



CAROLYN ASH
(b. 1944)

INTERVIEWED BY
SHIRLEY K. COHEN

November 17 and December 1, 2003

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Pasadena, California



Subject area

Administration, students

Abstract

An interview in two sessions, in November and December 2003, by Shirley K. Cohen with Carolyn Ash, Director, Student-Faculty Programs Office.

Born in Chicago and raised in Ohio, Carolyn Ash began working at Caltech in 1977 with Professor David Elliot, then secretary of the faculty, and other faculty officers. In this interview she recounts her early involvement beginning in 1979 in the new SURF [Summer Undergraduate Research Fellowships] Program and the evolution of that program over time; its origins in an idea of Professor Fred Shair (chemical engineering); participation of other faculty Hal Zirin (astronomy), William Schaeffer (chemistry), Bernard Minster (geology); initial financial support by trustee Lew Wasserman, eventual endowment by Caltech Associate Samuel Krown; NSF [National Science Foundation] contributes funding. Gradual administrative recognition and involvement; establishment of SURF board of directors and faculty administrative committee. Inclusion of women students and

students outside Caltech, initially from JPL, 1985. Departure of Fred Shair 1989, and Ash appointed director by vice-provost David Goodstein.

Circumstances of first National Conference on Undergraduate Research [NCUR] (University of North Carolina, Asheville, 1987); conference hosted by Caltech in 1991; Southern California regional conferences follow. Establishment of weekly career counseling sessions: research seminars, round-table discussions. Statistics on Caltech undergraduate student participation: upwards of 50 percent involved. Continuing recognition of SURF under President Tom Everhart. Startup by Professor David Van Essen of MURF [Minority Undergraduate Research Fellowships] program, 1991, in biology and chemistry; TIDE begins mid-nineties [Teaching and Interdisciplinary Education] with support from Professor Nate Lewis and President David Baltimore. Renaming of office Student-Faculty Programs. Additional programs funded by Beckman Foundation and Rea and Lela Axline (Axline SURF Program); NASA-developed program USRP [Undergraduate Student Research Program] modeled on SURF. SURF as model for other institutions; SURF firmly embedded in Caltech culture.

Administrative information

Access

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CALIFORNIA INSTITUTE OF TECHNOLOGY ARCHIVES

ORAL HISTORY PROJECT

INTERVIEW WITH CAROLYN ASH

BY SHIRLEY K. COHEN

PASADENA, CALIFORNIA

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CALIFORNIA INSTITUTE OF TECHNOLOGY ARCHIVES
ORAL HISTORY PROJECT

Interview with Carolyn Ash
Pasadena, California

by Shirley K. Cohen

Session 1

November 17, 2003

Session 2

December 1, 2003

Begin Tape 1, Side 1

COHEN: Good morning, Carolyn. Tell us a little bit about your growing up and where your family came from.

ASH: OK. I was born in Chicago, and we moved to Cincinnati when I was five years old, and I grew up in Cincinnati.

COHEN: Your father did something that took you there?

ASH: Well, he worked for EaglePicher—and he was transferred to Cincinnati. He passed away when I was five. We moved from Chicago to Cincinnati in July and he passed away the following January. We stayed on in Cincinnati, in a little town that's still called "the village"—Terrace Park, just outside of the city. I went to school there, high school there. I started college at Ohio University, but then I dropped out.

COHEN: That's in Miami?

ASH: No, it's in Athens, in the eastern part of the state. I went to the University of Cincinnati night school. I finally completed my BA at Mount Saint Mary's College after we moved to California. I was employed at UC in the medical school. That's where I met my husband, who was a graduate student in the medical school at UC. He finished his PhD there, and we moved out here when he came to do a postdoc at Caltech. He worked with Giuseppe Attardi [Steele

Professor of Molecular Biology] in biology. And we expected that we would stay here for a couple of years—two or three years—and go back to the Midwest. That was the plan. But he finished his postdoc here and then became part of the faculty at the osteopathic medical school in Pomona.

So, as it turns out, we stayed here, and the kids grew up here—though he’s not my husband anymore. When we moved here, my son was an infant, five or six weeks old.

COHEN: Oh, brand-new!

ASH: A brand-new baby. That’s how I always know how long we’ve been in California. However old Steve is that’s how long we’ve been here. My intention was to be a stay-at-home mom; that was it. I had an older daughter and then I had Steve. But then the cat got sick, and the vet bill put us over the financial edge. And I thought, “You know, I really need to get a job.” I thought I would just do temporary work, work for a temp agency. I could do clerical work and bring in a few extra bucks.

COHEN: Pay for the cat.

ASH: Pay for the cat, and these kinds of incidental expenses that come up. So I went to a temp agency and I took all the tests, and I thought, “Well, this is really crazy. Why would I work for a temp agency? Why don’t I just get jobs—”

COHEN: On your own.

ASH: Yes, on my own. Why don’t I just sign up with some companies, so that when they need somebody, I would make more money and they could pay *less* money, because we wouldn’t have the temp agency in the middle. I thought that was such a good idea, I wondered why everybody didn’t do something like that. So I came over here and talked to Nancy Cunningham in Personnel. We called it “Personnel” in those days.

COHEN: Not Human Resources?

ASH: It wasn't Human Resources, it was Personnel. I talked to Nancy Cunningham, and she said, "Oh, yes. Well, that's an occasional temporary employee"—I mean, they had a classification for exactly that kind of person. And she said, "But you know, we have this job you might be interested in. It's part-time, ten months a year. Maybe this would meet your goals and meet our goals, too." The job was working with David Elliot [professor of history, emeritus], who was then secretary of the faculty and supporting the work of the faculty officers.

COHEN: What year was this?

ASH: This was 1977. I started working with David in January of 1977, and it was a perfect job. It was thirty hours a week, ten months a year. I got the summers off.

COHEN: That's as good as teaching school, without the headaches. [Laughter]

ASH: Exactly. So that's how I came to be employed by Caltech.

COHEN: I see. It was your own cleverness in cutting out the temp agency. [Laughter]

ASH: I worked most closely with David Elliot, but also part of my work was to support the faculty standing committees. So that's how I got involved with SURF [Summer Undergraduate Research Fellowships], because SURF grew out of the faculty Committee on Scholarships and Financial Aid, when Fred [Fredrick H.] Shair [then professor of chemical engineering] was on that committee.

COHEN: So Fred Shair had this idea to—

ASH: Well, there was a pot of money that had become available. And we can now say that it came from a generous gift from Lew Wasserman [d. June 3, 2002]. He had wanted to keep the gift confidential. After his death, the family approved our recognizing him as the donor.

COHEN: Was he already a trustee at this time?

ASH: I think he was. And it was after *Jaws* came out [1975], which was very successful—

COHEN: Oh, so he had some money.

ASH: He had some money.

COHEN: Surplus money. [Laughter]

ASH: Yes, and he wanted to make it available to enhance the student experience. The money came through the Scholarships and Financial Aid Committee, and there was a great debate in the committee over whether it should be used to support needy students or made available on the basis of merit or something else. Fred came up with the idea of starting a program that would allow students to do research. And the roots of that idea were in an NSF [National Science Foundation]-based program that had supported the students in [the Division of] Chemistry and Chemical Engineering some years before. The purpose of that program was to get students involved in research, but there were some problems. It was a new program for NSF, and, you know, obviously things don't always work quite the way someone envisions them. So Fred suggested this new program. Fred actually envisioned this program and created the acronym. And the things he built into SURF at the very beginning are still at the core of SURF.

COHEN: That's phenomenal, isn't it?

ASH: Yes, it is. The vision he had is still there. SURF certainly has evolved over time, so in many ways it's very different from what Fred imagined, but the core of it is exactly the same. It was modeled on the grant-seeking process: that is, students would collaborate with faculty mentors early, way before the summer period. So, early in the calendar year—during January and February—students would find their own mentor and collaborate with the mentor to develop a project. The students themselves would write a research proposal. The proposal would go through a review process by a faculty committee, and awards would be made on the basis of reviewer recommendation. Then students would carry out the research over ten weeks in the summer, and at the end of the summer they would write a technical paper and give an oral presentation. So it had all of those elements, and that core remains to this very day.

COHEN: Was Shair alone in this? Weren't there other faculty members involved?

ASH: There were other faculty, of course, who were on the Scholarships and Financial Aid Committee. Hal Zirin [professor of astrophysics, emeritus]. Bill Schaeffer in chemistry. Bernard Minster, who was on the faculty in [the Division of] Geological and Planetary Sciences at that time. And there was another faculty member [the Division of] Humanities and Social Sciences, Forest Nelson. He's no longer here.

COHEN: We can look that up, if you know what year it was.

ASH: The first SURF was in the summer of 1979. So these deliberations would have been going on among whoever was on the Scholarships and Financial Aid Committee at that period.

So that's the birth of SURF. The first summer was 1979, and I was a little bit involved with it that year. I had applications in my office, and students came and picked them up.

COHEN: And that was it?

ASH: That was my involvement.

COHEN: It was running out of the faculty office.

ASH: Yes, the officers of the faculty. There were eighteen students that first summer, working with seventeen faculty members.

COHEN: And the idea, of course, was to give them a good enough stipend so that they were earning money.

ASH: Yes. The stipend that summer was \$2,000. The idea was that the stipend was such that they could do this and not have to, say, work at McDonald's or another mundane job to earn money over the summer. The thought was that this was really a much more valuable thing for students to do, not just a routine kind of job over the summer. Not that there's anything wrong with a routine job—for some students, it's a good break from Caltech. Ken [Kenneth G.]

Libbrecht [professor of physics] was in that first SURF class. He was the first SURF student to return as a member of the faculty. The next year, 1980, there were forty-three SURF students, and SURF was still being supported by the Wasserman money.

COHEN: Now, let's just stop a minute. Were the first eighteen successful? Did they get their papers written?

ASH: Yes, they all got their paper written, and they all gave their presentation. A number of them are still in touch with SURF, by one means or another.

COHEN: Was somebody assigned to be head of this program?

ASH: Well, Fred, of course, was working on it. In the spring of '81, Fred came into my office and said, "You know, we have this program, and we just need some support for the program. I think it would be about a week in the spring and a week in the fall."

COHEN: That sounds dangerous. [Laughter]

ASH: He said, "We have applications in the spring and then we do these presentations at the end of the summer, but I think it would just be about two weeks in the whole year. Do you think you could help us?" I knew Fred a little bit, and I said, "Sure! That sounds like it would be a great thing to do. Sure, I can help with that."

Well, it was obviously never just a week in the spring. It was never even just one month. [Laughter]

COHEN: I remember seeing you once when you brought your mother in to help. [Laughter]

ASH: Yes! Oh, she still comes and helps sometimes. [Laughter] She subsequently moved from Cincinnati to California. She lives out at Royal Oaks [Royal Oaks Manor retirement community, Bradbury, CA]. Of course, she was a good friend of Jesse's [Jesse L. Greenstein, DuBridge Professor of Astrophysics, emeritus, d. Oct. 21, 2002] out there. She still occasionally comes and helps us with something.

COHEN: So let's go back to this minor job you were going to do.

ASH: This minor job, which was to provide some clerical support for this program. Fred and I got to working very closely. We worked very well together. Fred had all the vision—he really figured out what things might be done. But I think what I brought to it was knowing how to implement his ideas.

COHEN: Putting pencil to paper.

ASH: Exactly. Fred would say, "We've got to have a newsletter," and he would develop the newsletter. But I was the person who said, "OK, well, let's send it here," or "Let's do this," or "Let's do that." Also I was the person who said, "OK, if we're going to do a newsletter, when are we doing the next one?"

COHEN: You gave some structure to the idea.

ASH: Exactly. And, I think, some continuity.

COHEN: It was just the two of you working on this? Is he still on this committee, after all these years?

ASH: Let's see, I have to think back. He was on the Scholarships and Financial Aid Committee for a time, and Jim [James J.] Morgan [Goldberger Professor of Environmental Engineering Science, emeritus] was at that time vice president for student affairs, so he had some oversight of SURF. But you know, I'm not sure whether it was a formalized oversight, because SURF was still this fledgling thing and wasn't really identified as a Caltech program. There was still a lot of debate on the faculty about whether students could *do* research.

COHEN: As undergraduates?

ASH: As undergrads, yes. So there was a lot of effort, fueled by Fred's enthusiasm for the program and what he was doing to develop it. He was always talking to people about SURF, and

[there was] a recognition that if this was actually going to become a formal program there had to be a lot of education done both within the institute and outside of the institute.

Jim Morgan at some point had said that while he thought SURF was a good thing in principle, he didn't think it should continue to rely on the Wasserman funds through the Scholarships and Financial Aid Committee, and he was going to recommend that it go on a declining amount of money from that source, over a period of time—maybe over four or five years. So SURF would get less money each year, and if Fred and others thought SURF was a good thing he would have to find other sources to pay the student stipends.

COHEN: Why would it have bothered Jim Morgan to take the money from Wasserman?

ASH: Well, that's a good question, and certainly one that Fred asked over and over and over again. But that became the decision of the committee.

COHEN: Do you think maybe they were wanting to get the money from Wasserman for other reasons?

ASH: Well, I don't know if they wanted to shift it to other things. I think that money ultimately became part of the merit awards that are still given every year. But I don't know what that decision was.

COHEN: We're talking about the early eighties now.

ASH: This would probably have been around '80, '81, '82, something like that. There was also a great concern that SURF would grow too much, that there would be too many students involved. This was a discussion that Fred and Jim Morgan and others had—that it would just get to be too big. Fred finally said, and rightly so, "If our faculty members want to work with these students, what difference does it make? And if we have the money to support it, what difference does it make how big it is? I don't think it will ever be more than a hundred students, but if it is, so what? You want us to keep this program at a certain size. What am I going to say if [then Caltech theoretical physicists] Richard Feynman and Murray Gell-Mann both want to have a student and we're at the limit? Which one am I going to tell that they can't have a SURF

student?”

COHEN: I doubt if either one of them ever took a student. [Laughter] Did they?

ASH: Well, Richard Feynman did.

COHEN: Oh, he did!

ASH: He did, yes. And it was people like that having students; and it was also the stories that began to come out, anecdotes about students who had done really well or who had actually contributed to somebody's research, or students themselves telling the story of the benefits they derived from doing research—that became the basis of people beginning to say—

COHEN: The program sold itself, is that what you're saying?

ASH: It did, absolutely. But you know what? There was also an intentional telling of the story. And it became part of that education both within the institute and outside of the institute.

All this was coming together at one time. Jim Morgan was saying, “You have to find other sources of funding.” And there was a senior development officer named Ed Baum, who came in at about the same time; and Ed immediately understood the vision of SURF, its value to the students, and the potential value to the institute. And he said, “You know, we really need to raise some money for this from other sources.” He had been director of corporate relations for a time, and he made some corporate contacts for us. General Motors, Ford, and IBM were the original—

COHEN: Now, by this time you must have been working more than a week—

ASH: It was never a week! [Laughter] It was never a two-week job. [Laughter] Once I started working with SURF, it was pretty continuous and year-round—though it was certainly much less time, obviously, than it is now.

Ed Baum came in and helped us raise money. He also brought in Elba Smith, who then was the executive director of the Caltech Associates. And Elba also understood the value of a

program like this and got a group of Associates together for a presentation. Meanwhile Ed was making contacts with companies.

COHEN: I can see how valuable this would be, because with a little bit of money, you already see the result.

ASH: Exactly. And that's still true. Undergraduate research, in the whole scheme of things, is very low-cost, even with 440 students, which we had this past summer.

COHEN: So you started getting funding from other sources.

ASH: We were starting to get funding from other sources. Right in through there, the National Science Foundation also developed its Research Experience for Undergraduates program, REU. When that first came out, Fred sat down and wrote proposals to NSF. I think he wrote six proposals to six different directorates, and they all got funded. That was to provide stipends for students in those six disciplines. REU was a new program for NSF—well, it was built on the old program that had existed a few years before that. They shut the old program down and then resurrected it as this REU program, and the REU program continues to this day. It was an important source of funds for us for a while.

So SURF then grew up under this funding paradigm: If there is something you want to do and you can find the money to do it, then you can do it. And that continues and it's still a part of how SURF is run.

COHEN: I remember this just vaguely. What year was it that Ann Boesgaard came and said there should be women in this program, when she brought undergraduate women from other schools?

ASH: Where did she come from?

COHEN: Well, at the moment she's in Hawaii, at the University of Hawaii.

ASH: She's an astronomer, right? [Ann M. Boesgaard is a professor of physics and astronomy at the University of Hawaii. She was a visiting associate in astronomy at Caltech 1985-1986 and

NSF Visiting Professor 1987-1988.—ed.].

COHEN: I don't know who she brought, but I do know that she decided there should be women in the program. The idea was to get more women in science, or something—one of those things. That would have been about the time you were going for outside funding.

ASH: Right.

COHEN: Ann Boesgaard was originally from Mount Holyoke.

ASH: Leila Belkora was a student from Cornell and worked with Alan [W.] Harris at JPL [Jet Propulsion Laboratory]. That was 1985, and she also was an astronomer.

COHEN: OK. I remember that Ann Boesgaard was here and decided that women from other schools should be part of it.

ASH: Right. That was kind of the beginning. We count Leila as the first whom we can identify.

COHEN: But you don't know where she is?

ASH: We do know where Leila is—we know exactly where she is. We're still in touch with her. In fact, Ward Whaling [professor of physics, emeritus] is developing SURF's history in a more formal way than I've done, so maybe you ought to talk to Ward. You may want to bring Ward in on the history of SURF, because he's really dug into lots of things and recently had a communication from both Leila Belkora and Alan Harris.

COHEN: OK. Well, let's go back now to the chronology.

ASH: OK. Where were we?

COHEN: We're in '81.

ASH: We're in the early eighties.

COHEN: You're juggling your two jobs now, taking care of the faculty committees and SURF? Or had you switched over?

ASH: Oh, no. The faculty officers are still part of my office [Student-Faculty Program Office].

COHEN: Even now?

ASH: Even now, yes. Fiona Tindall now works with the faculty officers, but she's still part of the Student-Faculty Program Office.

COHEN: OK. At this point, in '81-'82, you didn't have a hundred students yet in the program?

ASH: No, but we were getting close. It jumped very quickly. SURF went from eighteen the first year to forty-three students in 1980. In 1982, there were seventy-three students, and a hundred and six in 1984. So within six years it was at over one hundred students. It went very quickly. But Ed Baum had come on, Elba Smith had come on, and they were helping to raise money. Elba made a connection with a member of the Associates named Samuel Krown in 1981. Sam Krown was new to Caltech. He did not have a college degree; he was not a technical person, but he greatly valued education. He greatly valued the things that Caltech did. And he talked to Murph [Marvin L.] Goldberger [Caltech president 1978-1987] and said, "I will contribute money to Caltech, but I want to know, and I want to be involved with, whatever happens with that money." And Murph said, "We've got this new program. Maybe this is something you'd be interested in." And Samuel was very interested in SURF. He was a very crusty kind of guy, he had very definite thoughts and opinions about how SURF should work. He and Fred often disagreed, but Samuel was absolutely committed. He would come every Wednesday. We have these noon seminars during the summer. And he would be there early so he could talk to the students as they came in—you know, what was their experience like. He would encourage them.

COHEN: So he was a local. He was from around here somewhere.

ASH: Yes, he and his wife lived in Pasadena. They became SURF's first donors, our founding donors. A year later he encouraged us to endow the program, and he gave the first endowment

of \$50,000 named the Samuel P. and Frances Krown SURF Endowment. In 1983, he donated 40 percent of a warehouse building in South Gate to Caltech for SURF. The other 60 percent was equally divided among Pepperdine, City of Hope, and the American Technion Society. The property was valued at \$850,000. Caltech became the property manager. The building was rented by Frito-Lay at the time, and SURF received 40 percent of the rental income each year, about \$8,000. The building was sold some years later, and the Krown SURF endowment was increased by \$340,000.

COHEN: How did he make all his money?

ASH: He made it in commercial real estate and transportation—a trucking company.

COHEN: You talk about him as if he's gone now.

ASH: He is gone, yes. He passed away in 1997. He had the vision and the commitment.

COHEN: It sounds like this was also something good for him to do.

ASH: It was good for him—absolutely, that's true. Together with Fred Shair and Elba Smith, he started the SURF Board and served as its first chairman. He brought in a lot of people who are still with us today: Betty Nickerson is still on the board, and Joanna Muir. They're life members.

COHEN: How big is the SURF Board?

ASH: Let's see. It's about twenty-five.

COHEN: And how many of them are faculty?

ASH: Probably five. They are alumni, associates, faculty. And now, of course, former SURFers are coming on and participating, which is really nice.

COHEN: It's interesting that Murph Goldberger was involved in this.

ASH: Yes, but it's interesting—SURF had been around for maybe four or five years, so there had been successes, and we documented some of the successes, and Murph had vectored this important donor towards SURF, but he still made comments like, “Yes; well, it seems like a good idea, but why would we support something like that?”

COHEN: He wasn't completely committed?

ASH: I don't think he was completely committed. When it became clear that SURF was in fact becoming successful, we went to the administration and said, “We need to have this be a line item in the budget,” because at that point SURF was living on soft money. We had outdistanced the Wasserman money. We were raising money from companies, from the NSF, and from private individuals to pay for student stipends. My salary was paid by the officers of the faculty at that point, so it was a free ride for SURF. We went to the administration and said, “This needs to be put in the budget,” but that would not happen until Tom [Thomas E.] Everhart [Caltech president 1987-1997] arrived. As soon as Tom came, he valued SURF, and we did get administrative support for SURF, but we still raised all the money for student stipends from a wide variety of sources.

In 1983, the SURF Administrative Committee was formed. I think Robbie [Rochus E.] Vogt [Avery Distinguished Service Professor and professor of physics] was provost at that time [Vogt was Caltech's provost 1983-1987.—ed.]. And Fred said, “We really need to have a faculty committee to provide oversight. It needs to report to the administration.” So that committee was formed, and now we were developing a more formalized structure to support SURF.

So then Tom Everhart came, and we got a line item in the budget. Also, SURF began to report to the vice provost, David Goodstein [professor of physics and applied physics]. The vice provost preceding David was Chuck [Charles D.] Babcock [professor of aeronautics and applied mechanics], who became ill and passed away. When David was named vice provost [1987], administrative reporting on SURF moved over to the vice provost. And that was in large part because Jim Morgan and Fred were just so much at loggerheads. It was frustrating and difficult, I think, for both of them. So that's how SURF got moved over administratively and more formally to the vice provost.

In 1989, Fred accepted the deanship of natural sciences at Cal State Long Beach. I knew Fred had been looking at this position and thinking about leaving Caltech, so I walked into David Goodstein's office. I mean, here I was just this mere clerical person in the institute. And I said, "David, I guess you probably know that Fred is planning to leave Caltech." And David put his head in his hands.

COHEN: He didn't know?

ASH: He said, "Yes, I know. I just don't know *who* will take over SURF! Do you know of any faculty member who might be interested in doing this?" Because, of course, only a faculty member could direct a program like SURF. At that moment I wished that the floor would open up and swallow me, but I said, "You know, well, actually, I came to talk to you about having that job." And he just looked at me and he said, "Oh!" Clearly it *never* would have occurred to him. He brought out a big long piece of paper, yellow lined paper, and got out his pen and said, "Now, where's your degree from?" And I said, "Well, I don't have a degree." Now I *really* wished the floor would open up and swallow me.

I said, "No, I don't have a degree, but I've been working with SURF, with Fred, almost since the beginning. I know this program. I think I can be its director." So he said, "Well, OK, let me see what I can do." So he went over to—maybe it was Human Resources by that time, or maybe it was still Personnel, I don't remember. And he met with the SURF Administrative Committee and he met with some other people and he came back a couple of days later and said, "You got the job." So that's how I became director of SURF in 1989.

COHEN: I see. So at that time how many students did you have?

ASH: One hundred and eighty-five.

COHEN: So you then moved over and spent full time on this?

ASH: I did move over and spent full-time. Meanwhile I had hired somebody part-time to help out, because the SURF part of my job had increased and I still had the faculty-officers part. By then I had the equivalent of a full-time assistant. Shortly after that, we hired another person, but

we still had the faculty officers' work going, which has subsequently become a full-time job.

COHEN: For somebody else.

ASH: Yes. The staff support had gone up to two and a half FTEs [full-time equivalents]. It's now down to two FTEs.

COHEN: So when you took over in '89, there never was another faculty member, after Fred Shair, who—

ASH: —served as director? No. We had, of course, the Administrative Committee. And Terry Cole [senior member of the JPL technical staff and senior faculty associate in chemistry and chemical engineering, d. 1999] then became chair of the Administrative Committee. He had already been involved, because SURF had been growing at JPL. So under Terry Cole and Lew Allen [JPL director 1982-1991], SURF was beginning to flourish at JPL, and Terry was just so enthusiastic!

COHEN: Of course, it was easier for people at JPL to take a SURF student, because they didn't have to raise the money themselves.

ASH: Well, actually they did have to provide the money. It's always been the case that the students who worked at JPL were paid from NASA direct funds.

COHEN: Right, but it didn't come out of a professor's grant money.

ASH: Well, it came out of the funds that were allocated for their projects, so in a sense it was the same thing.

So Terry came in as chair of the SURF Administrative Committee, and the committee membership stayed the same. As people would drop off, we'd bring somebody new on. There are still people who have been on it from the very beginning. [Tape ends]

Begin Tape 1, Side 2

ASH: They review any academic issues around SURF. They oversee the quality of the experience, and they review the student proposals every year in March.

COHEN: So it's a fair amount of work, isn't it? Who goes out and drums up the professors who are willing to do a SURF and think up what a project would be?

ASH: Well, that happens in many different ways. The students themselves, of course—

COHEN: They will ask a professor to do something?

ASH: They will say, "Boy, I'm really interested in your work! I know something about it because I took your class, or heard your presentation."

COHEN: So a lot of it is student-instigated.

ASH: Absolutely. And by now, faculty are thinking of small projects for students to work on. In the early days of SURF, often a faculty member would say, "Gee, I don't know what you could do in ten weeks. Ten weeks is such a short period of time." And [it took] students coming back again and saying, "You know, gee, I'm really interested in your work. Isn't there something?" And often a faculty member would say, "Well, there was this little investigation I've always wanted to do and just never have taken the time." But it was always pushed by the student. And SURF is still pushed by the students. I invite the faculty to post announcements of opportunity, and some do, but most don't, because they are already in contact with a student. At JPL, they don't have contact with students. The only way somebody at JPL can get a SURF student is to post an announcement of opportunity. In the olden days, we kept a notebook in the office, and the students would come in and pore through it to see if there was something [that interested them]. Now, of course, that's all on the Web. So it's actually easy for students to make that contact. It's more difficult for non-Caltech students.

COHEN: I was just going to ask you when that happened. When did you start taking non-Caltech

students?

ASH: The first one was in 1985 and worked at JPL.

COHEN: The woman that you mentioned?

ASH: Yes. The next year, one non-Caltech student worked at JPL. In 1987, ten non-Caltech students worked with faculty on campus, and six worked with technical staff at JPL.

COHEN: Was this because you were taking NSF money? Did you have to open yourself up? I mean, why did you have to do this?

ASH: When we got the NSF money, it was as an REU site, and NSF wanted us to bring in students from outside. And it was interesting talking to faculty. They'd say, "Why would we want to do that? We've got the best students in the world. Why would we bring students from someplace else, who don't know Caltech, don't know us, don't know what we're doing, and they're not as good?"

Well, how about graduate school? It's a great way to bring a student that you might consider for graduate study.

COHEN: So you yourself were talking to these people as to why it would be a good idea.

ASH: Yes. And the NSF was concerned not only with bringing students from outside but also with bringing in minority students. Fred made connections with some of the HBCUs.

COHEN: What's that?

ASH: Historically black colleges and universities. He also made contacts at other minority-serving institutions. And we brought in some students, under our REU grant, from those institutions.

COHEN: Has that been successful?

ASH: It was moderately successful when we had that NSF money. But it also brought in students from other places—majority and minority students, from research universities, comprehensive institutions, liberal arts colleges, and community colleges. They came from all kinds of places. Some of them actually became upper-class transfers. Some came to grad school here. Once you begin to have a track record, then it begins to propel itself. People then begin to understand it. [Tape ends]

CAROLYN ASH**SESSION 2****December 1, 2003****Begin Tape 2, Side 1**

COHEN: Good morning, Carolyn. It's good to see you. Last time we stopped just as you became director of SURF. But there may have been a few other things you wanted to mention that you've thought of since that interview.

ASH: Well, what I was thinking about was to say something about the National Conferences on Undergraduate Research. In 1987 the University of North Carolina at Asheville decided to host a national conference on undergraduate research, and they put out a call for papers to all colleges and universities in the country. They expected they would get maybe a hundred students from within a 500-mile radius of Asheville, and they ended up with about 500 students from all over the country. It was the first time that people had gotten together and realized how much undergraduate research was actually being done at colleges and universities around the country. Of course, SURF was pretty well established by that time. In almost all the other cases, it was students working informally with faculty members who attended that conference. A national board was put together to oversee the conference, and Fred Shair was a member. Undergraduate research, from that point began to emerge nationally as an important aspect of part of undergraduate education. It became much more widely recognized. As I said, SURF was well established by that time. MIT's program was ten years older than SURF. They call it Undergraduate Research Opportunities Program, UROP. It's a very different kind of program from SURF.

COHEN: How many students did MIT serve?

ASH: At that time, I don't know. At this time, they serve about 1,800 students a year. They are all MIT students—as opposed to SURF, where lots of outside students participate. The students at MIT can walk in on their first day and get what they call a research position—and it may be doing some pretty routine lab assistance. So it's just a very different model from SURF. We

expect a SURF project to have the potential for publication in a refereed journal. At MIT, students could come in and do anything. But the advantage at MIT is that students come in and see themselves as researchers, and the principle of labeling takes effect. And very often—*very* often—they go on and do some very interesting things. They call it “research” when they come in at the lowest entry level.

COHEN: It’s a matter of semantics, really.

ASH: It is. At Caltech, SURF students who do those introductory things would probably do them by some other means—maybe they’d be hired into a laboratory, or they’d get that experience by other means. We would not call it “undergraduate research.”

So anyway, the conferences have gone on every year since 1987, and Caltech hosted the national conference in 1991.

COHEN: Who sponsors these conferences? Or who was the prime mover? How did it happen?

ASH: Well, it was started by the University of North Carolina at Asheville, and then a group of people came together around the conference with a commitment to ensuring that the conferences would go forward. They’ve done some fund-raising over time; and most recently—probably four or five years ago—they actually have a donor that provides grants for interdisciplinary research to institutions. So it has become much more formalized over time. Caltech hosted NCUR in 1991, as part of our centennial celebration, and we brought 1,100 students from all over the country here to Caltech.

COHEN: That must have been a huge effort.

ASH: It was a huge effort.

COHEN: Did you accommodate that with your own staff, or did you bring people in to help you?

ASH: I hired Linda McManus, who had most recently worked in development doing event planning and so on. She had never done an event of this magnitude, but we said, “Oh, you just

move the decimal points. [Laughter] What could be so hard about that?" So anyway, yes, it was quite a nice conference. Everything went well. It was held right after the Gulf War—I don't know how that affected our attendance. After we hosted that conference, we said, "We know how to do this. This conference is a very rich experience for the students who get to come."

COHEN: How long were they here for?

ASH: They were here for two-and-a-half days—all day Thursday, all day Friday, and half of Saturday. It's broadly multidisciplinary; it's not only math, science, and engineering, it's also the social sciences, the humanities, the fine arts, the performing arts. It's everything that students major in. And it's the only time that undergraduates have the chance to see how research is carried out in other disciplines and how it's reported. So when I take Caltech students to NCUR, they often end up going to presentations in the humanities or the performing arts.

COHEN: Just to see something else?

ASH: Just to see something that they don't see as often here on our campus. They're always astonished that the students who do humanities research read their papers. When they talk about giving a paper, they *read* that paper. They don't take their eyes off the paper, and they often, or typically, don't have visuals. Our students are always very surprised by that. But, you know, it's a way of broadening their view of the culture of different disciplines.

After we hosted NCUR, we said, "We know how to do this conference now. It's very expensive for an institution to send students across the country, especially for some of the small colleges or the public comprehensive institutions; they just can't afford to participate in NCUR in any significant way. So why don't we hold a conference in Southern California?"

COHEN: This was your idea, Carolyn?

ASH: Well, mine and others who had worked with me on NCUR. We said, "Why don't we host a regional conference but model it on NCUR? Not two-and-a-half days, but one day. We'll model it on NCUR, so it's broadly multidisciplinary. We'll host the first two at Caltech, so that other institutions can get on board, and we can then find other colleges or universities who'd

want to host it.” We hosted it in 1993 and 1994, and we had about 500 people from Southern California.

COHEN: They could travel here easily.

ASH: Right. They could have that conference experience for essentially the cost of transportation—gas—and a registration fee. So we had about 500 people in '93 and '94; and since then it's been hosted by the Claremont Colleges, Occidental, Cal State LA.

COHEN: So it goes on every year?

ASH: It goes on every year. We hosted it again in '02, for its tenth conference. The eleventh conference was just hosted by UC Irvine, and they had 800 to 1,000 people.

COHEN: Has anybody done any follow-up on how many of these students who have come to the conference then participate in one of these summer programs?

ASH: Well, to answer your question, no, probably nobody has done that. There are always SURF students. Occidental always sends a big contingent of students who have done research, either through a formal program or very often it's class work—students who are working on senior theses or other research projects as part of a course.

COHEN: Well, it sounds like a very positive, good thing to do. Even if they don't go into another program, at least their vision is broadened.

ASH: That's exactly right. And along the way, the role of undergraduate research in the undergraduate academic curriculum is being looked at, in lots of colleges and universities. The universities, of course, look at it differently from the colleges. But there's that sense that students can work on an open-ended project—you know, really getting their hands on, learning to ask questions, asking questions that people don't know the answer to. It's not just doing cookbook lab work.

COHEN: By now you have become the director.

ASH: I became director in 1989, yes.

COHEN: When you first came in, I would guess that you just sort of continued doing exactly what you had been doing.

ASH: Well, what I had been doing, plus all the things I'd learned from Fred. Fred had figured out how to do the program. I carried that on. Bill [William M.] Whitney, who is a Caltech alum and at that time was a division technologist at JPL—he's still at JPL—had been very interested in SURF almost since its beginning. Bill and Fred and I used to get together for Sigma Xi chapter meetings, as we called them, but the conversation very often turned to SURF, so Bill had been part of SURF conversations for many years. Pretty soon after I became director, Bill came along and said, "You know, there are a lot of things I wish I had known when I was an undergrad. I went on to grad school, but I kind of drifted into things. I didn't really make any solid plans. I didn't have a plan or a goal that fit into a long-term context. And there are a lot of things I wish I had known. What would you think about putting on a program for the SURF students to tell them these things, give them this information, so that as they plan their careers they have a way to take this experience and parlay it into the decisions they're going to have to make?" So we started what we now call the Monday-night career sessions, and it's become a series of six or seven. It depends on how the summer falls and the holidays and the budget whether we do six or seven. We bring in alumni to talk about various aspects of career planning and to raise issues that students will face as they move into the next phase of their lives. It's become quite successful. We experimented along the way. We used to do it on Monday evenings after the normal workday and after supper. Well, after supper, students have gone off to do other things. So then we said, "OK, why don't we have a supper—"

COHEN: Pizza.

ASH: "Pizza! We'll have pizza, and when that's over, they'll come in and we'll have this program." Well, what happened was people would come to eat, and they'd get to talking to each other, and pretty soon they'd go off and do something else. So now what we do is feed them

there, in the room, so when they come in, they get their supper and they sit down. And as soon as everybody has gotten food and sat down, then we start the program.

COHEN: OK. Trial and error. [Laughter]

ASH: Right. But you know, so many students have come back and said, “This was so valuable. I learned this, and I learned that, and I’ve acted on it,” in some way. So it’s actually become a very important part of what we do.

COHEN: It seems to me I’ve gone to a couple of those.

ASH: Fred had started—and we have continued—these research seminars. We do a series every Wednesday at noon on the campus, and then as SURF began to expand at JPL, we started a series up there on Fridays at noon. It’s hard for the JPL students to get down here and get back again during the day, so we thought they should have the same opportunity to enrich their research experiences by seeing what other people are doing.

COHEN: It also puts them in contact with one another, I would think.

ASH: It does.

COHEN: A lot of these kids must be loners.

ASH: That’s true. We have done some of what we call round-table discussions. We bring somebody in—sometimes an alum, sometimes somebody from business, sometimes an entrepreneur, and so on—for a small gathering. Of course, always at lunch or at a meal.

[Laughter]

COHEN: Feed them, feed them, feed them. [Laughter]

ASH: I know. We just go from meal to meal. That’s what undergraduate research is, you just go from meal to meal.

COHEN: Well, it works.

ASH: Yes. But it brings the students into contact with opportunity, at a time when their schedule is much different from the academic-year schedule. That's the advantage of it. Whatever their motivation is—and the prime motivation may be to come and eat [laughter]—they also take away other things. They meet people, they network, they broaden their view, they get some ideas. And all those things build on what they're doing in their research. So we did some of that, although we haven't done those round tables more recently, because SURF has gotten so big that it's hard to offer—

COHEN: Something that everybody can come to.

ASH: Yes.

COHEN: Sometimes size hurts things.

ASH: Well, it makes it different. It's a different experience.

COHEN: When did your numbers start building up to what you have now?

ASH: It's really been, over twenty-five years, a fairly steady increase. Every year there are more students. Fred made a report to the Faculty Board probably in about 1982, and he said he didn't think the program would ever be more than a hundred students—that was the saturation point, that was a lot of students. Well, within a year or two we were over a hundred. I made a report to the Faculty Board maybe a year or two after I became director, and I said, "I don't think we'll go over 200 students. That really has to be the saturation point, considering the size of our student body." And then we leaped over 200. I made the same prediction when we got to 300—and now I don't predict.

Out of last year's graduating class, 56 percent had done SURFs. About half of the students who've gotten their bachelor's degrees from Caltech since 1980—which would have been the first graduating class after SURF began—have been SURF students. Caltech is a place where—well, with the faculty, with our postdoctoral population—any Caltech student can do

research. There's one PhD-holding individual for every undergrad, so the capacity, I think, is just much greater. But then we also have JPL, and we haven't begun to reach the capacity there. One of the things we are concerned with, of course, is how many outside students SURF can accommodate and still be a Caltech program for Caltech students. I think it will be other issues than capacity that will determine that.

COHEN: So you've had no problem in raising the money needed for this program.

ASH: Well, we've had trouble raising the money. In the early days, and I don't remember if we talked about raising money the last time—

COHEN: Yes. You found a sugar daddy among some of the Associates.

ASH: Yes, we talked about Samuel Krown and the people he introduced to SURF. And Samuel started our endowment, in the early eighties, and I think we talked about that. So raising money became—of course, it's always been—a major concern, because SURF grew up under that research paradigm: If you want to do something interesting and you can raise the money, you can do it. That was something that was important for me to carry on, when I became director. We had, by that time, a group of individuals who were good friends of SURF. The SURF Board had been started, so it was important to build that group up with friends of SURF. It was largely a donor-relations activity, getting people together a few times a year—

COHEN: Did you go through the development people?

ASH: Yes, I always worked closely with development—always. You never want to come a cropper with the development office, because we would not then meet our goals and they would not meet theirs, so there's no sense to that. And of course we always solicited support from the administration in our effort to raise money. But every year there was always [the question of] whether we had enough money when we were ready to make SURF awards for the students that we wanted to give awards to. We would make awards with the money we had available, and then we would have a wait list, and we'd say, "We don't have the money. You do have a meritorious application. If we had the money, we would award it, and it's possible the money

will come in.” Because when you’re out raising money, you go out and shake a lot of trees, and money continues to come in. But we were never confident enough to award SURFs on money we didn’t have.

COHEN: To go into the red, so to speak.

ASH: Exactly. So when Tom Everhart became president—

COHEN: He was very interested in this program.

ASH: He was very interested. He was extremely supportive. I think we talked about this the last time: He made it a line item of the administrative budget. Lew Allen was chair of the SURF Board at the time, so this would have been after he finished being director of JPL, in 1990. Sinecures for directors of JPL: [Laughter] Put them on the SURF Board. And so Terry Cole, who was then chair of the SURF Administrative Committee, Lew Allen, who was chair of the SURF Board, and I met with Tom Everhart to request that the institute provide underwriting for SURF stipends against our fund-raising, so that we didn’t have to go through this process of wait-listing and holding the students and faculty off until we had raised the money. As it turned out, we never had to use that underwriting, and the underwriting was against our next year’s fund-raising, so there was really no—

COHEN: No problem with that. But it showed support.

ASH: It was support. It was a very important step.

COHEN: You had big guns on your board at this point.

ASH: Yes, absolutely.

COHEN: So that’s a credit to you, Carolyn.

ASH: Well, you know, it takes a lot of people to make this happen. It’s the synergy of the

community, and the support of the community, that allows these things to happen.

COHEN: Yes, but you've got to push them in the right direction.

ASH: Well, yes. It's one of the things I've come to realize—that without any particular constituency, SURF would not be as successful as it is.

COHEN: You do have to have a base.

ASH: Without the support of the faculty—that's absolutely key—there is no program. Without the enthusiasm of the students for this kind of experience, there is no program. Without our donors, there is no program.

COHEN: Shouldn't you put that one first? [Laughter] Almost.

ASH: Almost, yes.

COHEN: Without the money, you couldn't go anywhere.

ASH: Yes. But then there are staff all over the institute who make sure things run smoothly. We get students paid; we get all the stuff we need for SURF Seminar Day and our other events.

COHEN: So you're still running your office with a few people.

ASH: I still am. At the time I became director, it was Joan Spears and me. And then Susie Clark, right about that time, joined our staff. And she and Joan were job-sharing, so it was still one FTE. Then Susie decided she needed or wanted to work more, so she took up the officers-of-the-faculty work.

COHEN: That was your original job.

ASH: That was my original job. Susie did that half-time and SURF half-time, and Joan worked half-time, and we lived in the basement of Dabney, in nonadjacent offices.

COHEN: Just to make it more fun, right? [Laughter]

ASH: Yes. [Laughter] And then we moved over here, to Beckman Institute, in '91, when the building was new. Harry Gray was Director of the Beckman Institute, and he invited SURF to move in. He offered us permanent quarters. It was very important recognition of SURF, and it placed SURF physically in the midst of research activity.

COHEN: You've been here a dozen years.

ASH: Yes, we've been here a long time, and we hope we will continue to be housed here.

COHEN: One more question on the financing of students. If a professor takes on a SURF student, some of that money comes out of his grant. Is that correct?

ASH: We usually expect that the money we raise from outside sources will serve as matching funds from a professor's grant. Normally a professor pays half and SURF pays half. The students who work at JPL are paid from NASA direct funds.

COHEN: So the person who takes on a student there doesn't have to worry about the money.

ASH: That's right. For the non-Caltech students who come in, we have very limited money, but we do have some. The money we raise is used to support Caltech students working with faculty members, so the non-Caltech students who come in are typically paid by the faculty member; however, SURF provides an administrative infrastructure. It provides a process for bringing students in. I think we talked about the pedagogical advantages of their writing the proposals and doing the reporting. And then of course they have access to all the programming we do over the summer as well. And sometimes the faculty are looking at students as possible grad students. That's a great way to do that: Bring a student in for ten weeks to see if this is somebody you'd really want to have as a grad student. So it's often to the faculty's advantage, and they're willing to pay the amount of the stipend to do it.

While I'm still back in the early nineties, let's talk about the beginning of the MURF program. In 1991 David Van Essen, whom you probably remember was a biology professor

here, and some of his colleagues in biology and chemistry developed the MURF program.

COHEN: MURF stands for what?

ASH: Minority Undergraduate Research Fellowships, to bring in underrepresented students in biology and chemistry.

COHEN: This wasn't necessarily for the summer program, this was students in general?

ASH: It was for the summer program, and it was largely modeled on SURF. The students applied a little bit differently. The motivation was, I believe, that NIH [National Institutes of Health] provided encouragement/incentive through their grant programs from NIH for these kinds of programs to be developed. The MURF program was formed, and it is now largely funded from the Howard Hughes Medical Institute grants that Caltech brings in. I can't remember offhand what the early funding for MURF was, though I think NIH research grants provided at least some of the money. And they brought in probably ten or fewer students those first summers.

COHEN: Who recruited them? Where did they come from?

ASH: They were recruited from the minority-serving institutions but also from majority-serving institutions. They were recruited through programs like MARC, Minority Access to Research Careers, and MBRS [Minority Biomedical Research Support]—these are national programs, funded by NIH.

COHEN: So they did that work themselves and not through your office?

ASH: At that point, Professor Van Essen and his colleagues—including Kai Zinn, who later took over coordination of the MURF program after David Van Essen left Caltech for a faculty position at Washington University in St. Louis—did all the work of developing the program. They requested that the students admitted to MURF be included in the SURF program so they could take part in the seminars and activities and would come in contact with other students. The

SURF office also administered the payroll for MURF. In 1998 we raised money from the James Irvine Foundation to expand MURF into other disciplines beyond biology and chemistry.

COHEN: So your office really got involved with MURF.

ASH: Yes, we did get involved with it. And about that time, the biologists said, “Well, if it’s going to be an institute-wide program, why don’t we move it over to SURF?” So that program moved into our office in due course and is now housed with us.

COHEN: Who does the MURF recruiting? Do you do it?

ASH: Carol Casey, in my office, is the MURF coordinator. We have a big mailing list now.

COHEN: Is that something you developed out of your office?

ASH: Well, we expanded it—it started in biology and chemistry and we built on what they started. These are all non-Caltech students, and they apply a little bit differently. Rather than writing the research proposal, they write a personal statement of what their research interests are and what piqued their interest, how they fostered that interest. We encourage students now to look at the Caltech Web site to see what kind of research our faculty do. Occasionally we’ll get somebody who’s in engineering from someplace and they’re majoring in heating, ventilating, and air-conditioning. We say, “Well, we don’t do that kind of engineering here.” [Laughter] So we want them to do some research and some background on what kind of place Caltech is. In the last four or five years, we’ve looked at that as part of Caltech’s diversity initiative. MURF can help Caltech achieve greater diversity, especially in the graduate program. And then of course it becomes part of a pipeline for grad students, postdocs, and—down the line—faculty. We have made an effort to move it from being just a program to expose students to research and maybe help them along academically to a program that helps Caltech meet its diversity goals by bringing outstanding underrepresented students to Caltech to work with faculty for the summer.

COHEN: And how is that aspect coming along?

ASH: It's coming along very well. We're looking for stronger students—very strong students who potentially could be graduate students here. Since 1992, fifteen MURF students became graduate students at Caltech.

COHEN: How many MURF students did you have, say, last summer?

ASH: Last summer we had twenty-seven.

COHEN: That's a lot.

ASH: Yes. And of course, not all were ready to apply to grad school, because they were just finishing their sophomore year. Four students from the 2002 MURF class came to grad school.

COHEN: That's probably very good.

ASH: Oh, it's very good.

COHEN: These now are not students that are going to need help to keep up. They're supposedly coming in on a level with everybody else.

ASH: They are, absolutely. Then we had another program, which started probably in the middle nineties. It was funded from the National Science Foundation. Nate [Nathan S.] Lewis [Argyros Professor and professor of chemistry] was the PI [principal investigator] on the grant. It was to develop computer-based teaching tools for Caltech courses, and the program became known as TIDE, Teaching and Interdisciplinary Education. We had this big grant from the NSF to develop computer-based teaching tools on the lines of the chemistry animation project that Nate developed probably fifteen years ago or so. So that also became part of the work in our office.

COHEN: Now, were these other students who came in to do this?

ASH: Some of them were outsiders; a lot of them were Caltech students.

COHEN: But this was not the same bunch of people doing SURF?

ASH: It was different work. The idea was that the learners, in a class, could apply their technical skills and say, “I could understand this material better if I could see it *this* way.” And theoretically that was a good idea. It wasn’t research in the sense of being in a laboratory and investigating new problems, but it was taking the essence of that and applying it to how we could teach better, what tools we could develop to make our courses better.

COHEN: So Nate Lewis did this with his own grant? He didn’t have to do this?

ASH: Well, actually David Baltimore [Caltech president 1997-2006] was listed as the PI. But it was Nate who had generated the idea and drafted the proposal. So it became an institutional grant, but Nate was the key person. And it was something that David Baltimore was certainly very supportive of and enthusiastic about. So at that time—because now we had TIDE, we had MURF, we had SURF—we changed the name of our office from the SURF office to Student-Faculty Programs. We didn’t want all these other programs to just be subsets of SURF, we wanted them to have recognition as equal programs. We had a very hard time trying to [change the name]. SURF had such panache. You could answer the phone with it. It was an acronym that had words to legitimate it. It was just a great name—there was a lot of cachet there.

COHEN: I know. People would say, “Are you SURF-ing this summer?”

ASH: So we had a contest to name the office something with as much panache as SURF. For a couple of months we had lots of people weighing in with names for our office. But you had to be able to answer the phone and say it. It had to make some sense. I mean, it couldn’t just be Tsunami, which was one of the names suggested, but that doesn’t mean anything. [Laughter] If you’re identifying yourself, it doesn’t work. So we came up with, finally, Student-Faculty Programs.

COHEN: I’m sure most people don’t know it’s not still SURF. I bet most people still think it’s SURF.

ASH: Yes, but officially it became Student-Faculty Programs at that point. The TIDE program went on for a few years, and we funded a few interesting projects. I don’t know if any of them

are still in use in any courses. But then the grant ran out, and that was that, so the TIDE went out.

COHEN: OK. [Laughter]

ASH: Since then, however, other programs that allow students to work with faculty members on problems of mutual interest have come along and now take advantage of the SURF infrastructure. Some examples of those: We have a small grant from the Beckman Foundation, which we've had for the last five or six years. It funds two sophomores each year—sophomores in biology or chemistry—and it's a great program. Students do research over two summers and the intervening academic year. The grant provides a generous stipend, research money, and travel funds for the student to go to conferences.

COHEN: Who raised this money?

ASH: It came as a call for proposals from the Arnold and Mabel Beckman Foundation. We write the proposal. And the students get a little bit more summer stipend than the SURF students do. They're recognized in the commencement program as Beckman Scholars. It's a very nice program for the students, and it's been enthusiastically received by the faculty, because they've said that this is exactly what our students should be doing. It encourages the students to get more deeply into a research project.

COHEN: They start in the summer; they go through the whole year, and then the next summer?

ASH: Yes, so they really can do something.

COHEN: How many students do you have in this program?

ASH: Well, it's only two. We can only take in two, each spring. [Tape ends]

Begin Tape 2, Side 2

ASH: Harry Gray [Beckman Professor of Chemistry] was on the board of the Beckman Foundation, and when this program was developed, it had the SURF fingerprints all over it: The foundation wanted these students to write a research proposal, to have an interview with a faculty committee, to do the research, to report on the research, to write a technical paper, and to give an oral presentation—so it had all the SURF elements in there. We're quite sure we know where that came from [laughter], who got that instilled into the program when it was developed.

Five years ago, at about that same time, the institute was thinking about how to get the top applicants to accept their admissions to Caltech, and it was about that time that the Axline endowment was set up, from the big gift from Rea and Lela Axline. The money was given for undergraduate student scholarships and so on. So the incentives, of course, were lots of scholarship money and the opportunity to do research the summer before these students start their freshman year.

COHEN: How many do you have?

ASH: Let's see. In 1998, the first year, we had twenty-two. It was just hugely successful. Once Caltech did that, then of course other institutions started doing similar things.

COHEN: You advertised the program?

ASH: No, there's no advertising. The students are selected by the admissions committee.

COHEN: Oh, so this is not something they can seek out by themselves.

ASH: No, they have to be specially selected to receive this scholarship money and to have the research experience. These are amazing young people; some of them already have publications, coming out of high school. Some of them have done research—well, obviously, if they've got papers. Others haven't done any research, but they've done other very interesting things that definitely make them top applicants.

COHEN: Which is the committee that seeks them out?

ASH: It's the Freshman Admissions committee. That's the committee that, of course, reviews applications and makes the decisions on whom to admit to Caltech, and from that group they take the ones who have distinguished themselves the most and the ones they absolutely want to get to come to Caltech. Of course, every other college and university is also in competition for those students, so there are a lot of programs that are developed and incentives to get students to accept their admission to a particular place, and this is how Caltech decided to do it. Because research is the coin of the realm at Caltech, and undergraduate research is part of our culture, why don't we make that part of the incentive package?

COHEN: I see. So it's been very successful.

ASH: It has been very successful. Twenty-two students the first year. We had twelve in 1999 and 2000, six in 2001, and eight in 2002 and 2003. But that now is the Axline SURF program, and those students are matched with a faculty member. They don't write a proposal in the same way SURF students do.

COHEN: Well, they're not competing for it; they've been chosen.

ASH: They've been chosen to have it. And we don't even know who they are until May 1st, which is quite late in the whole process. But we ask them to write a personal statement: "What would you like to do? What would you potentially be interested in?" Some of them know exactly. We had a student who knew he was going to be a mathematician, actually had a problem that he wanted to work on. He himself made contact with one of our math faculty members. So—

COHEN: He's on his way.

ASH: He's on his way.

COHEN: Are there any women in that program?

ASH: Oh, yes, there are.

The Axline students always live in Avery House for the summer, because of course they should not become biased toward any of the seven houses. We have to respect the student culture here and not give them undue advantage, but they really become sort of a core group, even in the freshman class, because they've been here for ten weeks, they know their way around, they know some of the traditions, they've had the honor code indoctrination early. So we had to think about all those things as we brought these students in: How do they become integrated, and how do we do it in a way that doesn't give them an advantage over the frosh who arrive in September selecting a house to live in.

Then a few years ago, NASA developed the Undergraduate Student Research Program, USRP. Now, that's interesting—we have all these acronyms, but we always called that one USRP and not “usurp.” [Laughter] I don't know why that is. But it also has some of the SURF fingerprints on it. Jim [James] Gorman came out from NASA [NASA Office of Human Resources and Education] as they were developing the program to discover the key elements of SURF that NASA might adopt. And they adopted some of them. They did not adopt the proposal part, but they did adopt the reporting at the end and the students' writing a personal statement. This is a national program, so students apply to NASA for USRP. NASA's looking at the SURF model for its undergraduate research program was wonderful recognition for SURF!

COHEN: They apply after they have gotten here?

ASH: No, no. They apply for USRP from their institutions during the calendar year. NASA assigns successful applicants to various NASA laboratories, and so of course JPL gets a contingent of these USRP students. Because undergraduate research is really part of the culture and there's a lot going on, it was decided to make these students part of SURF once they're admitted to USRP. So once they've been admitted to USRP and assigned to JPL, they become part of the SURF group.

COHEN: But they may not necessarily be Caltech students at all?

ASH: No. But they could be. We've had a couple of Caltech students who have been USRP students, but the USRP students are almost all from other places.

COHEN: And they just come for the summer?

ASH: And they come for the summer, so it's ten weeks. The benchmark for the kind of work they do is the potential for publication. They can participate in all SURF activities. They can live in the student houses on campus. They become part of the undergraduate research community. So when we brought USRP under the SURF umbrella, it began to change the constituencies of SURF a little bit; it increased by twenty students or so. Also, probably in the last five to seven years, LIGO [Laser Interferometer Gravity-Wave Observatory] developed an undergraduate research opportunity, partly funded from an NSF REU grant but also partly funded from the LIGO grant. And Ken Libbrecht, who you remember was in the first SURF class, is the director of the LIGO undergraduate research program, so he brings in students and they're all from outside. And that number, last year, was twenty to twenty-five.

COHEN: That's quite a few.

ASH: Yes. So they apply to LIGO, Ken matches them with faculty and researchers within LIGO, and then they, too, become fully part of SURF—live in the houses, the activities, the summer—

COHEN: So they do all these things—the luncheons, the pizza, and everything else.

ASH: All that is open to them as well. So, I now think of this as the classic SURF, which are Caltech students working with faculty or JPL technical staff, the ones we raise the money for, And the others [I think of] as the allied programs.

COHEN: What is the breakdown of the numbers? It's not half and half, is it?

ASH: Not quite half and half yet. The thing is, we impose the SURF standards and the SURF requirements on all these programs. If they want to take advantage of the SURF infrastructure, it has to be research with the potential for publication. That's what we expect. They have to do the oral and the written report at the end. For the students who apply by writing a personal statement—the MURF students, the USRP students, and others—we require now that they write

a work plan before they begin their research. We can't call it a proposal, because they are already in, so it's not a proposal in that sense, but the writing of the paper, the work plan, functions the same way. It gets the student thinking about what he or she will do, and it gets the mentor thinking about what he or she will do. Everybody is prepared, so that once the student actually shows up for work, he or she can start doing something. They don't have to go to the library for a week while everybody figures out what they'll do. That really helps to maximize the ten-week period.

COHEN: Are you still operating with only two people out of your office, you and two half-timers?

ASH: Now I have three staff in my office. Fiona has the faculty-officers job, which is now a full-time job, not a half-time job anymore, because she attends the Faculty Board and the faculty meetings and takes the minutes. She has expanded some of her roles with the faculty committees and so on, so that's a full-time job. So when she came, I effectively lost a half FTE. I now have two full-time people, and then other people I hire on a consulting basis for specific things—for example, doing events.

COHEN: So a good bit of work is done by the SURF Board?

ASH: The SURF Administrative Committee does the proposal reviewing. The SURF Board helps with fund-raising activities. One thing that has allowed us to essentially reduce our staff level is technology. We had built, three years ago, an amazing database that manages all our data, literally at the press of a button. And this year we're going to online applications; we're in the process of building that system, which will further automate our office.

We won't have all that paper. But when we had the proposal review, every single year up until this coming year—'04—we've had to package up these proposals and hand-carry them to the reviewers and then hand-carry them back. The alternative, of course, would be to mail the stuff, but we were sending originals. We didn't want to have to Xerox everything. So it was just a sort of mad running around the campus. None of that's going to happen. In this next proposal round, it will all be online. If reviewers say, "Yes, I can review fifteen proposals," we say, "Here they are." Then they can just go in and make their comments and recommendations and they're done.

I wanted to tell you about a new program we started last spring, to provide training and support for the grad students and postdocs who find themselves mentoring undergrads. All these twenty-five years, of course, students who work in a laboratory generally work on a day-to-day basis with grad students and postdocs. And it very often happens that the SURFer shows up on the first day of SURF and the faculty member says to the grad student or postdoc, “Oh, by the way, here’s this student for you to work with all summer.” That has an effect on the grad students and postdocs, because they’re doing their own work, and now suddenly they have this other person they’re responsible for. So there’s, in some sense, a resentment factor—but also a bewilderment factor: “What do I do with this student? This student wrote a proposal for work that has something to do with what I’m doing, but not exactly.”

COHEN: And they’re pressured to get their own work done.

ASH: They’re trying to get their own work done, and they don’t have any experience in scoping a project for somebody with no experience, for ten weeks. So the year before last, the grad students, who are quite well organized, put out a survey in the graduate student newsletter on mentoring experiences with SURF students, and the first question was, “How was your interaction with the SURF office?” And they showed me the survey. Otherwise I probably wouldn’t even have known that this survey came out, because I wasn’t on the grad student newsletter mailing list. I said, “You know, this is really a loaded question, because I can tell you they didn’t have any.”

COHEN: You never saw them.

ASH: We didn’t see them. In some cases, we knew what their names were, but we had no contact with them, so they didn’t have any contact with us. But it became clear that this was an issue for them, and I thought, “If it’s an issue for them, it’s an issue for the SURFers. It’s going to impact their experience.”

COHEN: Sure.

ASH: Just as the undergrads are being introduced to research, here’s a whole group of people, a

whole constituency of people, who are being introduced to the mentoring process. So last year we got together a core group of grad students and postdocs who were willing to help develop this program. We put on workshops before SURF began, to explain what SURF is. In some cases, they didn't even know what the program was.

COHEN: Sure. Why would they know?

ASH: [We explained] what SURF is, what the expectations are, what the SURF philosophy is. We gave them tips on mentoring. We brought in faculty and grad students and postdocs who had had mentoring experience to talk about the process of mentoring and the importance and value, and the benefits to them of having mentoring on their résumés when they go on to the next phase of whatever they do. And then we had some discussion groups over the summer.

COHEN: How many of these grad students did you get to come?

ASH: Well, we did the workshops based in the divisions, so the biologists were talking to the biologists, the chemists were talking to the chemists, the physicists were talking to the physicists. When they talk about things like developing a project, that looks different in different departments. For the biologists, anything a student might have proposed in March has probably been done by the time summer starts. The article may have been written by June. In engineering, they might have the same thing going for years. So there are a little bit different issues. Plus, the grad students thought they would feel more comfortable and ask more questions and engage better if we did it within the divisions, so we did that. And we got probably twenty to thirty in the largest workshops—probably five to eight in the smaller workshops. But we started the process—the most important thing is, we started the process—and we gave them a name, “co-mentors.” We put them in our annual report and other materials; whenever we list the student with the mentor's name, we also list it with the co-mentor, to give the co-mentors recognition for the work they're doing.

COHEN: They're doing the work.

ASH: They are doing the work. We are going to hold, in the next couple of weeks, an

information session for co-mentors for next year, now that we're just moving into the application process. So if people want to become co-mentors, they can go to their advisor and say, "You know, I've got a little project. Why don't we get a SURF student?" They can be part of that process rather than just—

COHEN: That's terrific, that you picked that up.

ASH: We're excited about this, and I think they're excited about it. They feel it's important and that they've been recognized.

COHEN: Well, they had been doing something for which they got no recognition.

ASH: Exactly. OK, you asked me how many students we had last summer. We had 440.

COHEN: In all the programs?

ASH: Altogether, under the SURF umbrella.

COHEN: Right. Well, that's a lot. These programs are now copied by places all over the country?

ASH: Right.

COHEN: You can say, really, that there's nothing but success from all of this.

ASH: Well, you know, I think there really is a lot of success, and I think it's because everybody wins. The students win, the faculty wins. It isn't that somebody wins at somebody else's expense.

COHEN: That's really great. And it's really a tribute to you, Carolyn. I mean, well done!

ASH: Thank you. Thank you. But, as I say, I figured out a couple of years ago, when we had only maybe 350 students, that there were probably 1,000 people that summer making it possible

for those 350 students.

COHEN: So it's really a joint project, with many people.

ASH: To borrow from Hillary Clinton, it takes a village; it takes a community to make this happen.

COHEN: Do you have any wish list, of what you would like?

ASH: Well, let's see. We're in the capital campaign, as a campaign item, for \$10 million.

COHEN: Oh! Ten million for SURF!

ASH: Yes, right. Our current endowment is about \$5.6 million, and we're in the campaign for an additional \$10 million, of which we've raised about \$800,000 or \$900,000. So that would be my wish. If we could complete the endowment, that would be a nice legacy to pass on.

COHEN: So now this program goes on in many schools in the country.

ASH: In some form or another. I did a study for the Association of American Universities in 2000 to look at undergraduate research in six AAU institutions. Of course Caltech was one. And I looked at MIT, Rutgers, Emory, the University of Washington, and the University of Illinois at Urbana-Champaign—so, a small private institution, a mid-size private institution, a bigger private institution, and two publics. Before I started, David Baltimore said, “You have to be careful when you go to these institutions, that you don't tell them how to do things.” And I said, “Well, of course I'm not going to go there to tell them how they should be doing their undergraduate research. But when I'm finished, if I find out that Caltech is doing it the best of anybody, I'm going to exploit that information locally as much as possible.” And I think I can confidently say that SURF is probably the best undergraduate research program in the country, for these reasons: It's a comprehensive program, undergraduate research is embedded in our culture, our faculty expect to work with students, and most faculty do have students in their laboratories. Over a recent four-year period, seventy-five percent of our faculty had had students

in their laboratories, either through SURF or during an academic year for credit. And if you took out the humanities faculty—because we don't really have very many humanities majors—that percentage went up to 80 percent.

COHEN: As you say, it's part of the culture.

ASH: It's part of the culture. No place can touch that. Any undergraduate who wants to do research at Caltech can do it. SURF is so exemplary, in large part, because Caltech is Caltech. It can happen here because we have things that other institutions don't have.

COHEN: Well, it all sounds good. So would you want to change your life here at Caltech in any way? You've certainly done a lot of service to Caltech. Has Caltech been good to you?

ASH: Caltech has been a great place for me! Caltech has always been a place that values the entrepreneur. If you have an idea, you can implement it here. That's been a rewarding aspect for me. [Tape ends]