

THE PRESIDENT'S REPORT

Some highlights from Dr. DuBridge's
1951-1952 report on the Institute

THERE ARE PLENTY OF REASONS why those concerned with higher education should now be thinking deeply about the place of our colleges and universities in this kind of a world. There were times last spring, as students on various campuses gave vent in curious ways to their spring fever (as students have done from time immemorial), when many Americans wondered if college life was preparing our youth adequately for the serious business of living. Very few thought to ask whether, on the contrary, the colleges were too serious—and the safety valve just had to let loose.

In any case serious thinking about higher education—always appropriate—was now especially necessary. It has been the privilege of your president to be a member of a Commission which has been giving extensive thought to this question for the past three years.

The task of this Commission, established by the Association of American Universities, was to study the problems of financing higher education. But as this group of 12 educators and laymen faced this problem they found it necessary to ask: what *is* higher education in America and *why* should it be financed?

Our answers are contained in a recently-published report, *Nature and Needs of Higher Education* (E&S—February 1953). I hope many thoughtful friends of Caltech will find an opportunity to read it. Not that it pretends to say anything new; it only recalls to mind ideas that have been too often forgotten. For as we looked at American higher education we were impressed again with what a significant achievement it is.

There are in this country over 1100 four-year colleges and universities, large and small, public and private, sectarian and non-sectarian, rich and poor, good and

mediocre. They are bringing higher education in some form to a far larger fraction of our youth than any other nation has ever achieved. They are typical products of a free enterprise system, exhibiting diversity and freedom, uncontrolled by any central power. Yet they all seek a common goal—the preservation of the heritage of Western culture, the broadening of man's intellectual horizons, the maintenance of the dignity and the freedom of the individual. They seek, in other words, to preserve the values which made America great.

There was never a time when these values were in greater need of being affirmed. Are the colleges succeeding in this task? Our conclusion was that, on the whole, they are. It is true that some individual students or some faculties have been irresponsible or foolish or negligent. Some colleges, too intent on "practical" or "popular" goals, have neglected their primary educational mission. Higher education as a whole, however, remains the stronghold of our vital traditions, the defender of our freedom, the leader in the quest for new knowledge, new vision, new wisdom.

Is the future of American higher education in danger? The answer is "No." There are thorny paths ahead—as there always have been. Colleges are being expected to do more things than they can afford. Inflation and fluctuating enrollments have posed grave financial problems. Yet we recall that pioneer America made the most unbelievable sacrifices to create and to maintain its colleges. Will rich, modern America neglect this heritage? Not if Americans understand the problems. It is therefore the duty of all alumni, faculty, students, trustees and friends of American colleges and universities to help Americans understand the true values of higher educa-



tion. To the extent that they are understood, to that extent will higher education receive the support it needs and deserves.

Our Commission believes that this support should come from many sources. We do not believe it should come in handouts from the Federal government. Private sources have not dried up. Individuals, foundations, and corporations can furnish the necessary funds, provided only that *in sufficiently large numbers* they understand the need and respond to it.

The Institute and the Government

Caltech is a *private* institution. Its entire teaching program and a substantial part of its research program are financed by income from endowment and trust funds, tuition fees and gifts from individuals, corporations and foundations. However, our financial statements show also large sums of money "billed" to the Federal Government. The significance of these "billings" should be clearly understood.

The activity which accounts for the bulk of these

charges to the government is the operation of the Jet Propulsion Laboratory, located about five miles from the campus at the northwest edge of Pasadena. This laboratory—land, buildings and equipment—is owned by the government, and is devoted exclusively to carrying out research and development in the field of rockets and guided missiles, principally under the auspices of the Ordnance Corps of the United States Army. The Ordnance Corps, rather than managing and operating this laboratory directly (for example, as a military station), has asked the California Institute to serve as operator, in the belief that under this plan the Laboratory will carry out its mission more effectively and more economically.

The Institute has been glad to render this service in the cause of national defense. In carrying on this service we expend, as agents of the government, large sums of money for salaries, materials and equipment as necessary in carrying out the program. The government then reimburses the Institute for these expenditures—auditing them item by item. No "management fee" is charged,

but an allowance is made (also audited each year) to cover a reasonable share of the administrative or "over-head" expenses which the Institute incurs.

Thus, during the year just closed, the Institute billed the government nearly \$10 million to cover expenses of the Jet Propulsion Laboratory.

Other "billings" to the government during the past year amounted to about \$2 million. These covered reimbursements for the cost of research projects carried forward *on the campus*. These are projects judged by the faculty to be desirable additions to the Institute's program of education and research. Each one, however, is also of current interest to some agency of government. Because of this interest the government agency is willing to bear some portion of the costs of the project—just as an individual, a company, or a foundation may bear the cost of a project in which it may be interested. The nation's scientific strength has been greatly enhanced in recent years—and its welfare and security correspondingly advanced—by this type of cooperation between universities and the government.

But none of these "billings" to the government in any way lessened Caltech's primary dependence on private funds. In fact they all increased it; for we shall want to continue many of these special research projects even though some day the government interest in them should cease. There are many others of equal importance which can never command government interest, and we must never be forced to limit *our* interests to those of the government. In fact, except for a few large and expensive projects in fields such as nuclear physics and aeronautics, most of our educational and research work is still dependent on funds from private sources.

Financial status

The total net assets of the Institute passed the fifty-million mark this year, continuing the slow, steady climb which has added twelve million dollars in the past six years. The chief capital increment during this past year resulted from gains from the sale of securities.

The expenditures for the campus programs of instruction and research were \$5,203,000, which was \$131,329 less than the income available for these programs. Again this year budget economies and better-than-expected income enabled us to end the year with a modest surplus instead of an anticipated deficit.

The above figures do not include the money expended for others in managing off-campus research and development programs. The Cooperative Wind Tunnel, the Jet Propulsion Laboratory and the (temporary) Vista Project accounted for \$11,479,309 in expenses which were reimbursed.

Gifts for current operations this year amounted to the impressive total of \$1,200,419. (The entire budget of the Institute was less than this amount in 1939). The many large grants by industrial corporations, some for research in certain fields, others for general support, are especially noteworthy and encouraging. While the argument goes forward as to whether—or how—business

should help the colleges, many forward-looking companies are quietly doing it, and have been for many years.

The student body

Violently fluctuating enrollments have been a cause of serious difficulty in many colleges during the past 20 years. Depression, the war, the post-war veterans' program, and now the abnormally low college-age population (reflecting the low birthrate of the depression years) have alternately boosted and depressed college attendance to an extent which has in many institutions played havoc with finances, with plant utilization, and with staff.

Caltech has been freer from these large fluctuations than most colleges. For example, as a result of the policy of keeping the entering class fixed at 180 students, the undergraduate student body, even at the peak of the veteran load, reached only about 800 compared with the present or "normal" of about 650. We expect to maintain about this level. The number of applicants for freshman admission for the fall of 1952 showed a sharp increase, which followed a more modest increase in 1951 over the low point of 1950.

Choosing 180 freshmen from several hundred applicants offers the opportunity of securing a high quality class, but presents difficult problems of selection. The Admissions Office is being greatly assisted in this task by the statistical studies on methods of predicting academic success being made by Dr. John Weir, Associate in Psychology. Scores on the College Entrance Examination Board tests are found to be the most valid single criterion of success at the Institute. But in each individual case these scores must be supplemented by information on success in school, intellectual interest and motivation, and those personal qualities associated with character.

Our aim is to select students of outstanding promise of future success—and to reduce academic failure to zero. But prediction of human achievement can never attain perfection, and in many cases failure results principally from unavoidable personal, family or financial difficulties, or occurs for reasons of health. These, too, we aim to keep at a minimum through student health and counselling services, student-aid programs, etc. Only nine per cent of the 1951-52 freshman class withdrew for scholastic reasons. Also the Caltech sophomores ranked, as a class, in number one position among 128 colleges throughout the country in a National College Sophomore Testing program involving 14,000 students. They ranked first even in such subjects as English, General Culture and Current Affairs.

The number of students needing financial assistance continues to grow. Part-time jobs (the favorite: baby sitting) were of help in many cases. Indeed more jobs were available than could be filled. But the time available for outside work is, for a Caltech student, severely limited. Scholarships were awarded to 102 undergraduate students in the amount of \$47,560. In the upper

three classes only those in the top quarter of the class were considered for awards. Funds are needed to assist worthy students who, often for reasons beyond their control, do not quite attain the necessary B-average.

We note with satisfaction the growing number of industrial companies which are establishing undergraduate scholarship programs. If wisely administered, these can go far toward assuring educational opportunities to all talented and ambitious young people, regardless of family economic status. Such private funds will make unnecessary the Federal scholarship aid program being advocated in some quarters.

A large fraction of the graduate students must depend upon some form of financial assistance. For the most part this is earned through part-time services in teaching or research. There are also increasing numbers of industrial graduate fellowships and now the new fellowships of the National Science Foundation. Graduate students received in grants or stipends over \$400,000 during the year, distributed among 280 out of the slightly over 400 such students.

There were 344 degrees awarded at the Commencement exercises on June 6, 1952, including 126 Bachelor of Science, 133 Master of Science, 20 Engineer's degrees (M.E., C.E., Ae.E., etc.) and 65 Ph.Ds.

The geographic distribution of the student body continues to broaden. Of the freshman class entering in 1952, 35 per cent came from outside California, representing 25 states and 1 foreign country. Of the 1952 Ph.D. recipients, 80 per cent had received undergraduate degrees from institutions other than Caltech; 60 per cent of these were from institutions east of the Mississippi, and 13 per cent from abroad.

The curriculum

The goal of Caltech is not to educate *more* scientists and engineers but *better* ones. It is in the upper ranks of talent that the shortage is most acute. But how is this goal to be achieved?

One clue to the answer to this question comes from the fact that, in the face of a severe national shortage of scientists and engineers (the demand for *new* graduates is more than double the supply), many who have been out of college for 10 to 20 years have been unsuccessful in finding better or more rewarding positions. Many have therefore left the engineering profession. There is no single simple reason for this paradox. Salary scales for white-collar workers are notoriously slow to respond to inflation; personnel directors seek freshly-trained young people in preference to the "middle-aged"; many of the latter were not trained in the newer fields of science and engineering, where demands are the greatest.

It is clearly time for industry and government to outgrow the idea that \$10,000 to \$15,000 is an adequate top salary for senior engineers and scientists. But it is also desirable that young scientists and engineers be broadly enough educated so that they are both prepared and stimulated to keep pace with new developments in

their fields. Such men will remain in the forefront of the profession. Caltech seeks to select and to educate such creative minds.

How well do we succeed? In proportion to their numbers Caltech alumni stand at the top in the frequency with which they receive unusual honors or recognition (e. g., the Institute has now graduated two Nobel prize winners: C. D. Anderson and E. M. McMillan). A more comprehensive survey of alumni is now under way to see how they have fared and to learn what aspects of the educational program have been of greatest value.

In the meantime, the present curriculum is under continuous examination by the faculty. Substantial alterations have been made in the Humanities, Physics, Geology and Engineering Divisions, in the past year. For example, a new option has been created for Ph.D. candidates—to be called "Engineering Science." This is to give greater and more flexible opportunities for the unusual student whose interests extend beyond the bounds of one or more of the current Civil, Electrical, Mechanical or Aeronautical engineering fields. The boundaries between the fundamental concepts of these various traditional fields are already diffuse; for many students they should be ignored. This emphasis on basic concepts rather than specialized skills is behind all these recent curricular changes.

Alumni

The alumni of an educational institution constitute its "product". Their success is a measure of the success of the institution; hence in their achievement the institution takes special pride.

Alumni achievements can not be measured in numbers or statistics, because the qualities of good citizenship are not measurable. At the same time, statistical studies are frequently made and are often of interest. Thus, a recent study published in *School and Society* lists the number of graduates of various institutions who have attained sufficient distinction to be listed in the volume *Who's Who in the West*. If one divides these figures by the number of living alumni of each institution one obtains a figure representing "the percentage of distinguished alumni". The figure for Caltech, 2.6%, is higher by 60% than that for the next highest institution.

Another study of the sources of American physicists shows that Caltech has, in proportion to its enrollment, produced more physicists (listed in *American Men of Science*) than any other institution in the country, leading by a margin of 50% the institution in second place.

As has been mentioned in previous reports, the alumni have in recent years been showing an increasingly active and most welcome interest in the Institute. The alumni magazine has been developed into an outstanding journal; the annual alumni seminars on the campus attract great interest; the alumni fund is growing at an ever-increasing rate, and it should be possible to announce in next year's annual report the completion of the alumni swimming pool made possible by gifts to the fund of almost \$150,000.