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A Record of Achievement

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IT IS just twenty-five years ago that Dr. Robert A. Millikan assumed in 1921 his post of leadership at the California Institute of Technology. And if there is any truth in the saying that an institution is the lengthened shadow of a man, that truth has been abundantly exemplified in this case. During the past quarter of a century Dr. Millikan has been the center and soul of all our activities at this institution. For the progress which the California Institute has made during this quarter of a century he is in large measure responsible.

This progress has been remarkable. Twenty-five years ago there were only three buildings on the campus—Throop Hall, the Gates Chemical Laboratory, and that relic of primitive days which is now known as the Old Dormitory. Today there are nearly thirty permanent buildings, on and off the campus, representing an investment of over thirteen million dollars. The endowment funds of the Institute in 1921 amounted to considerably less than one million dollars; today they are more than sixteen millions, together with an additional nine or ten million which is, as the lawyers say, "vested in expectancy". In other words, it is slated to come to us when various wills are probated and trusts terminated. The student body enrolled in the 1921 catalogue numbered 448, of whom only 36 were graduate students; in the last year preceding the recent war, this enrollment had risen to 940, of whom no fewer than 322 were in the Graduate School, an increase of more than tenfold.

Meanwhile the faculty has been tripled in size and more than tripled in quality. As for the prestige and reputation of the place, I don't think that I will be charged with immodesty if I venture to express a belief that these have certainly not declined during the intervening years.

Now you can depend upon it that all this expansion in plant, endowment, faculty, and scholastic standards was not achieved without aggressive and clear-headed leadership. This institution owes more to Dr. Millikan than it can ever put into spoken or written words, and on this occasion, the first Commencement following his retirement from the chairmanship of the Executive Council, the Board of Trustees has given me this opportunity to place on public record its high appreciation of his services as an educational leader and its affection for him as a man.

Those of us who have worked with Dr. Millikan during these years of his leadership have never failed to recognize his amazing array of human qualities. The breadth of his academic interests, his keen sense of educational values, and his faith in high educational standards, have been combined with boundless energy and enthusiasm. He has been a super-salesman for any project to which he set his hand. His patience and good nature, moreover, are inexhaustible, or nearly so. There are few men, even supermen, who for a full quarter of a century could keep students and alumni, faculty and trustees, all working happily together while at the same time extracting an average of more than a million dollars per year from educational foundations, private benefactors, industries, associates and a dozen other sources. Let Dr. Millikan rest assured that neither this nor any other institution is apt to stumble upon the likes of him again. Meanwhile, in his new capacity as Vice President of the Board of Trustees, the Institute expects to utilize his interest and energies during the years yet to come.

This is our first Commencement since hostilities came to a close. For four years the California Institute found itself converted from an educational institution to a war industry. Now, since V-J Day it finds itself, like other war industries, in the throes of reconversion. In the years before Pearl Harbor the annual budget of the Institute was about a million and a quarter dollars. Under the impact of war research and experimental production it shot up to twenty times that figure. Perhaps it may surprise some of you to know that during the past four years, the California Institute has done work for the armed forces amounting to more than eighty million dollars and quite a bit of this work is still going on. Its peacetime payroll included something less than 400 names; at the peak of the war effort these names reached almost 5,000. We had nearly 1,000 civilian students when the war started, but these quickly melted away to a mere handful of freshmen and foreigners while their places were taken by young men assigned to the Institute for training by the Navy, the Army, and

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by our carrier planes, which they thought were down in the Solomon Islands. He expressed great fear of our dive bombers.

ATOMIC BOMBING

It will never be known accurately how many people died, either at Hiroshima or Nagasaki. Upon arrival in Hiroshima we found the devastation so appalling that it was impossible to visualize what the city had been like prior to the bombing. The same devastation, though not quite so impressive, was seen at Nagasaki. Because of the topography of this city, the extensiveness of the blast was not visible. Nagasaki lies in a valley, running approximately north and south, with many valleys and surrounding hills, while Hiroshima is—or was—a city lying on a flat plain with three rivers flowing through it.

In examining the survivors of the atomic bombing it was noted that blast victims as far away from the bomb as 2,200 meters (nearly 1¼ miles) exhibited flash and radiation burns. Outside of the 2,200 meter area, flash burns only were evident on survivors. The answer to the question as to whether primary fire had been caused by the explosion was given by victims, who in numerous cases testified that their clothes had burst into flame. While it is impossible for everyone in the world to view what was Nagasaki and Hiroshima, the pictures showing the devastation wrought by the atomic bombs should be published throughout the world in order to bring home to all concerned that the next war could be the end of what we know as civilization.

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Air Corps. Nearly 2,000 of these were sent here for training over periods ranging from three months to three years.

Of course this shift to a war program upset the normal work of the Institute. Most of the regular peacetime activities had to be suspended. Laboratories and shops were turned over to war research and production. Members of the faculty were summoned from their classrooms and assigned to work of high responsibility and secrecy connected with government war contracts. Halls and corridors became crowded with the desks of accountants, auditors, computers, and filing clerks. The campus became strangely bedecked with femininity as hundreds of young women were requisitioned to manipulate typewriters and adding machines, and even to do mechanical work in the laboratories. Dormitories built for 300 civilian students were stretched to house nearly twice that number of naval trainees. In addition, numerous buildings off the campus had to be built or leased to accommodate the overflow of war work. At any rate the California Institute did everything that the government asked it to do and did it willingly.

Now we are confronted with the task of reconversion. As soon as practicable the normal peacetime program of instruction and research will be resumed. There will be changes, possibly a good many of them, in order to keep the Institute abreast of the times; but it is not contemplated that there shall be any radical departure from the landmarks which have guided the course of progress in the past. Twenty-five years ago, on November 29, 1921, the Board of Trustees set forth in a series of resolutions this general picture of what they hoped the California Institute would some day grow to be. It is interesting to re-read these resolutions after the lapse of a quarter of a century and see how largely the original objectives have been reached.

Briefly, the plan of 1921 laid emphasis on the following features: (1) a limited and carefully-selected student body; (2) emphasis on training in the basic sciences of physics, chemistry and mathematics as the essential preliminary to a sound engineering education; (3) an adequate place in the curriculum for the humanities; (4) the active encouragement of research in all departments, and, finally, the concentration of the Institute's financial resources on a relatively few fundamental subjects rather than an expansion into all the fields of human knowledge, —in other words, the policy of trying to do a few things well rather than many things indifferently.

These are still the chart and compass which guide both the faculty and the trustees. But the lapse of time, and more especially the developments of the past four or five years, have suggested the need for an even greater emphasis on certain fields of scientific research. One of these is the field of nuclear physics, a branch of physics in which the Institute has pioneered in the past but must now go a good deal farther. The appointment of Dr. J. Robert Oppenheimer to a full-time professorship will greatly strengthen the Institute's staff in the domain of atomic research. On the other hand, the loss of Professor William V. Houston, who leaves us to become president of a sister institution, the Rice Institute in Texas, will be severely felt. Dr. Houston, who has been with us since 1931, leaves a gap which will be hard to fill. He goes to his new post with the good wishes of everyone connected with the California Institute. Similar good wishes are extended to Professor Ira S. Bowen who has recently become director of Mount Wilson Observatory.

In this connection it may be permissible to mention that plans are now under way whereby the Mount Wilson Observatory and the new Institute Observatory at Palomar will be operated as a joint enterprise when the new 200-inch mirror is finally installed at Palomar. Barring unforeseen delays this giant block of glass, the completion of which has been so badly delayed by the war, will be in place within the next year or so. Together, these two observatories will make southern California pre-eminent in its facilities for research in the fields of astrophysics.

Among other notable new appointments to the faculty, it is appropriate to mention the coming of Dr. George W. Beadle, a distinguished scholar who assumes the chairmanship of the Division of Biology. Other noteworthy additions to the teaching and research staff are under consideration and will be announced in due course.

Meanwhile the Institute has lost by death two of the most outstanding men in its academic circle—Thomas Hunt Morgan, Emeritus Professor of Biology, and Harry Bateman, Professor of Mathematics. Among geneticists of his time, Dr. Morgan was *facile princeps*. Winner of the Nobel Prize in Medicine, he deservedly received recognition from universities and learned societies in all quarters of the globe. At the California Institute his exalted standards of scholarship, his wise judgment in matters of academic policy, and the charm of his personality gained for him in high degree the admiration and affection of everyone with whom he came in contact. The recent death of Professor Bateman has likewise removed from our academic circle a scholar of world-wide reputation in his field, whose eminence was attested by his election, some years ago, as a Fellow of the Royal Society of London.

Some problems of serious urgency must be given attention by the Trustees within the immediate future. One is the increase of faculty salaries. Since 1940 the general scale of salaries has been increased by only ten

per cent on the average. Meanwhile, the cost of living has advanced by perhaps three times this percentage. To hold the distinguished members of the staff that we now have, as well as to make positions at the Institute attractive to new appointees whom we desire to bring, it is essential that there be an upward readjustment. Such action, it would seem, cannot be very long delayed. The Institute is in competition not only with the great universities of the country but with the steadily increasing demand of the large industries for highly-qualified scientists in their research departments. The allurements of life in southern California give us some advantage in the quest for men from other parts of the country; but there are limits beyond which this climatic advantage cannot safely be counted upon.

Another problem concerns the housing of our undergraduate students. Many years ago it was agreed that great advantages could be derived from the housing of the entire undergraduate body on the Campus, and land was set aside for that purpose. Through the generosity of various friends of the Institute a good start was made in this direction by the building of four dormitories in which approximately half the entire student body could be accommodated. Now it seems opportune to consider whether the time has not come to take care of the other half in the same way.

The problem, of course, is one of ways and means. Everyone is agreed that the benefits derived from having the entire student body living on the campus are beyond question. The loss of time involved when students come to their classrooms and laboratories from a distance, often from a considerable distance, is substantial. This time can be better devoted to study and recreation than to covering the roads twice a day in a car which may or may not be "hopped-up."

There is also the even greater benefit which comes from closer association with one's fellow students and the greater facility which is provided for observing the amenities of life.

To complete the original plan by the erection of four additional student houses, accommodating the present off-campus group of 300 or thereabouts, would cost approximately a million dollars. It is worth considering whether, in case this money cannot be obtained otherwise, the project should not be considered as an investment for some of the Institute's endowment funds. The yield on bonds and stocks has now dropped so low that it would not seem insuperably difficult to make a housing project on the campus reasonably profitable. Some other institutions have made it so. The plan would involve loading the dormitory rentals with an overhead of say five per cent for interest and depreciation; but even with this addition the cost of living on the campus would not be greater than that which students have to pay for rooms a mile away. This proposal has not yet been formally considered by the Trustees, and it may not commend itself to them; but it seems to be worthy of study from all points of view, academic as well as financial.

There is a common impression that the California Institute of Technology is a rich and heavily endowed institution. Doubtless it is better off than some other institutions of its size; but its expenses are much greater for two reasons, first because of its large proportion of graduate students (normally about one-third of the whole) and, second, because of the strong emphasis placed on research in all its departments. Research gives both strength and prestige to an educational institution—but it costs money, lots of it.

For various reasons it would be difficult to estimate what the California Institute spends each year on research, because members of the staff who are engaged in research also do some teaching and they do not punch a time-clock on their respective duties; but it would probably not be far wide of the mark to say that one-half of the Institute's regular expenditures go for the promotion of research in one form or another. That is a substantial amount, but it is well worth what it costs. If there was ever any doubt concerning the value of scientific research to the nation's well-being, that doubt has been fully dissipated during the past four years.

During the past few weeks a generous gift of $200,000 has been pledged by the Earhart Foundation for the construction of a temperature-controlled plant laboratory. In addition this Foundation has offered to give $6,000 per year for four years towards the cost of operating the laboratory. This new facility will make it possible to study the growth and behavior of plant life under any conditions of temperature that may be desired. Such research, it is believed, will prove to be of great economic value.

In any institution of higher education there are five points of view which have to be kept in mind; namely those of the student body, the faculty, the trustees, the alumni, and the general public. These sometimes get to be at variance, and without skillful handling they are sure to do so. The students would like less work, the faculty more pay, the alumni more extracurricular activities, and the trustees more endowment income to balance the budget. Successful leadership is leadership that can satisfy these diverse elements and keep them all working harmoniously together. It is the great good fortune of the California Institute to have had this kind of leadership during the past twenty-five years, and it is our earnest hope, in these days of administrative reorganization, that we may be similarly blessed during the years that are ahead.

GOLDSWORTHY TO HEAD STUDENT HOUSES

LIEUTENANT Colonel Elmer Colin Goldsworthy has recently joined the C. I. T. staff as Headmaster of the Student Houses. In this capacity he has primary responsibility both for the general behavior and conduct of the house members, as well as for the development and betterment of the houses themselves as cultural and maturing influences in the lives of the undergraduates.

Colonel Goldsworthy, a native Californian, received his Ph.D. in mathematics from the University of California. In World War I he served with the British Army from 1914 to 1920, first as a member of the famous Princess Patricias, Canadian Light Infantry, and later with the Royal Flying Corps. In World War II Colonel Goldsworthy entered the U. S. Army Air Force as a captain in September 1942. He was Director of Training, Army Air Force School of Applied Tactics. At present he is on terminal leave.

Colonel Goldsworthy also brings to his new work a wide experience in education. From 1923 to 1942 he was instructor, assistant professor of mathematics, and assistant dean of undergraduates at the University of California.