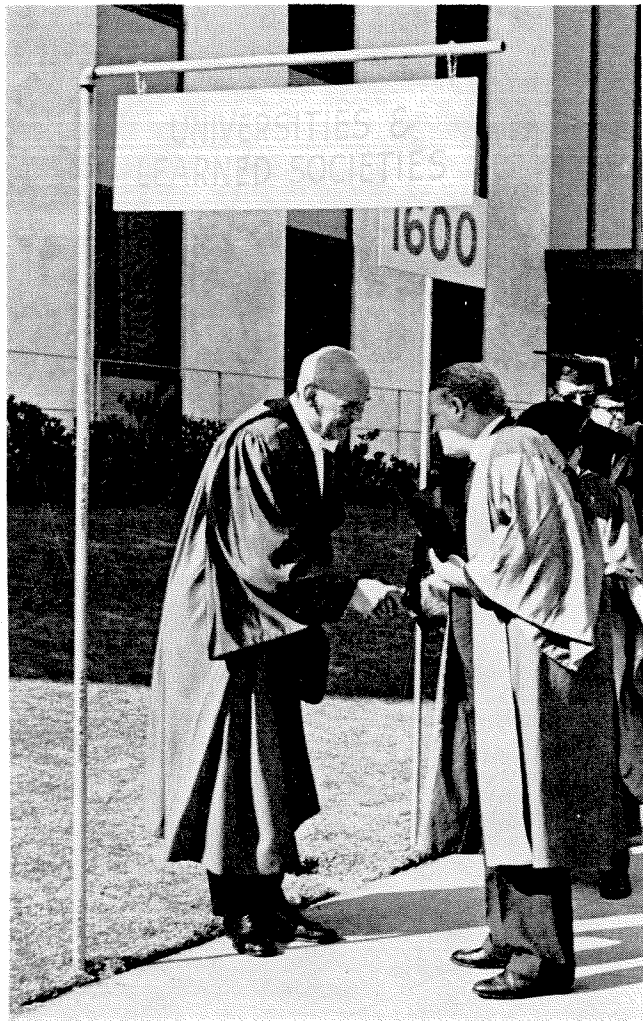


## CALTECH'S 75th ANNIVERSARY



The California Institute of Technology, founded as Throop University in 1891, began its 75th anniversary celebration with a colorful convocation on October 24, in which delegates from 124 other universities and learned societies took part. This was followed by a three-day Conference on Scientific Progress and Human Values, a formal dinner at which awards were presented to 23 distinguished alumni, an outdoor dinner given by the students, and a concert conducted by Igor Stravinsky—first of many events planned for the anniversary year.



*As their part of the festivities, undergraduates hosted a twilight dinner for nearly 800 people on October 26.*



*At the Conference on Scientific Progress and Human Values—(left) Simon Ramo, vice chairman of TRW Inc. and Caltech Provost Robert Bacher; (below) Caltech historian Rodman Paul and Asa Briggs, dean of the school of social studies at the University of Sussex, England.*



*Visitors had a chance to catch up on current Caltech research as Dabney Lounge was temporarily transformed into a scientific exposition.*



*Composer Igor Stravinsky, conducting the Caltech 75th Anniversary Orchestra, invited students to this final rehearsal before his special November 7 concert in Beckman Auditorium.*

# SCIENTIFIC PROGRESS AND HUMAN VALUES

*A report on Caltech's 75th anniversary conference*

*Caltech's Conference on Scientific Progress and Human Values*, the three-day meeting that was the core of the 75th anniversary celebration, brought together a group of British and American scholars who are concerned with the implications of science for our developing human society. For the most part the speeches and discussions represented an attempt to define the problems that are developing in a world which the scientist is sometimes inadvertently remaking.

The conferences began on Tuesday with a brief survey of the physical world as it appeared on October 25, 1966. Murray Gell-Mann, Caltech professor of theoretical physics, spoke of the smallest part of it, the elementary particles of matter, and of the current theories put forward to explain the complexities that new experiments keep revealing.

Jesse Greenstein, executive officer for astronomy and professor of astrophysics at Caltech, went to the other end of the scale, discussing work in astronomy that is constantly modifying our view of the universe. He ended with a pessimistic estimate of the likelihood of our knowing, even within thousands or millions of years, if man has any companions in the universe. *If his estimates are correct, man will have to continue coping with his own problems without the beneficent help of some other, more advanced civilization.*

Robert Sharp, chairman of Caltech's division of geological sciences, undertook to consider the vast middle ground between the atom and infinity. He pointed out that man, confined until now to the earth's thin crust, has nevertheless managed to learn a considerable amount about how his environment has been derived both from activities underneath him in the earth's interior and also from encounters with extra-terrestrial objects. *We may learn, he suggested, that those hunks of wandering matter, in the form of comets and asteroids, have been more important than we have so far imagined in shaping the surface features of the earth.*

From these speculations on the fundamental nature of man's environment the conference turned to consider how our expanding knowledge enables us increasingly to manipulate the conditions under

which we live. Three specialized views of the state and prospect of today's technology were presented. Sir William Penney, chairman of the United Kingdom's Atomic Energy Authority, noted that in power-poor Great Britain atomic energy is now widely applied and holds great promise for the future. In the next few years, however, he indicated that the United States would take a commanding world lead in nuclear power production, which has proved to be economically competitive with other power-generating means in this country.

George E. Mueller, NASA associate director for manned space flight, in evaluating exploration of the solar system at a time when man is about to take the big jump to the moon, said that the space program has become a powerful force which will bring technological, social, and economic rewards.

John R. Pierce, director of research for Bell Telephone Laboratories, predicted that the effects of modern communication systems will best be seen in rapid social unification of emerging nations. In more advanced countries communications will play a great role in meeting the complex demands of growing population and urban concentration.

The second day of the conference was devoted to what has become, in the last few years, an emergent scientific area full of hope and anxiety for its impact on man himself—the new biology. James F. Crow, head of the laboratory of genetics at the University of Wisconsin and a distinguished population geneticist, dealt with the new knowledge of heredity and evolution; he evaluated the rates and magnitudes of effects on human evolution to be expected from applications of the new biology and made a case for the importance and feasibility of humanity's preparing to direct man's own evolution.

Professor J. Z. Young of University College, London, discussed the probable future course of the collection and transmission of information by man. Memory and learning make it possible for each individual to receive detailed information, not from two parents only, but from many other humans, often distant in time and space. From its beginnings in speech to the establishment of vast memory stores in the form of books and computers, this has

probably been the main agent responsible for the astonishingly rapid development in human life and society in the last 10,000 years. Future changes in human life promise further improvements in the extracorporeal information store and in its use.

"As we understand life, we can control life," remarked Caltech professor of biophysics Robert Sinsheimer in opening the afternoon session. This understanding is increasing with astonishing rapidity. How far will it go? We can now assume that we will eventually create a self-reproducing cell. On the way to this achievement the determination of sex, the control of arthritic pain, and genetic therapy for diabetes are among the likely possibilities.

Will mind, sensation, and consciousness yield to the same analytical approach? Neal E. Miller, professor of behavioral sciences at Rockefeller University, suggested that human behavior is subject to natural laws and susceptible to scientific study. If we are able, either through the analysis of human behavior or through the study of the human brain, to understand these mysteries, we will face some awesome choices. But, as Sinsheimer noted, it may be that we have no choice, but are just "passengers on a fantastic street-car called evolution."

Robert Morison, director of the division of biological sciences at Cornell, pointed out some of the ways in which scientific progress is already drastically changing traditional social patterns. In regard to the transfer of information, for example, the family is already losing its traditional role as the main repository of knowledge in society. It may well lose much of its biological function too. How will our social institutions evolve to accommodate themselves to new conditions?

On Thursday morning Asa Briggs, dean of the school of social studies at the University of Sussex, England, added historical perspective to these prophetic flights by describing how in 1850 and again in 1900 men looked at their past and prophesied their future. Noting the prediction in 1900 that phrenology would be the science of the future, he pointed up the difficulty of distinguishing between fruitful paths of enquiry and the blind alleys of human curiosity. He suggested that the university was a proper vantage point from which to review our prospects in 1966.

Daniel Bell, professor of sociology at Columbia, went even further in stressing the role of the university. Characterizing our contemporary "post-industrial" society as one in which white-collar workers outnumber blue-collar workers, he envisioned a significant shift in the power structure from the empirical to the theoretical. When this change takes place, Bell suggested, the university will become

the primary institution of a new society.

Herbert J. Muller, professor of English and government at the University of Indiana, asserted that there is a basis for decisions that will have to be made, pointing out that while values are "scientifically unchaste," scientist and humanist both accept as absolute values such things as health, physical well-being, play, comradeship; and the satisfaction of the aesthetic sense, creative impulse, and natural curiosity. These values, he said, will exist as long as we assume that human existence is worthwhile. Nevertheless, the power that modern technology has given man is infinitely greater than ever before, and exercise of that power has too often not been responsive to those values. *Can we direct our technology to truly civilized, humane ends?*

A discussion on Thursday afternoon had Don K. Price, dean of the Harvard graduate school of public administration; James Bonner, Caltech professor of biology; Murray Gell-Mann; Carl Kaysen, director of the Institute for Advanced Study; and Simon Ramo, vice-chairman of TRW, Inc., trying to define some of the ramifications of technological progress. They concluded that man's social attitudes would have to be reorganized in the next few years and agreed that new decision-making agencies must be developed to cope with future problems in determining public policy. It may be that the university, which operates within demanding self-imposed rules that do attempt to recognize primary human values, will provide the model for the decision-making institutions of the future.

The closing session on Thursday evening dealt with the specific problem of how formal education will have to adapt itself to the kind of world the other speakers foresaw. Lord James of Rusholme, vice-chancellor of the University of York, England, saw science outstripping other fields, with a resulting alienation between scientist and non-scientist. He foresaw the greatest problem of this alienation as overcoming growing specialization in science—a specialization which cripples the scientist in other fields. To overcome this limitation he suggests a more general, even superficial, education for the scientist in non-scientific fields, and a broader exposure to science for the non-scientist to prepare him to live in a scientific world. To implement this new kind of education, more and better teachers—people who consider teaching and self-education their primary job—are needed. "In the last resort, if our education is to get better, as it must, it will get better because it is carried on by more educated, more sensitive, and more humane people who are not afraid to emphasize the social relevance of the subjects they teach."