The State of the Institute

Highlights and sidelights from President DuBridge's Report

THE ANNUAL REPORT of the California Institute of Technology, now coming off the press, will go out to alumni this month. Previously, alumni have only received a summary, but this year they will be getting the complete report. Crammed with information on such diverse matters as the high cost of athletic injuries ($2,015.75) and the present state of student morale (high), the 1947-48 report also includes these high lights and side lights from the Report of the President:

The students

Best boys? Though the number of applicants has fallen from the astronomical figures of 1946 and 1947, we must still turn away two out of every three men who are well enough qualified to take our entrance examinations. Are we sure we admit the best one-third? Are we really finding tomorrow's leaders? Under the direction of Dean Jones, careful studies have been undertaken to try to answer these questions and to correlate performance at the Institute and in later life with the various kinds of pre-admission information which we are able to obtain. For example, a special series of College Entrance Board examinations was given entering freshmen in the Fall of 1948 to determine how useful such examinations may be in predicting success at the Institute. Also we are steadily expanding and improving our system of interviewing prospective students, searching always to find evidence of those qualities which make for creative leadership.

Freshmen. The report of the Associate Dean for Freshmen points out the unusually large "mortality" (31 out of 170) in the freshman class. It was only 13 out of 180 last year. Are the students we are now getting from

high schools "soft", or unprepared for college standards? Or has our experience with more mature veterans led us to expect too much of unseasoned high school graduates? Or are we just being too tough?

How many? It will be noted in the Report of the Registrar that our total student body in 1947-48 declined somewhat in size from the previous year: 1323 against 1391. The enrollment at the beginning of the year 1948-49 was 1270. This is still 32 per cent above the highest pre-war figure of 962. It is anticipated that when the present large junior and senior classes are graduated, and when the graduate body has been stabilized at more manageable proportions, we will level off in 1951-52 with a student body of about 720 undergraduate and 450 graduate students.

Young men. The youthfulness of our alumni needs to be emphasized. Of the 4,862 men who have received degrees of any grade from the Institute, 54 per cent have been awarded these degrees since 1938. The 1948 Commencement alone increased the size of the total alumni body by 8.5 per cent. Of the 4,862 degree holders only 3,289 (69 per cent) received their bachelor's degrees from the Institute. The others received advanced degrees here following undergraduate work at other institutions.

Morale. Two significant commentaries on undergraduate scholarship and morale may be mentioned at this point: in three terms only four upper class students were required to withdraw for failure to meet scholastic requirements; and in only two cases were the privileges of the Institute denied to students as a result of violation of the Honor System.

More Ph.D.'s. At Commencement on June 11, 1948, 312 graduate degrees were conferred; of these 217 were Master of Science, 52 were Engineer, and 43 were Doctor of Philosophy degrees. The number of Engineer's degrees was less than for the previous year, but the number of Ph.D. degrees was the largest ever awarded by the Institute at one Commencement.

Veterans. The peak in number of graduate students receiving veteran benefits was probably reached during the year 1947-48. During the year, 57 per cent of the graduate students were thus assisted, whereas only 41 per cent received this aid in 1946-47. It is believed, however, that the number and percentage will decrease during the years to follow. As this occurs, the need for other assistance to worthy students will grow, and more dependence will be placed necessarily upon Institute scholarships, assistantships, and fellowships, and those financed by industries, foundations, and governmental agencies.

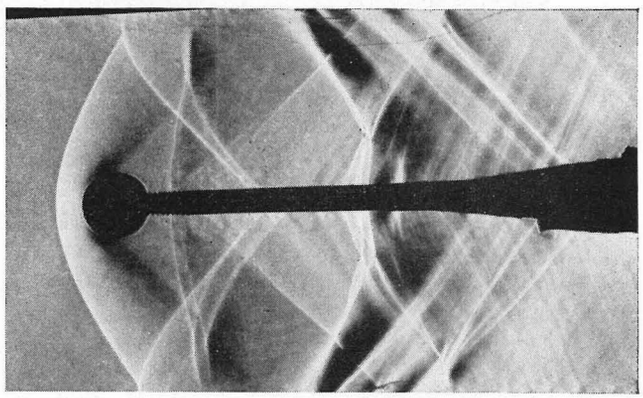
The staff: it's growing

One to three. As a result of the increase in the number of faculty members there is now at the Institute one faculty member for every four students. If graduate assistants who are actually teaching are included, then we have more than one instructor for every three students. Also, the total number of paid employees of the Institute, the majority of whom are professionally trained, greatly exceeds our total student body. Ratios of this kind are quite exceptional in our generally overcrowded educational institutions, and the Institute is fortunate, indeed, to be able to maintain such unusual opportunities for student and faculty contacts as now exist.

Best teaching? A poll of student opinion of teaching was conducted during the year and the "score" for each faculty member was given to him. Each man now knows at least how the students rate him, and it is already clear that many are determined to improve their standings. The President's Office declined to accept a compilation of these ratings; their reliability is far too uncertain for official use. However, some general results were illuminating. For example, there was little correlation between age or experience and the students' ratings of teaching effectiveness. Some of the highest scores were awarded to young instructors or even graduate assistants.

Research: there's plenty

. . . In Aeronautics. In the Guggenheim Laboratory and in the Jet Propulsion Laboratory important forward steps have been made in both experimental and theoretical studies of air flow at supersonic speeds. A small wind tunnel (of 2½-inch aperture) has been operating at speeds up to twice the speed of sound, and a large unit (10 by 12 inches) has just been completed at the Jet Propulsion Laboratory. A new tunnel in the Gugenheim Laboratory is nearing completion for speeds from 7 to 10 times the speed of sound, and at JPL a larger tunnel (10 by 12 inches) for 4.5 times sound velocity will be complete next year. These facilities provide outstanding opportunities for basic studies at these high velocities.



AERONAUTICS: *Shock wave configuration in 2½" wind tunnel as air flows around sphere at 1.24 times speed of sound. A new tunnel may reach Mach 10.*

. . . In Engineering. The study of the flow of liquids is as important for the designer of ships as the study of air flow is for the designer of aircraft. Yet, curiously enough, water tunnels for such studies are less common than wind tunnels. The Institute Hydrodynamics Laboratory has pioneered in the development of superb equipment for research in this field, and new knowledge of the nature of liquid turbulence, cavitation (bubble formation), and other phenomena is now being revealed.

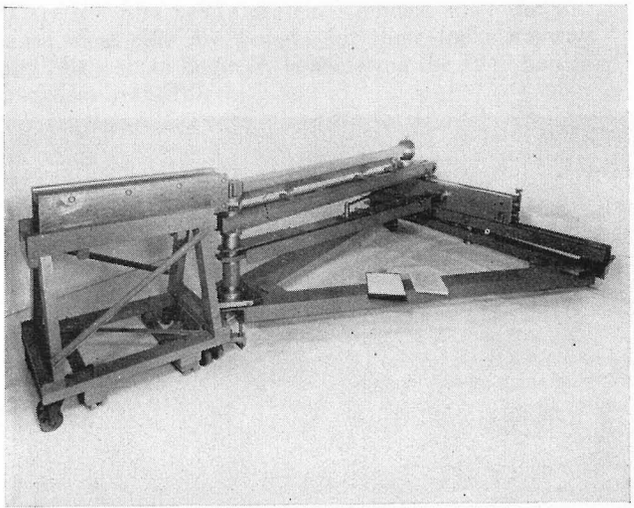
A new electrical analog computer for high-speed analysis and solution of mathematical and engineering

problems has gone into operation during the year. It is in continuous demand and already highly successful. Professor G. D. McCann and his group are busy improving and enlarging it to extend its usefulness. It is a major asset to both the research and instructional program on the campus and is extensively employed for solution of problems brought in by industrial and government agencies.

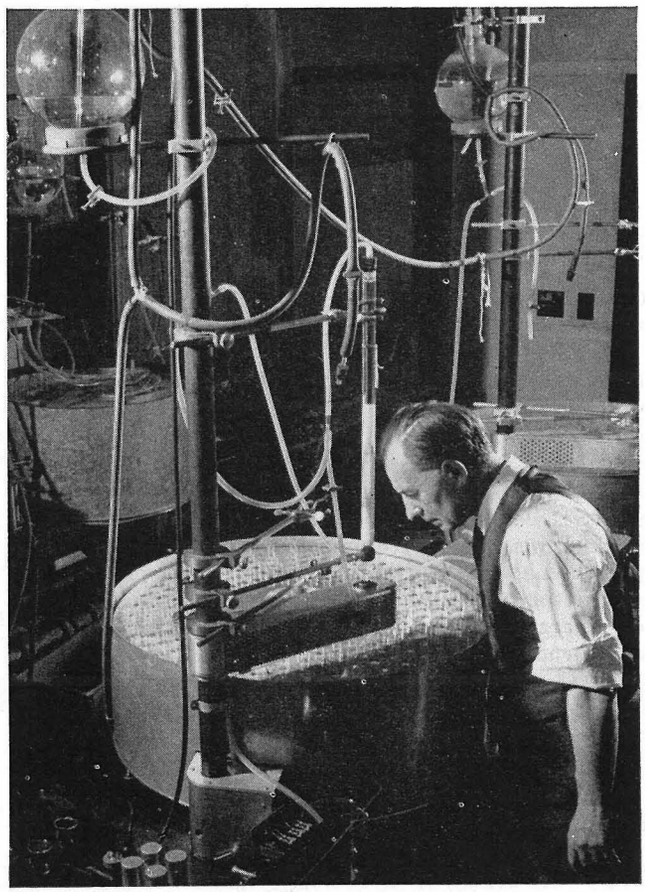
. . . In Chemistry and Biology. The Divisions of Chemistry and Biology pursue their long-range program aimed at a better understanding of life. Seldom has such a basic and comprehensive program in any field been undertaken by such a brilliant and adequately equipped group of scientists. The $700,000 grant by the Rockefeller Foundation to this program is in itself a superb tribute to the men involved, to the results already achieved, and to the importance of the future program.

During the year steady progress was made on many aspects of this program. Significant advances were made in understanding the nature and behavior of viruses (see *Research in Progress*, page 12)—those basic things which seem to be the intermediate link between the living and the nonliving. They can be seen with the electron microscope, and the way in which certain types of virus attack and destroy bacteria is now understood as a result of studies here and elsewhere. Astonishing, however, is the discovery that these bacterial viruses are made up of sub-units, each of which is remarkably like that other basic unit of life, the unit of heredity, called the gene. Here is a field where heredity and life are apparently reduced to their simplest form, and further studies are certain to yield basic new information.

. . . In Physics. Cosmic rays have been a perennial source of fascination to physicists ever since the pioneering work of R. A. Millikan here in the early 1920's. They loom larger and larger in the world of physics as time goes on. Cosmic ray work by C. D. Anderson at the Institute first revealed the positron in 1932. Then came Anderson's discovery of the mesotron in 1936. Now it is found (first by Powell in England) that there are two kinds of mesotrons, one being 50 per cent heavier than the other. Each may be either positive or negative, and the heavy one may decay into a light one. Anderson has made observations of the decay of the light mesotron into an electron and presumably some neutral particle. Professor R. F. Christy and his students are attempting with some success to elucidate the theory of these mysterious processes. All that can now be said is that the secret of nuclear forces and nuclear energy is closely tied to the understanding of mesotrons.



PHYSICS: *First direct measurements of gamma ray wave lengths have been made with this spectrometer.*

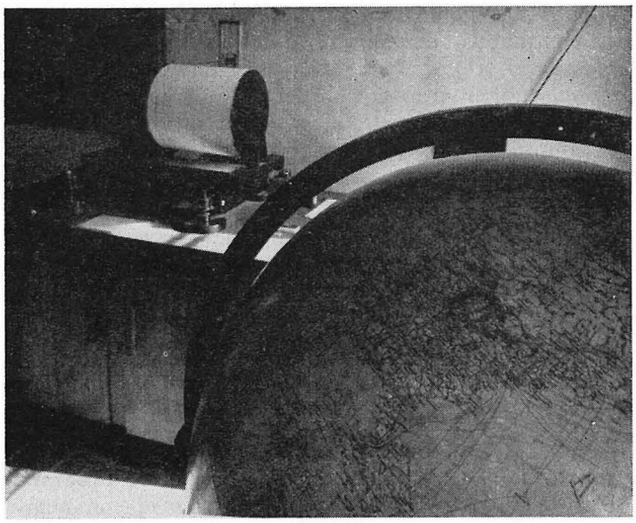


BIOLOGY: *Electronically controlled machine built by Dr. Henry Borsook (above) and Dr. Geoffrey Keighly helps Caltech biochemists separate and collect proteins and amino acids — the fabric of all living cells.*

Nuclear forces are under investigation from other angles in the Kellogg Radiation Laboratory under the direction of Professors C. C. Lauritsen and W. A. Fowler. Their measurements are making more precise and complete our understanding of the release of nuclear energy in the sun and stars—the primary source of energy in the universe. Professor J. W. M. DuMond and his colleagues have had spectacular success in making the first direct measurements of the wave length of nuclear gamma rays, using a new curved-crystal spectrometer.

. . . In Geology. The division of the Geological Sciences, among its many activities, concentrates on two of peculiar interest to Southern California—oil and earthquakes. Its graduates, excellently trained in physics, chemistry, geology and geophysics, are in urgent demand by the petroleum industry. The Seismology Laboratory not only participates in a world-wide earthquake analysis program, but is making basic studies of the structure of the earth's crust by analyzing the propagation of earthquake waves. The tiny earth-tremors produced by a

GEOLOGY: *In the Seismological Lab automatic recorders amass data for world-wide earthquake analysis program.*



storm at sea (microseisms) are now being intensively studied and provide an important meteorological tool.

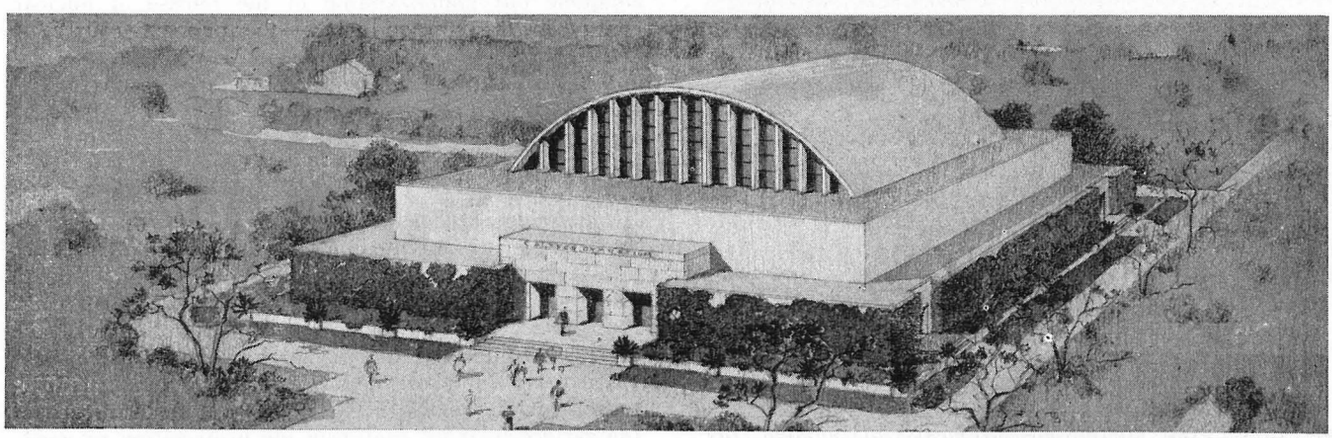
Government research. The fact that government contracts have reached such a large volume ($4,600,000 for 1947-48) has led some to suppose that this represents expenditure for enterprises foreign to our educational program; that is, for secret military research. This supposition is far from the truth. Of the $1,200,000 spent for contract research projects on the campus during the past year, practically all was for basic non-secret research, and none was for the development of specific weapons or equipment. Even at the Jet Propulsion Laboratory (the major off-campus project, and by far the largest contract enterprise) the work carried on is largely basic research in fuels, propulsions, motors and structures—not rocket weapons.

Buildings and land

Buildings. In the last report two building projects were mentioned as being about ready to get under way. The construction of a Biology Annex has now been completed and will provide much needed new facilities. The proposed Earhart Plant Research Laboratory was for a time endangered because mounting costs had far outrun the original gift of the Earhart Foundation. However, the Foundation generously met the situation and increased its pledge from $200,000 to $407,000. Construction began immediately on receipt of news of this action, and this valuable and unique laboratory and greenhouse will be ready for use in the spring of 1949.

Land. The final contract for the purchase of Tournament Park by the Institute was completed in August, 1948, and title will pass into Institute hands as soon as the necessary rezoning of the area has been completed. The long delay was due solely to the extended process of determining the portion of the Park to be retained by the City, and to the necessity of a complete survey of boundaries and of existing utilities and easements. The Institute is not yet in a position to proceed with the construction of the proposed athletic facilities, but will immediately arrange additional car-parking areas to relieve the parking problem.

Gym. The organization of the new Alumni Fund, announced in last year's report, was completed by the Alumni Association during the year and a very large group of alumni generously cooperated in getting a campaign under way. By August, 1948, the cash receipts had totaled over $20,000 and an additional $50,000 had been promised for the future. This is truly a magnificent start, and the Association deserves both thanks and congratulations. But the alumni officers are not yet satisfied and are seeking to secure a much wider participation of alumni. Those who have given have been generous. Many have not yet responded to the call. But we may be sure that the response will grow as the alumni come to appreciate the need of the Institute for their support. The alumni proposal to devote the initial proceeds of the Fund to expanding the athletic facilities of the Institute is most welcome and timely. There is a desperate need—long recognized—for such facilities, and Tournament Park now offers the necessary site for them.



BUILDINGS: *Architect's preliminary sketch of the proposed Caltech Gymnasium — goal of the Alumni Fund.*