

CREATING THE NEXT DISCIPLINE

The humanities and social sciences at Caltech—as eleven members of the division faculty see them.

The history of the development of the California Institute of Technology and the study of the humanities as a part of the curriculum are inextricably interwoven. For more than 50 years, there has been no wavering from commitment to the principle that the education of scientists and engineers should be a full one in the classical sense—that it should be leavened with a broad program of humanistic and cultural studies.

Over the years, of course, both the Institute and the humanities division have grown and changed in scope and emphasis, but undergraduates have always been required to take from 20 to 25 percent of their coursework in humanities subjects. Since 1965 students have been offered options in English literature, history, and economics. Signalling a new direction, the division added Social Sciences to its name in 1966. Now, in 1971, social science has become an integral part of the curriculum; and the growing faculty and staff of the division are for the first time in many years housed in one building—the beautiful new Baxter Hall.

What role do the humanities and social sciences play in the education of a Caltech student in 1971? What role *should* they play?

A group of undergraduates addressed themselves to these questions recently in a meeting with the visiting committee of the division—an advisory group of trustees, alumni, and other distinguished friends of the division.

Some student comments:

“What’s a humanity—and how do you pour it into a scientist to make him more human?”

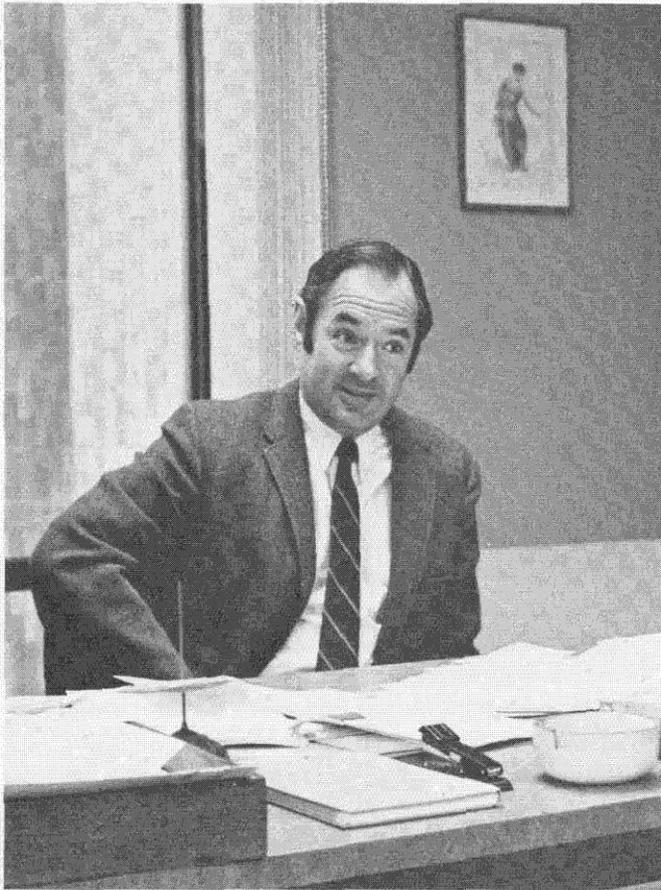
“Tech has given us all a knee-jerk assumption that the faculty in the humanities and social sciences aren’t rigorous. But if you talk to those guys, you find out that they are critical, logical, and analytical, even when they’re not quantitative—and some of them are that, too.”

“Somewhere in the world there has to be a place where people are interested in both science and the humanities.”

“I’m staying here even though I’m not going into scientific research. We’re a technological society, and to effect change you have to understand science.”

Such comments indicate the depth of the students’ concern with this aspect of their education. It is a concern that is shared by the faculty of the Division of the Humanities and Social Sciences. Their answers to some of these perennial questions are presented on the following pages, in a series of *Engineering and Science* interviews with 11 members of the division.

What is the role of the division?



Robert A. Huttenback

*professor of history, dean of students,
and acting chairman of the division
of humanities and social sciences*

Caltech has always been innovative and forward looking, and the Division of the Humanities and Social Sciences, rather than duplicating what is already being done, is concerned now with moving ahead—with creating the next discipline. One new direction lies in social science, viewed not in its traditional guises of economics, political science, sociology, and psychology, but as a truly a-disciplinary and interdisciplinary venture.

We are already heading in this direction. For example, one of our current efforts is attempting to fund a Center for Applied and Theoretical Research in the Social Aspects of Public Needs. The center will consist of a group of faculty—and perhaps eventually graduate students—who will be dealing with questions of social policy and problems at two levels. They will be developing and improving social science theory. And they will provide personnel for the growing number of campus programs concerned with applications of theory to social problems. Some of our economists are now working in the Environmental Quality Laboratory, and other division members—including an anthropologist—are working with the Environmental Engineering Science and the population programs.

In the future we hope to work closely with JPL's section on social problems. If a center is developed on campus, as is hoped, to deal with problems of natural disasters, we will be cooperating with it. I expect that our work will include both the hard and the soft social sciences, although—given the history and strengths of the Institute—a heavy emphasis on analysis and quantification is likely.

The role of the division in the areas of the humanities is somewhat different. We must continue to emphasize undergraduate education and excellence of teaching. We also have a responsibility for the enrichment of the entire campus community. That means increasing our efforts in such affective areas as art, music, and drama. Possibly we should establish a Center for the Creative Arts. Next year we will have two poets-in-residence: Robert Kelly and Diane Wakowski. William Agee, curator of the Pasadena Art Museum, will offer a course in modern art history, and we are particularly happy that Erik Erikson will give the Haynes Foundation Lectures in January 1972. Then in the fall, Professor Erikson will be in residence on the campus and will lead a seminar on the nature of creativity.

In what areas does the division perform?

David C. Elliot

*professor of history and executive officer
for humanities and social sciences*

The division has two areas in which it performs. One is in the humanities, where for many years we have been concerned with giving students an opportunity to talk about values—to understand that things are not always cut and dried mathematically and that even when they are, choices still have to be made.

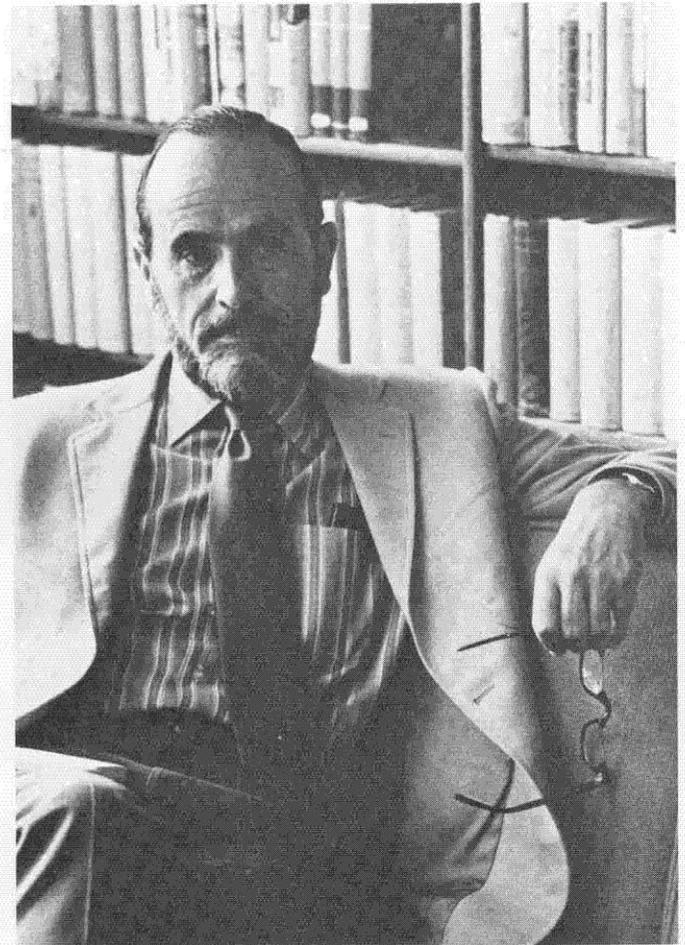
In the social sciences, which is the other area in which we perform, I think it is important that we think about the effects of scientific developments on human life. The problems that arise are social problems.

A classic case is the development of atomic energy and then the atomic bomb, which dramatically changed the whole security picture in this country. Arms control and security problems are examples of the kinds of social problems we at Caltech should try to deal with; and in an environment that is highly skilled technically and scientifically, we ought to be able to get a line on such practical problems.

This particular interest is expressed at present in our connection with the Southern California Arms Control and Foreign Policy Seminar which Caltech and the RAND Corporation jointly sponsor. Last year the Ford Foundation gave a three-year grant of \$285,000 to enable RAND and Caltech to bring together people who are interested in these matters. I should hope that we could encourage three or four young guys, graduate students or faculty members, to develop an interest in this field. The ranks of the older generation—the Bachers and the DuBridges, who were involved in the early development and application of atomic energy—are thinning out. It's about time we had some younger people applying their minds to this problem, which is not going to be solved tomorrow. It's going to be a problem for their generation, and the next one, and I think we have a public responsibility to provide the opportunity for some of our young people to become involved.

Right now I think there is some real skepticism about what social science can contribute, because—quite frankly—despite much creative work, there's a lot of guff there. Possibly the most suspicious of all are the humanities people here, especially when they see the obvious or the over-simplified proved with mathematical precision.

Economics tends to be recognized as being more mature than other social sciences, and I suppose it is. Is that because it's more mathematical—because you can add up pounds and shillings and dollars and cents, whereas it's harder to add up human attitudes and beliefs?



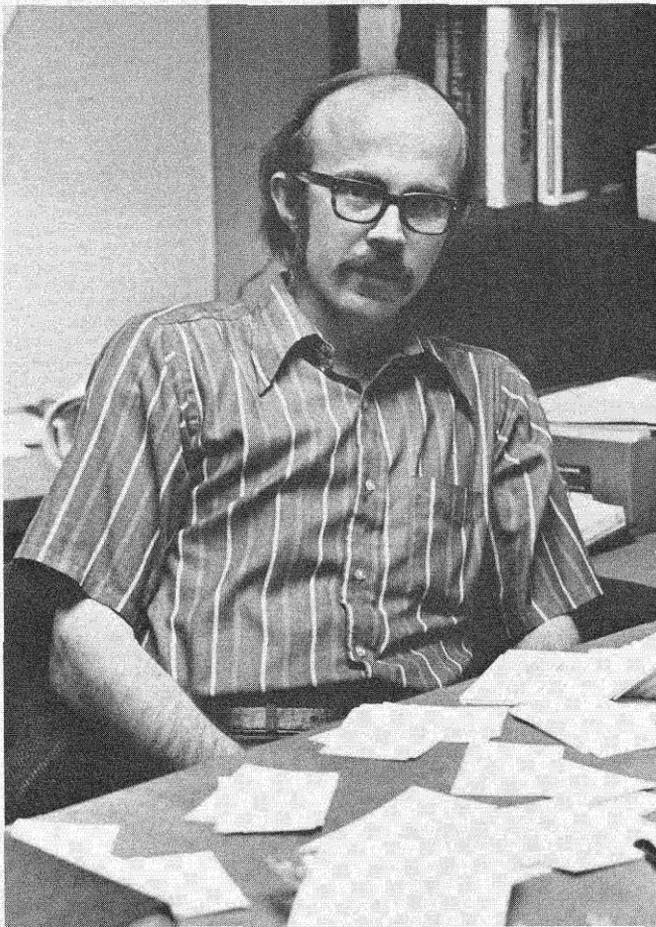
Can one make the rest of the social sciences mathematical in the same way as economics? This is a real question, and I don't think the answer is yet clear. And, anyway, is this what we mean by rigor—making things mathematical?

Where is the division heading?

Robert Bates

assistant professor of political science

I think the division is headed in a very exciting direction in terms of formal, analytical modeling or theorizing about social, economic, and political processes. By its very nature, Caltech is a place where that can be done in a superior way, and political science will have a strong part



to play in it. Political science departments are increasingly turning out people who are very much interested in the modeling of political theories.

There's also room for another kind of political scientist here—the kind concerned with making empirical observations of how people behave politically; getting out and interviewing a lot of people in the field; doing public opinion studies, power analysis, and decision-making analysis. This is more the kind of political scientist I am. One place we might work that in at Caltech is with EQL, doing studies of active decision-making for the regulation of power supplies, population controls, transportation schemes, and things like that.

I say, as do many people in this division, that the talents may be different for these two kinds of political scientists, but the two types are not incompatible. Obviously, in terms of good analysis they can't be incompatible. When you look at empirical reality, you ought to be testing something. When you try to explain what you see, you should be taking recourse to certain kinds of theories. And I don't have an awful lot of respect for theorizing that hasn't been worked against an empirical data base, either.

Caltech offers a social scientist several things. One is an incredible amount of freedom to do whatever it is that he wants to do; he doesn't have to fit into an already rigidified program that has to perpetuate itself. Another thing it offers is very bright and able students. People are doing work for me in freshman courses here that would be highly respectable in some graduate courses. And then there is the material support that the Institute gives the social scientists. In most universities, a young assistant professor couldn't expect to get anything like the kind of support that has been available to me here.

There are disadvantages of course: the small library and lack of a graduate program at the moment. You tend to feel lonely intellectually. You miss having people to talk to who will have an immediate grasp of the field so you won't have to go slugging your way through to an understanding of even why it's important. But this can be overcome to some extent by taking advantage of the tremendous range of professional interests available at other universities in southern California.

This isolation is something that people seriously consider when they think about signing up at Caltech. But the thing is, some of the areas of political science that we will be working in are so new that you'd be equally isolated almost anywhere. A man who is really in the forefront of the field isn't going to be any better off even in a school with a big political science department.

What makes the division interesting?

Thayer Scudder

professor of anthropology

I think the most interesting thing about the division is its diversity—which also creates its greatest problem. I doubt if there is another academic division in the country to compare with it. Right here at Caltech, it is certainly more diverse, for example, than the Division of Physics, Mathematics and Astronomy. We run the whole gamut in teaching—from English literature and art, where you are primarily concerned with aesthetics and values, to econometrics and analytical techniques in political science, which is highly quantitative and scientific.

Other prestigious universities have busted up the humanities and social sciences into departments: economics, political science, psychology. I think it would be a great mistake to do that at Caltech. One of our advantages is that we have the opportunity to develop an a-disciplinary program that is interested in intellectual problems involving a wide range of social sciences and humanities.

I'm an anthropologist. As such I'm a behavioral scientist; I'm also a social scientist, but I'm also in the humanities. Other anthropologists are involved in the biological sciences. Those subdivisions met the traditional conveniences of the past, but they will not necessarily be conveniences in the future.

Many of our intellectual and applied problems in the United States and the world today are problems that can be dealt with only through the interdisciplinary approach, utilizing a wide range of social sciences and also bringing in the disciplines which are primarily concerned with questions of values—the humanities.

And I think we will be able to get the kind of people we need to develop the division along these lines. It is true that our reputation as primarily a science school handicaps us in recruiting the kind of people who feel happiest in a large department, and this probably includes the majority of social scientists. Certainly, the best departments in the country in political science or anthropology, for example, are the largest ones. And young people a little uncertain of themselves probably won't want to come to a place where they're going to risk being alone.

On the other hand, I think we have a tremendous advantage in recruiting brilliant oddballs. When I say "oddballs," I mean people who want to come to a place where they can do their own thing without the security of a long-established structure behind them, where they can have some input into the system no matter how junior they



are. I suppose we can automatically eliminate 90 percent of the possible candidates, but the remaining 10 percent—the oddballs—are some of the brightest guys being turned out today.

Similarly, when we get into graduate education, I think the division will attract an unusual kind of graduate student. They are going to be setting up their own programs instead of getting their degrees in the traditional disciplines. The fact that we have no graduate program now means that the dead weight of tradition isn't holding us back.

What should we try to do very well?

Dan Kevles

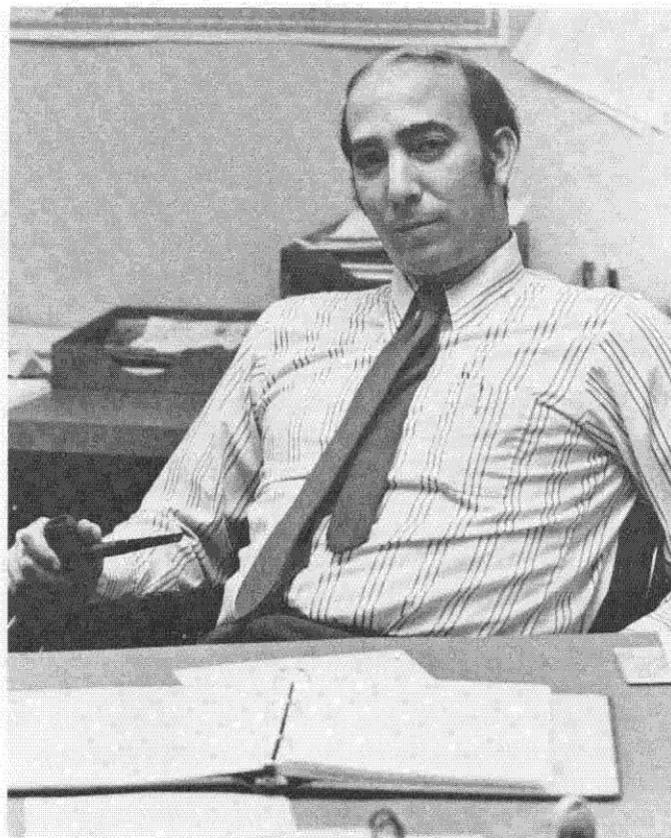
associate professor of history

Over the years we have been asking ourselves the key question: What are those few things we ought to be trying to do very well? Social science is one obvious choice because contemporary social science is moving increasingly in an analytical and mathematical direction. Given the strong support in other divisions for this approach to the world—and a good deal of expertise and facilities, like computer banks, for helping us to develop it—this seems an appropriate thing for Caltech to do.

Many of us believe that the history of science in the 20th century is another appropriate field to do at Caltech. For one thing, there's the obvious reason that Caltech is a scientific and technological institution. The Institute is relatively young, and accordingly all its work has been done in 20th century science: in physics, quantum mechanics and nuclear physics; in biology, molecular biology and genetics; in geology, geophysics, geochemistry, and, more recently, planetary science. The story of the development of these fields is well worth doing and there aren't any programs anywhere in the United States in the history of 20th century science as such.

Generally, historians of science are centered in the 17th and 18th centuries, and they deal primarily with intellectual history, with the development of scientific ideas. By concentrating on the history of 20th century science, we would be filling an important academic gap. And by including the social, political, institutional, and economic history of science, especially in the United States, we would be doing it in a unique way.

I should add that there is another and quite different reason for doing social science at Caltech. Financially, science in the United States has gone through its golden years and then its lean years in an almost cyclic fashion. In the golden years, the scientific community has managed to argue that what's good for science is *ipso facto* good for society. The public has in general been willing to go along with this notion in the golden years mainly, I think, because at those times it's been more interested in the enlargement of the economic pie than in its distribution. The lean years for science have occurred when the larger public has become concerned with social reform: in coping with the environment, with depressions, with social problems. At such times it has tended to mount something of a revolt against science, and to contend that we should be doing less to advance science and more to assure that the benefits of science are distributed and controlled in an equitable



way. In the past the critics have fastened upon the social sciences as an intellectual and managerial instrument to achieve this end. You don't have to be especially well informed to know that they are doing the same thing today.

Considering the contemporary mood, the scientific community—and Caltech in particular—would be doing itself a disservice if it were to dig in against the social sciences. It seems to me that the scientific community would have served itself and the nation better if for the last 40 years, since the depression in short, it had paid more attention to the distribution of the benefits of science. I would be willing to argue that Caltech ought to commit itself to a program in the social sciences at this point in time precisely because the public is suspicious of the natural sciences. By doing so the Institute would be telling the public that it is not merely interested in advancing science at great public cost. It would be telling the public that, parallel and together with advancing science, it is also interested in helping to assure that science is used to good social purpose. In my opinion, that would be in the best interests of Caltech and science, not to mention the republic.

How is the division changing?

Peter Fay

professor of history

I think the division is going to be moving from its traditional middle ground out toward the ends of the scale—in both directions. We're going to be successful in developing quantitative social sciences of the same caliber and much the same kind of interest and specialization that the science and engineering disciplines have. And that's new, because this Institute didn't have any such thing—didn't even have that ambition—until four or five years ago.

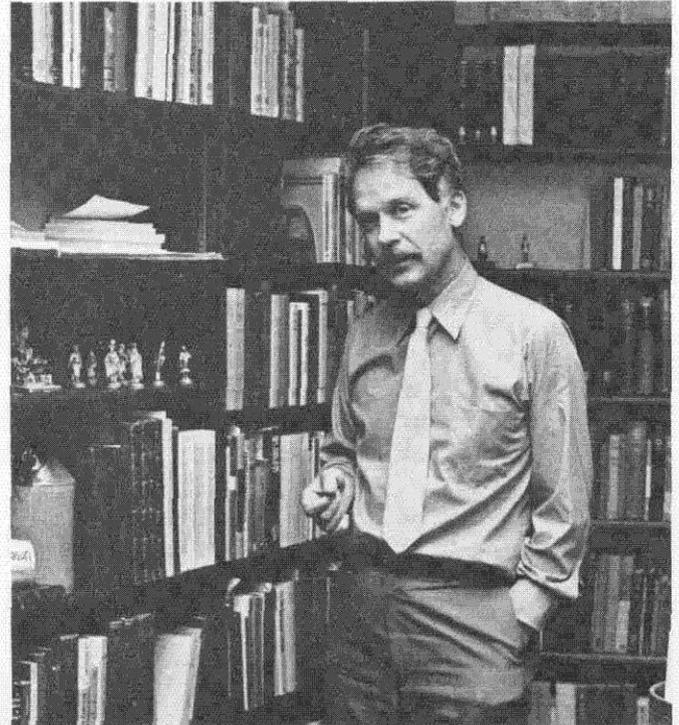
On the other end of the scale I think we're going to grow in the "affective" area—the arts. I don't think we're ever going to have a formal course for Institute credit in piano playing or oil painting, but we may well have course work in art history or music theory, and facilities for art activity in the widest sense—visiting artists, practice rooms, and pianos, for example.

What really concerns me is the middle area of the scale, where English and history are. They have the two largest faculties in the division, and measured by either their teaching or their writing they're strong. But their range is narrow. We historians are almost all in either American or European history.

I think we've become so specialized because of the teaching requirement we've had. For years all incoming freshmen had to take European history and English, and all sophomores had to take American history. So we acquired a very large faculty in a very few subjects. If we're going to diversify—and I think a good case can be made for that—we're going to have to let our history and English faculty contract by a gradual process of attrition, and use those slots to widen our range. We could offer Chinese history maybe, or Italian or Latin American history, and some literature that's not English.

We're on our way to some of this because the requirements have been changed. Next year the freshmen will be offered a smorgasbord of courses that will fulfill the humanities requirement. I would define humanities as work which is not expressible in mathematical terms, that must be put into words. A course in which you read prose, in which you write, in which you argue in prose, is a humanities course.

That, of course, excludes the kinds of mathematical social sciences that our social scientists are pushing, and they're the ones who are pushing the show right now. We're hiring analytical political scientists instead of descriptive political scientists, for example; and



economists who work with models but regard Galbraith as frivolous because he writes big surveys in prose for the general public. Some of our social scientists think if they can't do their work with mathematics, it isn't worth doing.

At least in the short run, that's the way things are likely to go here, and in some ways that's unfortunate. I'd like to have the descriptive faculty too.

It seems to me that we should have among the political scientists, for instance, someone who is interested in understanding the American or European political systems; and that he should start teaching with a descriptive recreation of past politics related to present politics. I know our students need this. The freshmen I teach simply do not understand, descriptively, how the American—or any other—political system works. They can't describe it.

A descriptive understanding of the whole has to precede analysis of any of the parts. I'm pretty sure that the analytical political scientist can't tackle the whole spectrum of politics, because some of it is too human to be susceptible to mathematical analysis. If you line up their articles—with all their mathematical analysis—in the end they won't, I suspect, give a total view. Educated people ought to have a reasonable understanding of the American political system as a whole, and for this some plain description is indispensable.

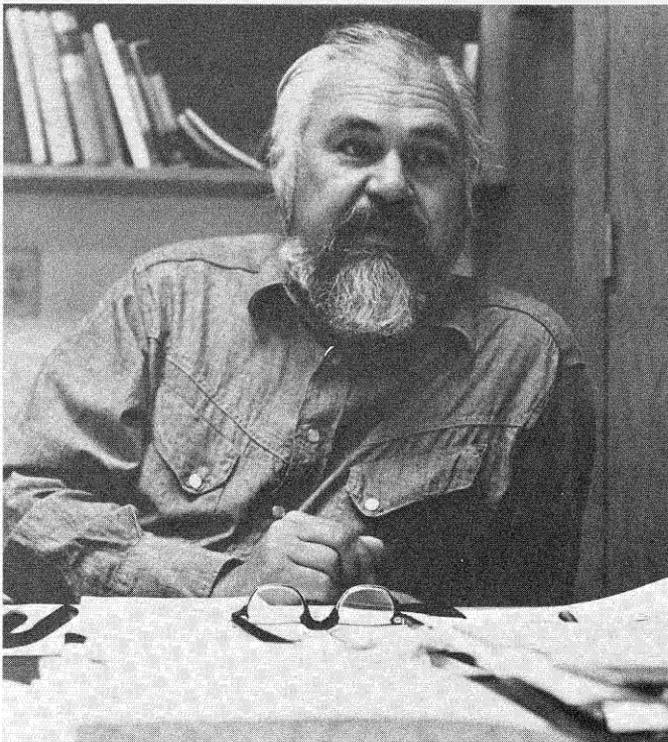
David Smith*associate professor of English
and master of student houses*

One of the difficulties with work in the humanities here at Caltech is that it is so different from work in any other field. The social sciences and the sciences are rather alike in that their work is, in a sense, done publicly; it's very often done by groups of people. Humanities are done alone—in a closet thinking.

It's very easy to be a humanist here and to feel isolated, because there are not very many people doing what you are doing, and not many who understand the need for privacy and quiet and the singular effort that goes into it. And, indeed, we *are* somewhat isolated—or at least on the periphery of activities at the Institute.

What that sense of isolation—and lack of worth—can lead to is the loss of good faculty in the humanities. We have very, very fine scholars in the English and history departments right now—two or three of world reputation and several others of sound national reputation. We have to fight against losing people like that.

But we in humanities have to do something to establish a sense of activity on our own part, and we have to feel a sense of commitment by the Institute that humanities are really worth doing. I don't really feel that we need graduate students as much as we need support for our research and for leaves of absence. It's very difficult to get an outside grant if you're in humanities, no matter how good you may be, so the help the Institute does give is very much appreciated.



The tradition of the sabbatical has reasons, you know. At some point you have to have a means of getting out to get some perspective. I taught a course at Cal State, Los Angeles, and that did more good for my teaching here than anything that's happened in a long time.

The students at Cal State weren't the greatest in the world, but some of them were surprisingly good. They were mostly English majors. They were all seniors, but the class was evenly divided between men and women. I had a middle-aged nun, an old lady who was finding something to do with her time since her children were grown up, a couple of housewives, and some young students. That kind of change is really very exciting.

One thing we could do here is to admit a few people who are going to actually do humanities—in effect make the English major more a real major than it is. Now, it's for people who came here thinking they were going into the sciences, and defected. They say we're turning out a special kind of English major, one who can take a heavy load of science in his junior and senior year. But you can't really train an English major if he's spending half his time in the sciences any more than you could train a scientist if he was spending half his time in English. One kind of arrogance in a scientific institution is the assumption that it doesn't matter whether you're a good English major or not.

Two areas in which we ought to do more work are in the history and philosophy of science. So many kids come here accepting science as an absolute in itself—and even the scientists don't accept it as an absolute. Science is a cultural phenomenon, a product of the civilization and vastly influenced by all kinds of ideas.

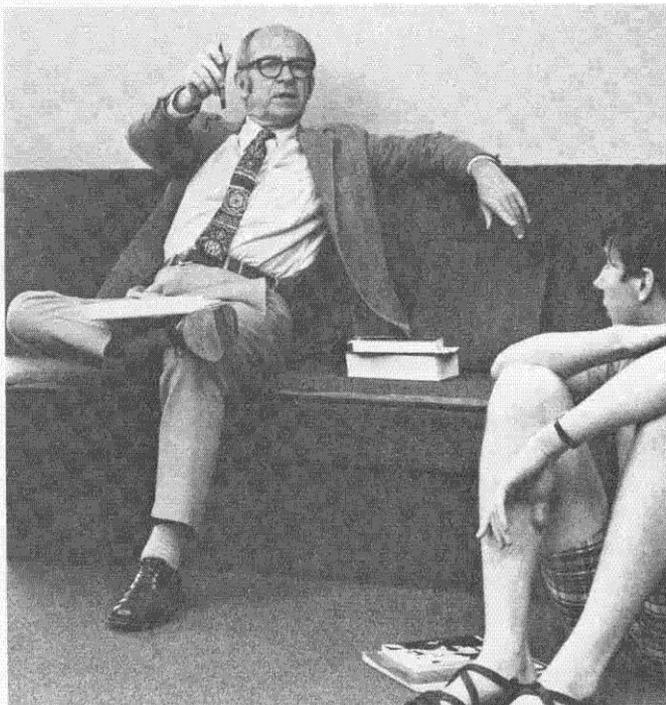
The "affective" areas at the Institute are pretty marginal right now, but there's a good deal of talk about enlarging them. Bob Huttenback is trying to move the division in this direction. Next year we will have two poets-in-residence, and I wish we could bring in an occasional novelist or musician. This is a grandiose dream, but why not increase our offerings in music—just a bit? Perhaps we could get instructors who are performing artists as well. With a little imagination, some shifting of priorities in the division, and a little additional money, we could begin to make this a more lively place.

As for the arts program, which is three years old now, unless we get some more funding, quick, it's going to fall apart. But there is a core—an exhibitions program, which I've been doing—and some artists-in-residence actually working here, and we ought to get more mileage out of them. They, along with the exhibitions program—to which we're absolutely committed—can be most useful in interesting community people in the Institute.

literature and the arts?

Charles Newton

lecturer in English



One area where we will encourage students to experiment is that of making films. The cost has been underwritten for three years by a gift from Frank Capra, who is an alumnus and a member of the humanities visiting committee.

Administratively, we don't expect this project to take a place in the curriculum, but several of us regard ourselves as contributing volunteer time to the supervision and organization of a student activity. The first year will probably be one of exploration—finding out what we need to know. This summer we want to decide what kind of professional help we need.

Some students are interested in film as an artistic creation; others want to use it as a means of communication. About 15 students have indicated an interest so far, and a few of them think they can put together a project that can qualify for independent studies credit—as students did at Harvard.

I think we are going to see surprising originality in some of these projects. Not long ago one of the undergraduates shot a time-delay sequence of the sun rising over Millikan Library, and then edited it together with some tape-recorded music so that when the sun's rays struck refraction angles in the lens, the music hit a big chord. It was good.

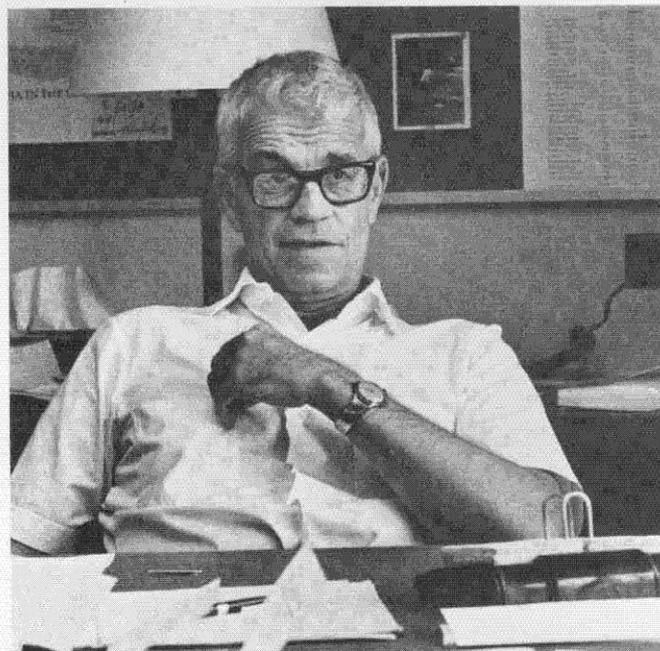
J. Kent Clark

professor of English

There is going to be a new emphasis on the visual and performing arts at Caltech, and we in humanities think it is going to help us do a better job of teaching. Forms of art like dance, drama, and film are creative and more immediately available to our students than some of the great literary art; they require less sophistication for an initial kind of appreciation and response. The visual and performing arts are valuable in themselves, of course, and they should also be useful in leading students from the simple to the more complex forms of expression.

In our age there is an intense and increasing involvement with morals and values. Combine this with the constant need for beauty, significance, and self-expression, and you get a natural concern with the humanities in general and the arts in particular. Here great literature is extremely important, because literature is an attempt to deal with values and behavior; with the intricacies of the human soul. This is, of course, why Dostoevsky, Shakespeare, Joyce, and Eliot, for instance, are so interesting and discussable today—and permanently important. Great art of this kind is always relevant and is to be distinguished from temporary flashes and fashion.

But literature usually requires a good deal of sophistication, both in reading and in experience. That is its great difference from, say, mathematics: Once you master a difficult abstract principle of math, you've got it; no richness of personal experience of feeling is required. It is humanities' job to help people become capable of dealing with complexity and sophistication in artistic and intellectual values.



Why should Caltech get into the social sciences?

Lance Davis

professor of economics

Why should Caltech get into the social sciences? Well, a part of the answer is that we have some very, very fine undergraduate students who are beginning to find that the scientific world may not be just what they want. It seems too narrow, too confining, and not really relevant to some of the major problems that face the world. Secondly, we have already gathered a damn good social sciences faculty; with the additions we've made in the last two years we have a very powerful capability in the area that falls between economics and political science—what I call public choice.

Finally, and most important, many of the most pressing problems around the world today—while they frequently have an important scientific and engineering component—are basically social science problems. Caltech could go on doing first-class science forever, but if we want to do



the stuff in the next 10 years that's as exciting as biology was 15 years ago, and as physics was 30 years ago, we'd darn well better get into social science. All the environmental problems clearly have a major social science orientation; and the same thing is true of population, of poverty, of the ghetto. Science can offer something, but social science is the major area concerned.

I want to see Caltech have a major role in the formulation of some really predictive theory in social science—theory that can be used to formulate rational public policy. Just as science attempts to structure theories that make sense of phenomena and allow you to predict what will happen, analytical social science needs to build theories that will be useful and relevant for handling problems. It's only through reasonable prediction that you can get any measure of control of your environment.

Economic and mathematical academic theory have had fantastic impact in the past 20 years. But in the political world, as yet there are fewer important uses of theory. That's principally because the theory has been so lousy. It's only been since the late fifties that we have had the beginnings of some very simple-minded analytical theory in political science. Now the work has become more useful in the sense of being able to predict in a reasonable fashion some behavior of a government institution. There's been a lot of work on things like the actions of congressional committees, or on small-group decision-making in such things as zoning boards—all of which has led to the beginnings of some sensible policy. If I were going to start over again, I'd be a political scientist. I think that's where the action's going to be over the next 10 years.

Some of the new people coming to the division are interested, and very competent, in applying this analytical methodology to problems that fall between economics and politics. Another group here says: "Look, economics hasn't been concerned enough with psychological aspects of problems. You'll have to modify some of your theories on the basis of personality and individual behavior." And the third leg of our program is provided by people who are interested in laboratory simulation of small-group behavior, or in field work in real-world situations—men who are attempting to bridge the gap between theory and the problems of the world.

So we have within the same operation quite different groups, which I think will interact with each other in ways that will provide us with a well-rounded program: the formulation of theory; the application and testing of that theory in the light of what happens in the world; and then modifications necessary to make that theory cope with the fact that you're dealing with individuals, not computers; and, finally, useful policy recommendations.

*What will be the impact of
social sciences on the humanities?*

Rodman Paul

professor of history

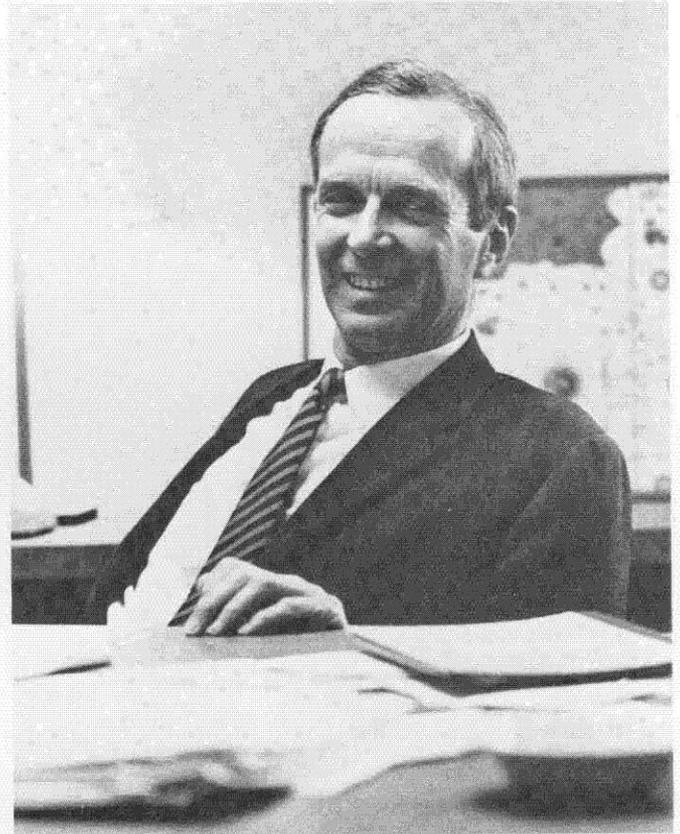
I'm not at all sure the social sciences, which are at last getting started, will really have a deep impact on most of the humanities. Indeed, in a superficial sense they will be competitive. We all know that; and yet, as a matter of faith, I believe the social sciences should be cultivated. But in the process I don't want to see history, literature, and philosophy neglected. Nor do I want us to neglect music, the fine arts, and drama—things we haven't ever done a great deal with here.

If this place remains small and in one nice building so that we can share students, lunches, and bull sessions, I think there's a fair possibility for fruitful interchange on an individual basis between the social sciences and the humanities. But a handsome building is not in itself a guarantee of that. At Harvard the chairman of one department complained to me that his new little skyscraper kept his scholars vertically fragmented; and at the University of Pennsylvania another said that their brand new sprawling headquarters made for horizontal fragmentation. Maybe we need a cube.

Graduate work in the division will no doubt always be very selective, and it should be. I think graduate work in the social sciences will come very quickly; and graduate work in a few highly selective areas of history might be quite logical. But there will never be a broad-scale attack on the social sciences; we would have to change the whole nature of the place, increase it to an unmanageable size, to do that.

There's a lot of debate as to the function of humanities, and it's harder to define that than it is to define the function of the social sciences. Ask yourself, for instance, why we have historians around this place. Well, I've been here since 1947 teaching undergraduates, and I've long since outgrown the notion that it was to make cultivated gentlemen out of them. We do help give them a more rounded outlook, so that their education will not be hopelessly one-sided. But we in the humanities have a chance to offer them not only useful information, but subjects that lead to a consideration of values, which may lead them to form their own values. And we can help them get fun out of life—a sense of beauty, a sense of pleasure.

The key to the whole thing is to get first-rate people. Many of the first-quality people in the nonscientific areas are reluctant to come to Caltech because it seems an alien environment. A great many are afraid to come to a place where so many of their colleagues speak another



language and think in an unfamiliar way. So, there have been a great many difficulties over the years in recruiting the best people. To a great extent the only people who have stayed and have been productive in their fields have been the loners, people who don't need to be surrounded by a crew of admiring graduate students, research assistants, and colleagues; people who aren't afraid to be in a community where many people won't understand them. I've often said that Caltech should pay bigger salaries to nonscientists than the national going rate, and provide better research support than is available elsewhere, in order to increase the material attractions of teaching here.