Inaugural Address of
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# Caltech: A Singular Opportunity

"I believe that mankind can find an acceptable existence only by proper understanding of science and utilization of technology, not by their rejection. And I believe that Caltech's particular qualities and potential demand that we create not only new discoveries and applications, new sciences and technologies, but new ways of seeing nature, man, and society."

When I visited the California Institute of Technology just over a year ago to discuss the possibility of becoming its president, what I experienced was anything but a polite sherry-drinking ceremony. It was two and a half days (and two late evenings) of straightforward question-and-answer, on both sides, with faculty and students. We reached, I think, deeply into each other's concerns and hopes.

Those days left me tired and rather bruised, but exhilarated too—buoyed up by the honesty and intellectual competence, the aspiration and compassion, that I had seen. There was a lot to think about and to be challenged by in those sessions. Among the many perceptive questions asked of me, one was especially thought-provoking. It was—"Why are you interested in being a university president, and why of Caltech in particular?"

In answering such questions, historical perspective is sometimes useful. A century ago, as Lord Bryce tells us, the university president was virtually a monarch, responsible only to God, which in the academic case meant the governing board. A half century ago the faculty wrested a good deal of power from the president, and now the students are seeking their share.

Insofar as university presidents are kings today, we seem to have reverted to a still earlier form. It is that of those kings of ancient times who, after a short term of rule, were slain. Then they were either eaten in a Dionysian frenzy or plowed into the furrows in order to encourage the growth of the crops.

So it can't be the hope of comfort and security that encourages me—or anyone else—to become president of an institution of higher learning.

Can it be that I am an example of what Dr. Lawrence Peter cites in his recent book, *The Peter Principle*? He writes that people who have exhibited what he calls "summit competence" have a "strong tendency to sidestep into another hierarchy—say, from the army into industry, from politics into education, from show business into politics and so on—and reach in the new environment that level of incompetence which they could not find in the old. This is compulsive incompetence." I will say only that such a compulsion is not my conscious motivation.

Since World War II it has been the style of most university presidents to preside over, or to spearhead, great expansions of faculties and student bodies, massive

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building programs, and large-scale organization of scholarship and research. Centers, institutes, and laboratories have been financed largely by federal and partly by state funds, and by private and foundation support when it could be obtained.

As a result of this evolution, our universities have become much more closely involved with American industry, American government, and American attitudes. The universities are now being assailed as having sold out to the power structure, and as having forsworn scholarship. Somewhat contradictorily they are also charged with being irrelevant to the problems of modern society. In these circumstances, the university president is not likely to find himself in a position of unchallenged prestige—the quest for which, then, can't be the reason for coming to a university.

Yet our great institutions of learning present an unequaled opportunity to make a long-range contribution to society. In my view, this is particularly true at Caltech. By producing new knowledge and new leaders, we in the universities can grapple with the problems not only of today but of the next decade, and of the next century. I have found before, and find now, a particular challenge in working to relate the activities and goals of a highly professional, effective institution—on its own terms, the best in the world—to the larger perspectives and aspirations of the world of which it is a part. This opportunity, and this challenge, are what have brought me to Caltech.

The basic values of our educational institutions and our society are now being contested. Our universities are under scrutiny and under attack. Rational thought is under scrutiny and under attack. And science and technology are under scrutiny and under attack. These institutions and values, until very recently, were the most respected of all.

I suggest that this change in attitudes results from the inevitable failure of these most respected institutions to solve quickly all of our problems, or even the most desperately urgent ones. They have not solved the problem of control of weapons of mass destruction. They have not extricated us from a divisive and damaging local war. Poverty still exists in our own country and to an even greater degree in the rest of the world. We still live with the degrading reality of racial oppression. We face increasing environmental pollution. The growing human population is not many doublings away from disaster.

All of this causes many—both young and old, left and right, some of our best people and some of our worst—to denounce our society and its works. Particular criticism and even hatred have been directed against the universities, against their products, and against the industrial civilization which those products, in turn, have combined to create. In their disappointment, many people have turned against science, technology, reason—and against us, their practitioners. The student who cries, "What we need is to think less and to feel more!" and the legislator who says, "Cut off government aid where students misbehave!" are both exhibiting this reaction. This situation presents a great challenge, and a real danger, to the universities and to society.

We must understand and respond to what is sensible in the criticism of our society and our universities. New

times require new ways; we must find them. We must educate those outside the university community about what we do, and explain why our work is vital to man's spirit as well as to his material well-being. We must resolutely defend the rational process, science and technology, *and* the human values from the know-nothings of our day. We must defend them from those who would legislate against freedom of thought and inquiry no less than from those disrupters who would destroy without any idea of what they—or others—would then build on the rubble. If either group succeeds, the universities will be destroyed before they can be improved.

We know that rationality is not all there is to man's nature. Indeed, 2,300 years ago Aristotle defined man not as reasoning, but "*capable* of reasoning." And the non-rational part of man's nature has recorded some of his most luminous as well as his most shameful deeds.

An institution of higher education is by its nature dedicated to the humane values and also to rationality, whose offspring are science (the knowledge of ourselves and the universe) and technology (the ability to change ourselves and to influence our surroundings). These are the central concern of this particular institution, and together they constitute the essence of our modern civilization.

I believe that mankind can find an acceptable existence only by proper understanding of science and utilization of technology, not by their rejection. And I believe that Caltech's particular qualities and potential demand that we create not only new discoveries and applications, new sciences and technologies, but new ways of seeing nature, man, and society. These views convince me that Caltech presents a singular opportunity to me and to all of us who are a part of the Institute community.

Now the question arises, how can the Institute's president act most effectively to help turn these opportunities into achievements?

It seems to me that the president of an educational institution cannot merely preside. Nor can he simply direct. He must lead.

To lead is perhaps the most difficult and complex method of all, yet the combination of actions that it comprises offers the best hope of getting something done. It requires the active use of persuasion, rather than either simply being persuaded by others (presiding) or coercing them. Leadership rests largely on the inspiration generated by mutual respect, by shared feelings, and by the interplay of personalities. It includes, of course, day-to-day administration and management. It includes the duty of informing people—within the Institute and outside it—of the nature of our activities. The president must resolve and unify the diverse interests and views within the Institute sufficiently so that action can at least sometimes proceed. He must do so with a high sensitivity to the full range of opinions of the members of the Institute community, but without merely averaging those opinions. And finally, the president must be the focal point for interaction of the Institute with its outside constituencies —our neighbors, our private benefactors, governmental organizations, and the interested public.

Decisions cannot be made by instant and universal balloting. Under some circumstances they must be made by individuals, and those individuals must take responsibility for them. But unexplained and arbitrary

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administrative action, whether on business affairs, curriculum, relations with the external community, or the future evolution of the Institute itself, needs to be avoided. And there is a need to obtain as wide a spectrum of views as possible—from faculty, students, and non-academic employees—on important questions before the corresponding decisions are finally made. To that end, I intend to continue to establish advisory councils, informal and formal, on a wide variety of matters, to the principal administrative officers of the Institute.

The most important point about governance is that the Institute *is* a community with shared interests and shared responsibilities. If we are not to be governed by others from outside the Institute, we must govern ourselves—and we must be clearly *seen* to govern ourselves.

Of course, we do not limit our aspirations to internal tranquility. Inevitably, and properly, we will be measured, and will measure ourselves, by our academic activities—teaching and learning, performing research and fostering scholarship—and by our constructive effect on each other and on the world around us.

The academic tenets laid down at Caltech almost 50 years ago have persisted to this day. Hale, Noyes, and Millikan established a number of fundamental principles:

Confine the expansion of the academic program to areas where Caltech can be truly outstanding.

Teach in an atmosphere of research.

Concentrate on science and engineering while at the same time encouraging a broad cultural outlook—thus avoiding, as Noyes said, "the narrowness common with students in technical schools and the superficiality and the lack of purpose of many of those taking academic college courses."

It is remarkable how apt those thoughts and those principles (and those words) appear today. But the contexts in which our activities are carried out are changing more rapidly than ever before. They will continue to change as time goes on, as the state of human knowledge changes, as the world changes, and as the people at the Institute change.

In the face of such change, I want now to reiterate Caltech's dedication to excellence—indeed to preeminence—to research and teaching, and to science and engineering as the center, but not the whole, of our attention. You all know some of the areas in which the Institute has been active for the past 50 years. Those areas remain fruitful for learning and for research, and for teaching and training, because they are central to human knowledge and to human activities.

A large part of our interest involves the physical universe. The work ranges from the subnuclear world—the study of the very smallest bits of matter and their structure—to astronomy—the study of the very largest bodies of matter that we know. It covers a great deal in between—the dynamics of reactions among molecules, ions, and atoms, and the seismic activity of the earth, to name but two disciplines.

Another area, connected with the first through chemistry and physics, includes the study of life—the DNA molecule, the cell, the nervous system.

A third area includes the applications of such knowledge, through engineering, to human activities.

From supersonic flow to water quality, from fracture properties and earthquake engineering to plasma dynamics, Caltech engineers are at the frontiers of technology.

Many of these disciplines have come together, knit by interdisciplinary ties. A decade ago we joined radio and astronomy to our activities in optical astronomy, nucleosynthesis, and theoretical physics to create a center of such studies unequaled in its depth, breadth, and brilliance. We have begun outstanding work in bioengineering, joining together biology, chemistry, chemical engineering, and fluid dynamics. Further interdisciplinary opportunities beckon. The interaction among astronomy, geology, and space exploration is a promising one. There is enormous potential in the synthesis of information theory with behavioral biology as a new approach to psychology. Economics and engineering can combine to aid rational decision-making about the problems of society, though the setting of the fundamental goals of the society is not the province of either discipline. I can't promise that the approach of science will allow us to understand man and his interactions with his fellows in the same way that we understand the interaction of nuclei in a star or the interaction of chemical compounds in a cell. I do know that we had better try to understand the nature of man if man is to survive.

The mutual impact of science and technology with economics, politics, and social patterns is already a matter of particular interest to scholars of the social sciences and humanities here at Caltech, as well as to our scientists and engineers. I believe we should develop even greater capabilities on the frontiers of certain disciplines in the social sciences. We should specialize in a small number of new activities, such as social or humanistic psychology and the history or sociology of science, in addition to attempting to work toward them from science itself.

As part of our effort to find ways in which to help solve the problems of the nation and the world—particularly those for the creation of which science and technology must bear a substantial responsibility—we plan to hold during 1970 a series of four conferences, each in its way exemplifying an interaction between science and technology on the one hand and human behavior and society on the other. These conferences, on Genetics and Behavior, on Technology and Development, on the Population Problem, and on Technology and Environment, will bring leading scientists, engineers, social scientists, and humanists to the Institute to participate. Such activities will do much to speed the evolution of Institute programs in these fields.

In view of its small size, Caltech must select carefully what it does. And what we do, we must do in a special way, appropriate to our particular nature. In new as in continuing activities, we insist on excellence as a minimum, and seek preeminence. Our history, and our aim, is not replication but innovation. To restate our founding guidelines in a modern framework, it is our goal to make our activities at Caltech exceptional, and to have them relate to other activities at the Institute, thus providing a unity and effectiveness that is possible only at a small institution of outstanding competence. By these guidelines, it seems unlikely that we would want to grant PhD's in English literature or ancient history. On the other

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hand, our faculty may well decide in the future to give doctoral degrees in some fields of economics and in some areas of psychology.

Our small size and particular talents should also govern the interaction of the Institute with other elements of the society of which it is a part. A major force motivating our insistence on excellence in teaching and research is our belief that these activities are more than ends in themselves—though they are that, too. They are the basis of our ability to contribute in the long run to the solution of the world's problems, those unsolved problems I mentioned earlier as the source of so much justified discontent. We must also consider our contributions in more immediate terms. Caltech, though an international institution in its scope and influence, its faculty and students, remains a citizen institution of Pasadena and southern California. There are many problems that touch the Caltech community directly. Beyond participation by individuals in community service, the Institute as a good citizen has a responsibility to help meet these needs.

Our country is under domestic strains greater than it has experienced since the Civil War. Our urban ghettos suffer debilitating human blight which produces explosive forces. This community, like this nation, cannot remain half affluent and educated, half impoverished and disadvantaged. Caltech of course cannot do—and should not try to do—all that must be done. But because Caltech is a teaching institution, I believe we have a special and continuing duty to encourage excellence in the public elementary and secondary school education around us. We must encourage young people in the development of their scientific interests. Especially is this true of disadvantaged students who need to be shown that intellectual activity in general is open to them. Some of our students have shown the way over the past 18 months by teaching in the Pasadena and Los Angeles schools for a few hours a week. During this past summer a faculty-organized project brought two dozen junior high school students to live, work, and learn on the Caltech campus, to see what laboratory science is like. Activities like these can be the beginnings of a significant and unique Caltech contribution.

Another community problem that affects us all is environmental pollution—which in the Los Angeles Basin is manifested most obviously as smog. As technologists, we have a particular duty to take the lead in its solution. Though the strongest constraints are economic, political, and sociological, the technological alternatives define the boundaries within which these other forces must operate. Here again, students, faculty, and some of the off-campus activities of the Institute, including the Marine Biology Laboratory and the Jet Propulsion Laboratory, must combine to provide a framework in which individual members of the Institute can contribute to the solution of community problems.

Institutions, like men, must be considered both as creatures of their environment and as entities in themselves. Each of us says, "I'm me"—a collection of emotions, desires, sense impressions, and self-replicating DNA—a seer of stars, singer of songs, poet, composer, discoverer of natural laws, maker of tools—"and I want to be thought of as a *person*, worthy, independent of what I need and of what I produce for others."

As we think of ourselves as an institution—and the

Institute *is* its people—we want, and deserve, to be valued for what we are and what we aspire to. But as individuals must also view themselves in terms of their needs and their products—intellectual, metabolic, social —so too we must ask: Where does and where will the Institute get the support to do what its aspirations require? And how will it generate its products—knowledge, research, technology, scholars, scientists, engineers, educated men?

A private university, by virtue of its autonomy, and by deriving a substantial component of its income from tuition, endowment, and gifts, has a greater freedom to follow its own path. We have been free to emphasize quality and to concentrate on activities which we ourselves select. We will continue vigorously to seek the support from the private sector that makes this latitude possible. Together with federal grants and contracts, such support will allow us to move into new areas at the same level of excellence.

Caltech, moreover, is a very special private university. It is special in its ratio of faculty to students, in the dedication of its trustees and alumni, in its research orientation, and in its small size, which allows new forms of interaction and experimentation. Most of all, it is special in the quality of its faculty and of its student body.

We have demonstrated success in finding new ways of doing things, and we continually renew our dedication to that end. We shall continue to set new standards of excellence. We have created and will create entirely new disciplines. We have produced and will produce the people who can do the same in future generations.

Indeed, people are central to the activity of the Institute. As recognition of this fact, we plan to establish several new named chairs, including Institute Professorships. We hope that others will follow the wonderful example of the Associates of the California Institute of Technology, who decided this year to establish the DuBridge Professorship.

The community, the Institute and its people, the life of learning, the advancement of reason and humane values—these are the responsibilities of the university president in our day. I assume them gladly, but with humility before the magnitude of the task at hand. I am especially aware of how great a burden rests on one who follows in the footsteps of Robert Millikan and Lee DuBridge. The Institute is already a monument to their achievements, and I will be loyal to the magnificent tradition they created and sustained.

We want our institutions to give maximum opportunity and freedom to the individual in learning, in doing research, or in any other role. And yet we also want the Institute, by its stature and strength, its continuity and shelter, to provide that same kind of support to those who may be associated with it in the future. This requires that we give it loyalty beyond our own immediate personal satisfactions. I pledge myself to the goals of providing opportunity and freedom for the individual, and reinforcing the strength and stature of the California Institute of Technology which makes that freedom and opportunity possible. And in achieving these goals, I ask your help.

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