetic studies.

Kamb is also a Caltech alumnus (BS '52, PhD '56) and has been a member of the faculty ever since he received his doctorate. An authority on the structure of crystals and of glaciers, he is studying the flow properties of ice and the structures produced in ice by flow. From this study of ice Kamb hopes to learn more about the deformation of rocks at high temperatures and pressures deep in the earth.

His research also includes determination of the atomic structure of minerals and the relationships between these structures and the various forms of ice. He was awarded the Mineralogical Society of America award for work on minerals in 1968.

In addition to his teaching and research at Caltech, for the past five years Kamb has been a research collaborator at Brookhaven National Laboratory in New York, where he has used neutron diffraction to study forms of ice.

In 1960-61, Kamb held a Guggenheim fellowship in Switzerland where he did research on glaciers. He has directed Caltech's research program on the Blue Glacier on Mt. Olympus in Olympic National Park, Washington, since 1964. He is a fellow of the Geological Society of America and of the American Geophysical Union.

Ground Broken for New Mudd Building

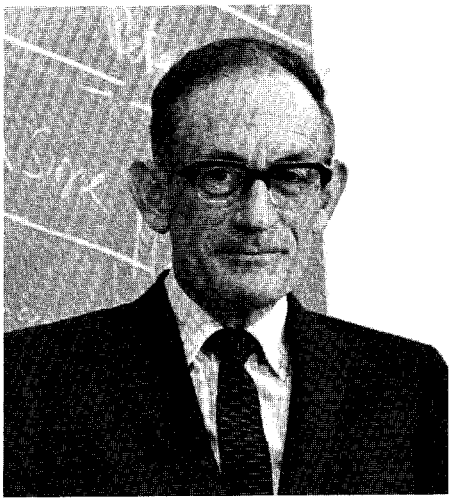
Caltech's newest building is officially under way. Aided by a set of gilded shovels, the symbolic ground breaking for the Seeley G. Mudd Building of Geophysics and Planetary Science took place on March 7. The building should be finished in December 1973.

This Mudd building is the third campus structure to be financed by the Mudd family (the other two being the Seeley W. Mudd Laboratory of Geological Sciences and the Millikan Memorial Library). A grant from the Department of Health, Education and Welfare has also been provided to help defray the costs.

Speakers at the ground breaking ceremony included President Harold Brown; Arnold Beckman, chairman of the board of trustees; Eugene Shoemaker, chairman of the division of geological and planetary sciences; and Clarence Allen, professor of geology and geophysics.

Located on the site formerly occupied by Culbertson Auditorium, the new structure will have 71,000 square feet of floor space on its five floors—three above ground and two below. The Helen and Roland W. Lindhurst Laboratory of Experimental Geophysics will be a part of the building, which will also contain faculty offices, libraries, laboratories for research and teaching, special super-clean and shock-wave laboratories, shops, conference and seminar rooms, and a computer laboratory with direct ties to Caltech's southern California seismological network.

With this addition to the existing geology complex on campus, most of the geographically scattered activities of the division will be brought together. Faculty, staff, and students now located at the Donnelley Seismological Laboratory in the San Rafael Hills will move into the new building. Kresge Seismological Laboratory, which is near Donnelley and which has many of its instruments anchored to bedrock, will continue its operations.



Hans Liepmann

Director for GALCIT

Hans W. Liepmann, professor of aeronautics, has been appointed director of the Graduate Aeronautical Laboratories at Caltech (GALCIT). Liepmann, a native of Germany, has been on the faculty at Caltech since 1939. He is an authority on shock waves, plasmas, and flows of rarefied gases, and is currently occupied with research in the fluid mechanics of Helium-2.

Widely honored for his contributions to aeronautics, Liepmann is a member of both the National Academy of Sciences and the National Academy of Engineering, and is a recipient of the Ludwig Prandtl Ring—the highest honor conferred by the German Society for Aeronautics and Astronautics.

GALCIT, which was established in 1928, has had only two other directors: Theodore von Kármán, director from 1928 to 1949, and Clark B. Millikan, who directed it from 1949 until his death in 1966.

Graduate Degree in Social Science

There is—usually—nothing startling about the faculty voting a new degree program into existence at Caltech. But the agenda for the faculty meeting on February 21 called for a vote on a genuine innovation—the first qualitatively different program at the Institute in 50 years. And it was approved with only two dissenting votes.

Starting next fall, Caltech will offer a Graduate Degree Program in Social Science. This is not only a first for the Institute as a whole; it marks official recognition of the ability of the Division of Humanities and Social Sciences to offer graduate education leading to the doctor's degree as in the other divisions of the Institute.

The gestation period for the program was lengthy. In fact, says Robert Huttenback, chairman of the division, "I doubt if there has ever been any program at the Institute that has been subjected to such long-term, frequent, and minute scrutiny."

A graduate degree program in the general area of the social sciences has been under consideration within the division for several years. By two years ago, a group (the chief protagonists being economists Lance Davis, Roger Noll, and Burton Klein; anthropologist Thayer Scudder; and Frederick Thompson, professor of applied science and philosophy) had hammered out the basic outlines of a three-pronged program balanced between hard analytical social science; field work in real-life problem areas; and measurement and testing using econometrics techniques, gaming, and laboratory experiments as well as computer simulation. For another year this basic outline was discussed both within and outside the division, a process that honed it to a final statement of aims, requirements, and curriculum. In the fall of 1971, after preliminary study by the Institute Administrative Council, the proposal went to the Graduate Study Committee.

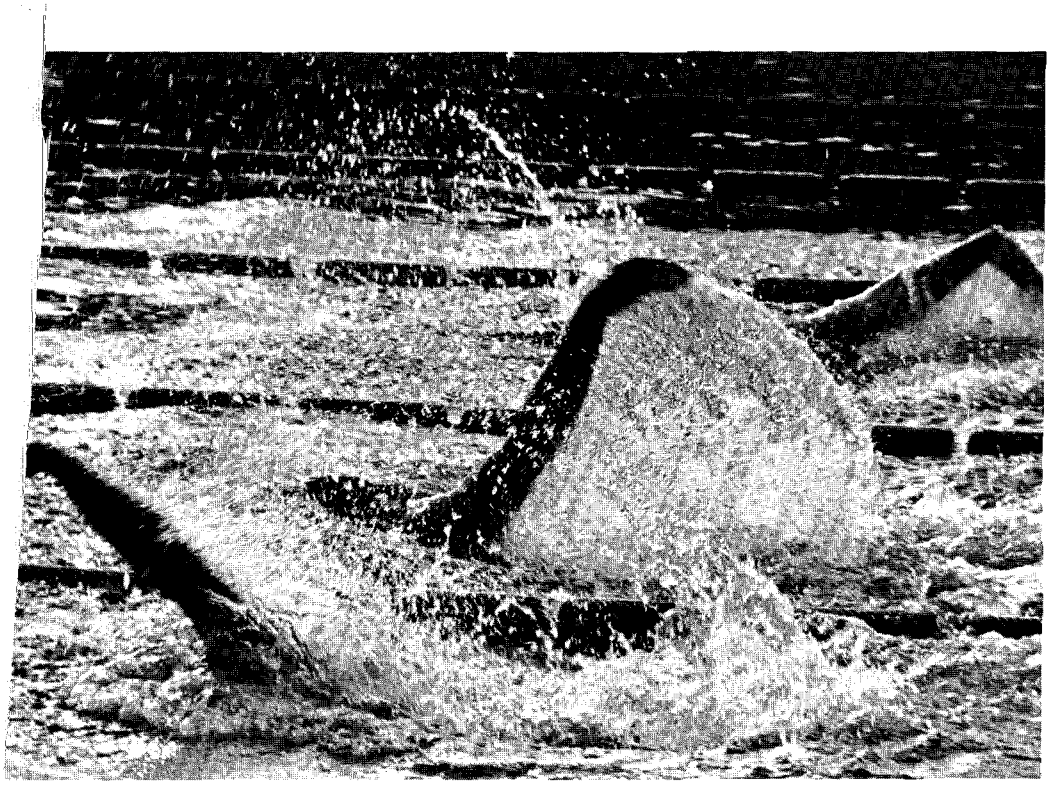
The Graduate Study Committee not only discussed the program at length but called in two outside consultants to evaluate it. Their report was favorable; the faculty board approved; and on February 21 the whole faculty voted the new PhD program into the Caltech curriculum.

Admission into the graduate degree program in social science will require, first of all, a thorough grounding in mathematics. Once a student is admitted, he or she will be expected to take about a year and a half of tightly structured course work in such subjects as micro economics, political science, psychology and organizational behavior, econometrics, and computer modeling and data analysis. This will be followed by another year and a half of research with emphasis on applications and testing of theory.

While the course work is similar to that of analytical economics majors in many graduate schools, the focus of the research for the Institute's students will be quite different. They will have to do it in areas like anthropology and political psychology, so that they will get some of their information about institutions outside the hard analytical areas. Specifically, they will be doing research with, for example, the Environmental Quality Laboratory, the environmental engineering science program, the social problems section of the Jet Propulsion Laboratory, and the population program.

"While some of them may come out looking not very different from economics majors elsewhere, others will come out looking very different indeed," says Lance Davis, professor of economics. "We'll turn out, for instance, some highly analytically trained graduates whose main interest will be in fields like political science or anthropology. We're going to try to use what theory we have to develop policies that make some sense in terms of social problems right now."

Once the program is under way, approximately five students will be admitted each year. Since the basic facilities and a 25-member faculty in the social sciences are already available, the division hopes that—late as it is to recruit graduate students for next fall—it may still be possible to bring in three for starters in October.



Here It Comes Again

The Loch Ness Monster hasn't been making much of a splash lately—but his little brother made this brief appearance in the Caltech pool recently, during the annual All-Conference Swimming Meet.

Some Faculty Honors

Fritz Zwicky

Fritz Zwicky, professor of astrophysics emeritus, has been awarded the Gold Medal of the Royal Astronomical Society for "his distinguished contributions to an understanding of the constituents of the galaxy and the universe." He will attend the November 10 meeting of the society in London to accept the medal in person.

Zwicky, 74, predicted and discovered compact galaxies, pioneered in the discovery and understanding of supernovae, and for many years has done research on the distribution of matter in the universe. He has just issued a catalog of 4,000 compact and post-eruptive galaxies; several years ago he supervised the production of a six-volume catalog of 40,000 galaxies and 10,000 clusters of galaxies.

Rochus Vogt

Rochus Vogt, professor of physics, has been appointed to serve on a 12-member panel on Alternative Approaches to Graduate Education. In the 18 months allotted for its studies, the panel will meet to discuss and make recommendations on such subjects as the growth of external degree plans, the trend toward non-graded study, the concept of part-time, self-paced study, innovations in graduate study, and the educational needs of disadvantaged groups and of potential graduate students among older persons. The panel is jointly sponsored by the Council of Graduate Schools in the United States and by the Graduate Record Examination Board.

George Housner

George Housner, professor of civil engineering and applied mechanics, has been appointed by Governor Ronald Reagan as a member of the governor's Earthquake Council. This council will coordinate research programs, recommend legislation, and work to develop an earthquake warning system. Clarence Allen, professor of geology and geophysics, will serve as Housner's alternate. Allen is a member of the State legislature's committee on earthquakes.

William Lear has ideas about eradicating air pollution—and will travel to explain them.

Betting on Steam

Seventy-year-old William Powell Lear, the industrialist-inventor of the first car radio and the first jet airplane autopilot, is known as "the man who not only invented the impossible but made it pay."

He now wants to be known as the man who eradicated air pollution.

Speaking to a capacity crowd at Ramo Auditorium on March 6, he said his goal is to "develop a smog-free automobile—even if it takes the last of my wife's millions."

He has placed his bets on the steam turbine as the most likely candidate and has gambled $8 million of his $30 million personal fortune on the engine. In addition, each month he pumps $250,000 into the Lear Motor Corporation factory, located—appropriately enough—near the gamblers' paradise of Reno, Nevada.

The results of this gamble are two prototype engines. One is installed in a Chevrolet sedan and is currently undergoing trials on a test track near the factory. The other is in a General Motors bus being road-tested before delivery to the city of San Francisco in April.

Lear's aim is to produce a steam car that not only pollutes less than an internal combustion engine automobile, but that costs less as well. He has come close to this ideal. The heart of his steam turbine design, which he calls a "vapor cycle power plant," is a 30-pound turbine that has only one moving part and turns out a healthy 125 horsepower. While the prototype Lear engines would cost $50,000 apiece as currently designed, he expects that mass production would reduce this to about $250 an engine.

A vapor generator (boiler) contains coiled stainless steel tubing and a kerosene-fed burner that heats the steam fluid within the tubing. A throttle valve controlled by the accelerator determines the amount of superheated steam that will flow into the turbine. Running at speeds up to 60,000 revolutions a minute, the turbine (through reduction gears) drives the accessories, such as the water feed pump, fans, and generator—and also an automatic transmission. The steam is exhausted and returned to a condenser where, through heat exchange, it is converted to fluid and recycled.

The key to the Lear design is the size of the turbine. Early concepts of the steam turbine were large and heavy and plagued with poor efficiency. A smaller, more efficient turbine could be built, but only if it were driven by a vaporized fluid of relatively high molecular weight. (Water is not used because it freezes in cold weather, takes too long to come to a boil, and has too low a molecular weight.) Lear specified that this fluid, called "Learium," must be chemically stable, non-toxic, non-corrosive, non-freezing, and possess good heat transfer characteristics. After analyzing and rejecting several hundred chemical compounds, his researchers have come across a form of fluorinated hydrocarbon which appears acceptable.

Lear's engineers are looking for ways to cut down the cost of the engine. The rotors in the prototype engines cost about $90 apiece. The engine design calls for two of them. By using a new manufacturing technique, costs of these particular components in a production engine may be reduced to 96 cents a pair. Also, by using air bearings at 50 cents each instead of ball bearings at about $4 each, Lear hopes to produce the engine's turbine for less than $30.

A considerable effort has been made to improve the efficiency of the engine. Every bit of efficiency gained in the engine means less horsepower used running auxiliaries and more horsepower delivered to the wheels. The turbine has an efficiency now of 74 percent, compared with 60 percent for more conventional designs. The condenser fan was redesigned to boost its efficiency from 40 to 65 percent.

For a brief period it appeared that the Lear engine would not be as pollution-free as its developer had hoped. If it were to meet the 1975 emission standards, it had to reduce hydrocarbons, oxides of nitrogen, and carbon dioxides simultaneously. But designs which minimized two of these pollutants caused the third to skyrocket. A few months ago Lear hit upon a scheme (which he is patenting) for burning the fuel below 2000 degrees Fahrenheit, which will enable the engine to meet not only the 1975 requirements but the more stringent standards anticipated for the future.