

# AN INTERVIEW WITH HAROLD BROWN

## THE PARTICIPANTS

**Anne Bacon**, assistant to director of development  
**Peter Beckman**, '74, editor-in-chief, California Tech  
**Jesse Beauchamp**, associate professor of chemistry  
**Don Davidson**, '38, chairman, Alumni Fund  
**Lee Hood**, assistant professor of biology  
**Don Hudson**, professor of mechanical engineering  
and applied mechanics  
**Andy Ingersoll**, associate professor of planetary science;  
staff associate, Hale Observatories  
**Joe Morin**, '73, president, board of directors, ASCIT  
**Jerry Pine**, professor of physics  
**Gerry Ward**, chairman, Graduate Student Council

**BACON:** I remember in the early fifties it was being said around the nation that we didn't need any more scientists or engineers. Then suddenly the demand went up again and there was the great boom. Now, with the federal government withholding funds, are we going to find ourselves in the same boat we were in 20 years ago? Is pure research going to be hampered—and graduate fellowships?

**BROWN:** It is certainly true that the demand for graduate science and engineering seems to go in cycles. It is also true that federal support seems to go in cycles, and federal interests seem to change from one thing to another.

The up-cycle that started in 1957-58 with Sputnik was actually a continuation of an overall trend that began right after the war, of *very* strong federal support for basic research, which produced a certain way of supporting graduate students too. It was run that way for about 20 years—and it's *still* run roughly that way. But in the late sixties national interest—popular interest—began to change. People became more and more concerned with social ills whose solutions weren't possible in purely technical terms. In the second place, the university population, which had been going up very fast all through the fifties and sixties, had to level out—just as any exponential has to level out.

These two things came together, along with a federal fund shortage, to produce a very severe crunch on the universities. I think Caltech hasn't suffered nearly as much as many other places, but we've had our difficulties, too.

The federal government's reduction of support for science and technology has, of course, hurt our support of graduate students. There has been a confusion, I think, between the need for scientists and engineers in society as a whole and the question of how rapidly the universities can continue to grow. Our own students have been largely oriented toward academic research after they leave. And that's where there's been the most severe leveling out of job prospects

I think that as people become clearer on what the real societal problems are, and as they become clearer about how to solve them, there is going to be an increasing number of jobs for technically trained people, because all

the questions of environmental pollution and regulation of environment, and new transportation systems, and so on, are going to demand new kinds of technology and new people to do them.

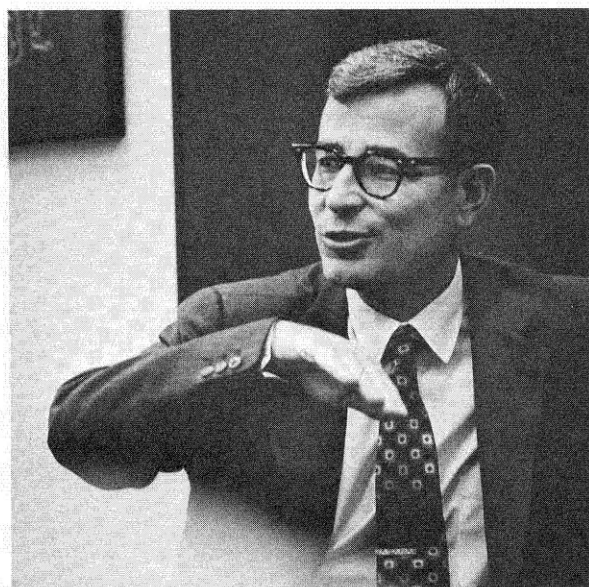
I don't think that Caltech can, any better than any other place, outguess the future to the degree of training people now for what they will be needed for very specifically 15 or 20 years from now. I do think that a Caltech education can be, and to a very real degree is, training people broadly enough in science so that they *can* move from one thing to another.

**HOOD:** It seems to me that one of the things Caltech has been very good at in the past is guessing where the action is going to be in the future. It's very evident now that we have limited resources with which to make guesses, so, in your estimation, where is the action going to be in the next ten years?

**BROWN:** When I start to answer the question of whether we should go into this or that area, it is on the basis of several things. First of all, in which areas is it going to be important for academic science to produce results? What is society going to be interested in? Where does the science and technology itself lead? It's not enough to have a problem. The state of the technology and science has to be such that you can contribute to the solving of the problem. That leads to the third matter—specifically, what talents does Caltech have, or can it accumulate, to help solve these problems?

It seems perfectly clear to me that biology and chemistry, and engineering also, can and will combine to make big advances in medical technology.

Another area is the application of engineering, and science, to problems of environment. I would include in that, for example, some of the things we are already doing—our environmental engineering sciences program, and also the Environmental Quality Laboratory. EQL is rather different from some of the things we've done. The problem is to make sure that there are enough components of technology in it so that the faculty feel comfortable with it. But I would associate that problem also with something that's quite different in organization—namely the Center for Natural Disasters—which is a center for research on the problems of natural disasters. That clearly has a much larger component of technology. Nevertheless, it also has to bring in the studies of systems and of public policy, the economics of these questions, and the political and social problems that go with them, because insurance is a big part of natural disasters, and land use is a big part of natural disasters, and all the rest. I would place the Disaster Center with the Environmental Quality Laboratory as an attempt by people at Caltech to try to bring together different kinds of technology, and to apply



them to problems that either implicitly or explicitly are matters of public policy.

The Population Program is not quite as well known at Caltech as the other two, but it exists here and might in the future combine very well with EQL to look at a still broader question of public policy.

Now all these things are largely applied. I think that there are also some places in basic research that are flowering or are ripe to be exploited. It is clear that astrophysics—both experimental and theoretical—is really coming up with new things faster than people can explain them, and we might be willing to gamble on setting up something in that area.

But I'm not foolish enough to think that this sort of question is something I can decide all by myself. Even if I had the power to do so, I don't think I'm smart enough. I have to listen to other people, and try to decide who to listen to, see what the consensus is—if there is a consensus—and then make my decision.

**INGERSOLL:** We've been talking about areas of research that Caltech might move into. What about teaching? It seems to me there's a demand for good science teaching at the graduate and undergraduate level, and that Caltech *has* good teachers who are perhaps not being used to their fullest capacity as teachers. One of the reasons is that students are so expensive. Do *you* feel that students are expensive? Do you feel that Caltech is going to take more or less advantage of its teaching capabilities?

**BROWN:** It depends on how you calculate the expense of a student. If you do it by dividing the resources we've got for teaching (which is essentially the number of faculty that a certain limited amount of dollars can pay

We should have  
as many students  
as we can  
without seeing  
the quality of the  
teaching go down.  
That's why I'm  
in favor of  
a slightly larger  
student body



Beckman

for)—if you divide that by a certain number of students, then the answer comes out that students are expensive. To me, that suggests that we should have as many students as we can without seeing the quality of the teaching go down. And that's why in general I'm in favor of a slightly larger student body. Many faculty feel that beyond a certain number the nature of the interaction with students changes and the quality goes down. However, I would still favor adding students until you get to the point that the nature of the educational experience changes, and I think that 800 is *not* the limit for undergraduate students. I would be very surprised if it were 1,000—but I don't think it's as low as 800, and for that reason I think it would be a mistake to reduce it to 600 or 500 as some people have suggested.

I haven't really answered your question, except to suggest that one way Caltech can do more teaching is to have *some* more undergraduate students—and graduate students too.

INGERSOLL: I think some demand for teaching is for a different sort than we presently offer our undergraduates. It's perhaps more popular science for adults who want to learn a little physics, and maybe never use it. It would be for students—but not necessarily young students. This is a pet thing with me. Adults may want to come here and take classes. Is that a potential financial source for Caltech?

BROWN: Yes, but indirectly. We do a certain amount of popular science—like the Watson lectures in the Beckman Auditorium. I think those are very popular. But I think there's something worth seeking, at least, in trying to bring that kind of thing to a much larger audience. Some faculty members, I think, would be interested in giving a series of lectures which describe modern astronomy—or six or ten lectures which describe geological or planetary science, or biology, chemistry, or whatever. We're toying with the idea of organizing a subsidiary, to which Caltech would lend its name; and interested faculty members, for a consulting fee, would give such lectures.

If the new videotapes and cassettes prove as inexpensive as some people think, you might have an enormous home audience for this thing, as well as a separate audience of junior college and college people, and it might serve a much broader educational function. The faculty might be more interested in doing this than in



Ingersoll, Bacon, Ward

some of the consulting they now do, in fact—and it might make some money for Caltech too. It's kind of an exciting idea—I don't know whether it will work. It depends on a lot of marketing and production questions that I don't know the answers to. It also depends on whether there are enough faculty who are both able and willing to do the lecturing and can do it well.

WARD: Some people I've talked to both within the Institute and from outside have expressed the feeling that perhaps private education will undergo a demise in the next 30 to 60 years because of financial difficulties.

BROWN: It may not take that long.

WARD: My question is, do you think this is likely, and what can be done about it?

BROWN: I think it's possible. Maybe I have to be an optimist, but I don't think it is likely for the leading private institutions, although there are some examples of rather good ones that have in a sense gone under. They have not disappeared from view, but they have become either supported or run by the state. Many public schools are very good and innovative, but I think they'd be much less so if they had no competition at all from the private schools. So I think the incentive is there and as long as enough people work hard at it, there's a chance of keeping the private schools—if not affluent, as they once may have been—at least in acceptably good health. I'm willing to work at it.

PINE: I wanted to ask you to put yourself in the position of maybe the chairman of an *influential faculty committee*—instead of administration. What would be your pet causes to improve the level at which we do our teaching?

BROWN: I think I would, under those circumstances, take a very careful look at shortening the curriculum. Students seem to come with so much better preparation than I recall arriving in college with, that I should think it would be possible to cut some things out. Whether it's humanities requirements for some students who now get in high school what I didn't get until I was in college, or whether it's abandoning some of the physical science requirements for students who aren't planning to be

faculty members on the physics or chemistry faculty of a research university, I don't know.

I am not suggesting that every student make out his own curriculum or simply announce that he has been at Caltech long enough to consider himself educated; although I wouldn't rule out trying that with a few students, just to see how it worked. But there do seem to me to be an awful lot of required courses, and the more requirements there are beyond, say, one year's worth of courses—the less possibility there seems to be for educational innovation.

BECKMAN: I was wondering—about once a year the local rumor mill comes up with the story that the trustees are about to change the teaching functions by abolishing the undergraduate option, turning Caltech into a grad-only teaching institution.

BROWN: You know, I've never heard that from a single trustee. I've heard it from a lot of other people around here.

BECKMAN: Do you think this is a possibility?

BROWN: I think the trustees, if they got a strong recommendation to this effect from the faculty or from me, would have to look at it very carefully before they could be persuaded to abolish undergraduate education at the Institute.

HUDSON: What do *you* think the undergraduate school does for the Institute?

BROWN: I think it gives us a little flavor. The undergraduates are not all quite sure about what they want to do. And so they put the rest of us to a little more of a test to justify what *we're* doing. Otherwise I think we would be even more introspective and self-satisfied than we are.

HOOD: I've got friends at MIT and Harvard who say there's considerable pressure these days to hire women faculty members. As far as I know, we have two, or something like that?

BROWN: Two professorial faculty members, out of 250. And the pressure is on us too.

*continued on page 30*

## An Interview with Harold Brown

continued from page 7

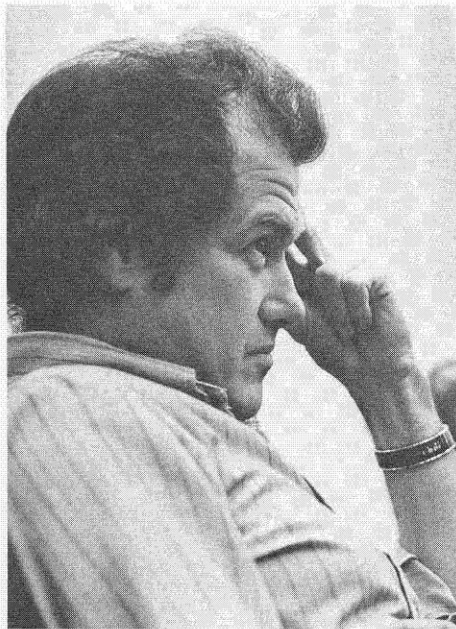
HOOD: I'm wondering what is the nature of the pressure and how does it get reflected, because it certainly doesn't seem apparent from where I sit.

BROWN: That just shows that your division's not doing its job.

HOOD: Well, I think they go through all the motions, but I don't detect any real enthusiasm. But what really is the nature of the pressure; is it really serious?

BROWN: I think there is serious governmental pressure on the basis of the law—and on the basis of the executive order calling for equal opportunity in employment. I think there is serious pressure from the women's groups. And I think there is moral pressure from within our own consciences.

Interestingly enough, if you look at the number of PhD's in science, say, from members of the minority groups—blacks or Mexicans—the numbers are very small, so that the competition for those



Pine

who have the qualifications is very large. And one can make a very good explanation as to why such groups are not represented in university faculties in numbers proportional to their numbers in the population; because the numbers are not the numbers of people, but the numbers of PhD's. That is not a way to excuse the facts, but to explain them.

In the case of women the situation is very different. There are quite a lot of women PhD's, particularly in biology and chemistry, and they're not represented on faculties in the same proportions. I think there has traditionally been, in some cases overt, in some cases tacit, discrimination against women. The argument is that "you can't count on women—they're always likely to do something strange, like getting married or having children, and dropping out of the market." And at the same time you have another difficult problem. The institution of marriage reflects the past societal arrangement that even in families where both husband and wife are professionals, they have gone where the husband's job is—and they still do. So long as that's the case, the wife's professional development is distorted and often stunted. And when they also, as often happens, agree that it's the woman who will retire from the job market while the children are young, that exacerbates the problem.

To get back to your original question, the pressures do come from the Department of Health, Education and Welfare, and from women's groups.

HOOD: What can HEW do?

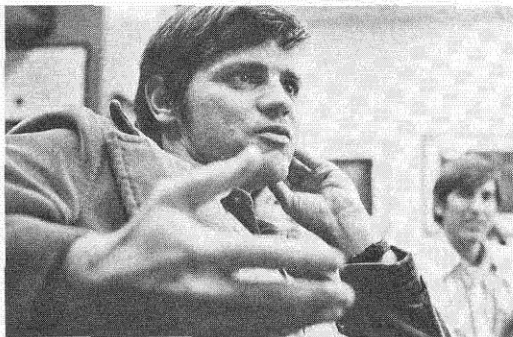
BROWN: In the extreme, they can find an institution not in compliance with the executive order on equal opportunity, and cut off grants and controls. And at some institutions—at Michigan, for example, and Columbia—they've really gone right down to the wire on that question. We have had a somewhat different situation, partly because we are strongly technically oriented, and the pressures by women in those areas aren't quite as great. I think that we have to—and we are trying to—assure standard procedures—equal procedures—and carefully document them. I haven't found any way to avoid the question of

judgment. People are appointed on the basis of judgments of the people who are here and of people elsewhere. And judgments are individual. They are sometimes hard to document. I think what we must do is look as hard as we can for qualified people, especially qualified minority people and qualified women. Once we have tried to get them here—to interview them—to make the judgment of them—to encourage them to come, I don't see what more we can do. I don't accept, and I think the federal agencies are not now claiming as they once were, that the criterion is: Do you have the same percentage of women as there is in the population?

MORIN: As you pointed out, the undergraduate education is rather traditional in structure as well as content. It would seem that since Caltech is preeminent as a research institution, one way we could be innovative is to make undergraduate education more research-oriented. After a couple of years of classes maybe undergraduates could become attached to groups of faculty and grad students, pursuing their education at their own level, while doing research at the same time, and thereby being more prepared to continue in research when they got out.

PINE: The thing that impresses me about that comment is that that's exactly what's available now to the *few* people who are aggressive enough to go after it. And it seems to me they have to be *quite* aggressive because the faculty is not that generous with its time and concern for undergraduates. Is it your feeling, Joe, that this has to be formalized to get more faculty people opening up opportunities?

MORIN: Exactly. The problem is now that this kind of arrangement is available if you're *really* willing to put in a lot of time to try to prove to people that the research you're doing will cover the work you would be dealing with in three or four courses, which you'd have to drop. More often you have to keep the three or four courses and try and do your research above and *beyond* that. And it puts a lot of pressure on the undergraduate. A lot of people don't want to put themselves on the line that way.



Hood

**BROWN:** A number of Caltech faculty, including some who are really quite favorably inclined toward innovation and experimentation, have told me that one of the problems is that our students themselves are very conservative—very few of them are willing to gamble with their own academic careers. I'm not saying that this is bad. I'm saying it's an observation that I tend to believe.

**MORIN:** I would say that the undergraduates are more like the faculty than the graduate students these days.

**BROWN:** Well, you don't know the graduate students.

**BEAUCHAMP:** I think a lot depends on the option as to whether we can offer research opportunities to students. Many physicists tend to work by themselves, for example, while chemists have large research groups that can incorporate large numbers of undergraduate students. You spoke of wanting to shorten the curriculum. You know the chemistry option for the last three years has had no required courses other than one two-unit speech course, and I think this has had some success. It has allowed the student who is aggressive to formulate his own plan of study and to carry it out and benefit from this rather open structure. As a whole, however, the students have taken the same courses they would have taken under the previously required curriculum. They are conservative. They don't want to do anything that might damage their chances of getting into grad school, or now into med school.

**BROWN:** I don't think that's so terrible.

**BEAUCHAMP:** The open curriculum has had two real pluses though. More students have gotten involved in research. But the real benefit has been an evolutionary pressure on courses. The courses that have a reputation for being bad, the students don't take. So they're dropped, or they're changed and improved—and this has been the real benefit of an open curriculum.

**BROWN:** Tradition can't overcome revulsion.

**BEAUCHAMP:** The whole Institute could probably benefit from that. I had another question, though. The faculty gets a lot of feedback from students, from other faculty, from administration, and from outside the Institute, about the kind of job they're doing in teaching and research. What kind of feedback is a university president most sensitive to in terms of knowing whether or not he's doing a good job?

**BROWN:** I find that I am constantly seeking reassurance that people love me—and I don't do any better than the rest of you in getting it, except that the administration these days can probably regard absence of active signs of dissatisfaction as a pretty good sign. And the willingness of faculty members and students, if they've got a problem, to come in and talk to me about it, I regard as a happy sign. I think the word is around that my door is open. Those words are used in lots of places, and they may mean much or little. (The door can be open, but there can be all sorts of force fields operating to keep people out.) I do try to get out among students and faculty often enough so as to provide some opportunity for talking together. But I don't do what I know some students and faculty would like me to do. I don't go spend two hours regularly once a week in the coffee house, or two hours once a week having beer at the Athenaeum. I thought about whether I should do that, and concluded that if it didn't really appeal to me it wasn't going to work. I know I'm not close to all groups enough to make sure of feedback from them. Inevitably I rely for it to some degree from individual faculty members—wise old heads or well-connected younger faculty members. The outside community is a problem as far as feedback goes. It's always hard to tell whether any individual or any few people represent themselves or a much larger segment of opinion. The number of irate letters I get goes up and down. Over the past year it's been remarkably low, and I don't know whether that means apathy, or whether we're doing well, or what.

**HOOD:** Perhaps part of the problem of innovative teaching is the old tra-

dition of tenure. What do you think about a young faculty member who comes in and does an outstanding job of teaching to the detriment of his research, and then it comes time in three years or six years for review and the faculty has to decide whether or not he merits tenure. We're a research institute and we're told that's our primary obligation. I don't sit on the tenure committee, and I don't know how they decide these things, but I'm curious to hear about it.

**BROWN:** My experience from having read what some of them have to say is that research competence always does come first, but that teaching counts too. And I can think of a few cases where exceptional teaching ability has made the difference. My own judgment is that using our present criteria of research, teaching, and service, in that order, but without fixed weights being given, has worked pretty well.

**HOOD:** What are your thoughts on tenure?

**BROWN:** I speak, of course, from the position of someone who doesn't have it. And that may color my thinking. I think the defenses of it, to which I subscribe, are correct: the independence it provides, and the assurance that you have been judged able enough so that your own judgment of what's worth pursuing and what you say about it are reliable enough to be the criteria that govern your work. I think those are good defenses. And they're the defenses that I present to the trustees or to outside people when they bring up the question. But those defenses, I think, either tend to leave out, or underplay, the difficulty and reluctance of the administration of a university to take action against a tenured faculty member who really isn't producing. Because it is a matter of individual judgment whether someone is not performing his assigned duties acceptably, or whether he's just kind of coasting in the job. Those aren't the same thing. Tenure has become more than protection of the individual faculty member's freedom of expression in his own field and freedom from retaliation against unpopular political opinions. It has become a kind of job security. I

*continued on page 32*

## An Interview with Harold Brown

continued from page 31

should note, in defense of academia, that in some industrial organizations (good ones, too) a high degree of job security exists, though it's not called tenure.

**WARD:** Do you feel there are any changes that need to be made in the graduate program, or anything to be done to improve it?

**BROWN:** I feel strongly that the graduate program has to be looked at by the faculty in each option, with specific attention to the question of what you are training graduate students to do. In the fifties and early sixties a larger fraction could be expected to go into academic research than you can expect in the seventies and eighties. And if that doesn't require some change in emphasis—then it's a remarkable coincidence.

**DAVIDSON:** I have a question that relates to fund raising—because the alumni fund drive is rolling along now. How do we tell alumni, or any potential giver, why they really should give to Caltech?

**BROWN:** What we say to individuals and foundations is that Caltech deserves to be supported because it is at the cutting edge of human knowledge. It turns out not only new facts, but new sciences. It produces really outstanding graduates, partly because the people it takes in are good, but also, we think, because of what happens to them while they're here. In the long run our national well-being, both in material terms and in terms of the intellect or spirit, depends upon the products, knowledge, and people in places like Caltech. And Caltech is among the very best—we feel it's *the* best—at what it tries to do.

Those are the answers we give in words. What we find is that when we bring people around here, we don't have to say all that. All they have to do is listen to some of our people talking about their work.

**BECKMAN:** Drs. Millikan and DuBridge both headed the Institute for about 20 years apiece. Do you see yourself as filling the office of the presidency in five years or ten—or going on to something else?

**BROWN:** Twenty years seems to me a very long time. I think the tradition of very long presidential tenure, if not now dead, is quite out of fashion. For

understandable reasons. The pressures are substantial and they come from all sides. Things are changing more rapidly. And every time you make a decision, if you don't make enemies, you at least have some annoyed people around, and these just add up. After not too many years you've accomplished most of what you *can* accomplish. Whether this is in five years or ten years, I don't know. I don't feel so close to that time that I've started to speculate on what comes next. But I expect not to be president of the Institute for so long that I don't have career problems afterwards.

**PINE:** There's a sort of tradition of administration people teaching here. Would you like to teach?

**We feel that Caltech is the best at what it tries to do. But when we bring people here, we don't have to say that. All they have to do is listen to some of our people talking about their work**

**BROWN:** I am not quite comfortable enough with all my other duties yet that I could face up to that. But I would like to, in fact. It really would involve picking a subject and preparing enough material on it to cover a term's work. And when I would get a chance to do that, I don't know. I *have* agreed to serve on an independent study committee for one student, and that may be a good introduction to doing something.

**HOOD:** What's your impression of the student houses? Are they a good place for the students to live? Is there any way of making them better? What is the administration thinking in this regard?

**BROWN:** The student houses *represent* themselves as being each very different from the other. They have not to me seemed to offer enough alternative ways of living. I think that is what they ought to aim at, and I think it is the one thing perhaps the administration can encourage more. I'm not sure it can be done simply by trying to change the student houses. It may be more do-able by creating alternative living arrangements outside of the student houses. You know cooperatives have already been set up in three houses on Holliston Avenue. The Institute is also in the process of purchasing an apartment house which might be used for analogous purposes. Maybe some grads will want to live in some of the new houses acquired, and maybe some undergraduates will want to live in some of the graduate houses, where they would not have the advantage of having meals prepared, but probably would have more privacy. So I can think of four or five different kinds of living arrangements, of which the undergraduate student houses are one. And I think if you had those four or five, then the undergraduate houses would become more different than they are now.

**BEAUCHAMP:** Are there any questions you hoped we'd ask that we haven't asked you?

**BROWN:** Yes. There's one thing I wanted to get off my chest, so I'll both ask the question and answer it. What is it that you feel you've been unable to do that you very much wanted to do? And the answer is that I have wished ever since I came that I could sit down and spend a few weeks just looking at long-range plans for the Institute. I haven't been able to do that.