

An Interview with  
RALPH and MADGE GRISWOLD

OH 256

Conducted by Judy E. O'Neill

on

29 September 1993

Minneapolis, MN

Charles Babbage Institute  
Center for the History of Information Processing  
University of Minnesota, Minneapolis  
Copyright, Charles Babbage Institute

Ralph and Madge Griswold Interview  
29 September 1993

Abstract

Ralph and Madge Griswold discuss how their respective educational backgrounds in electrical engineering and journalism led them separately to Bell Laboratories. Madge discusses her involvement with TEXT90 and TEXT360 in the preparation of technical journal documents. Ralph recalls the informal dissemination of SNOBOL to the academic community. The Griswolds describe Bell Laboratories' involvement with MULTICS and the movement of groups within Bell Laboratories away from GE machines to IBM equipment. From their perspectives as an employee and an administrator respectively, Madge and Ralph describe the climate for women at Bell Laboratories during the 1960s. Ralph discusses how changes in the research environment at Bell Laboratories led him to the University of Arizona. Ralph describes his effort to recruit computer scientists to the fledgling department and Madge discusses her involvement in the recruiting process and the development of the department. The Griswolds also discuss the stagnation of SNOBOL4 after the language manual went out-of-print, and their work at the Bright Forest Company with the development of a commercial Icon implementation.

RALPH & MADGE GRISWOLD INTERVIEW

DATE: September 29, 1993

INTERVIEWER: Judy E. O'Neill

LOCATION: Minneapolis, MN

O'NEILL: This is September 29, 1993 and I'm in my office in Minneapolis interviewing Ralph and Madge Griswold. I'd like to start the interview with getting some personal background on both of you. Ralph, I've seen that you have your undergraduate degree in physics from Stanford in 1956, went to the Navy, got EE degrees from Stanford, masters and Ph.D., 1960 and 1962. Can you tell me about your earlier background and your interests when you were younger?

RALPH GRISWOLD: How far back do you want me to go?

O'NEILL: Well, in particular, did you want to be a physicist? Did you go to Stanford with that idea? What were your interests?

RALPH GRISWOLD: No, I'd been brought up in a household where my father valued science. He'd been a chemist originally or wanted to be and I was interested in science, at least at the time I was in high school. I think I was most interested in biology actually, but had been involved in science, and I was a finalist in the Westinghouse Science Talent Search of the year, and graduated from high school, and I think I anticipated going into the sciences when I went to college, but I didn't have a real fix on it. My father had wanted to be an astronomer but that had been impractical because you couldn't get a job, especially in the depression. I was interested in biology, interested in being a naturalist. What actually happened was really quite accidental. I went to Stanford alone, across the country on my own, showed up in some registration line where I had to register, and I was told I had to pick a major, and I hadn't thought about it and I had no advisor. I had to make a decision then and there. I was not allowed to wait, and so I picked physics. I didn't actually like physics very much. I don't regret having a degree in physics but it seemed, I guess, to me as how to be in sciences, to be a practical thing to do. I probably would have majored in mathematics except I was afraid of math as lots of people are. So I just happened to be standing there and was all of a sudden told

to make a snap decision, and it could have been chemistry, it could have been physics. I just picked physics. So I got into a degree by accident and with no way out. At one point I did explore alternative majors. I took a Strong Interest test and was told that I was best suited by interest to be an architect or a preacher. I talked with people in architecture and they discouraged me, basically. I didn't want it badly enough, I think, so I went ahead and got a degree in physics, but it was purely an accident.

MADGE GRISWOLD: You didn't talk to people about preaching?

RALPH GRISWOLD: No. [laughs] I really wasn't interested in the ministry. Preaching I do. I can do that.

MADGE GRISWOLD: Different kind of preaching, yes.

RALPH GRISWOLD: Physics was entirely an accident. If I'd been given a chance to spend a year or two exploring different disciplines, I might have picked something entirely different.

O'NEILL: After that you went to the Navy for a couple of years.

RALPH GRISWOLD: I had an ROTC obligation.

O'NEILL: What kind of work did you do in the Navy?

RALPH GRISWOLD: My father, who worked for the government at that time, had written a letter to Admiral Hyman Rickover trying to get me in a good position for those two years, for Rickover was the head of the submarine organization. Because my father worked in the State Department, Rickover called me in and bawled me out for my father trying to use influence. I didn't know my father had sent the letter, and I decided Rickover was a pretty nasty person, but I weathered through that and some others and I got assigned because of my degree in physics, perhaps, to the Naval Damage Control Training Center in Philadelphia where I taught atomic warfare defense, of all things, to

Naval officers, submarine officers, I guess mostly, coming in to be educated about chemical, biological, and nuclear warfare. I knew nothing about the subject, but they had nice view graphs, so that's my first experience teaching also, which wasn't very pleasant. It was not a rewarding time. I spent my off hours reading and studying, actually computer related things, and mathematics, and I took a course in theoretical physics from Temple University, but basically it was just spending a couple of years doing a dumb job.

O'NEILL: So up to this point you had had some exposure to computing?

RALPH GRISWOLD: Well, some. I think probably my interest in computing in general goes back to reading a lot of science fiction when I was in high school, something my stepmother did not approve of, but interest in advanced technology which had a flavor of computing, robots and things like that. When I was an undergraduate at Stanford, there was no computer science program there at that time, but a professor of mathematics taught the first course in computer programming when I was a senior, and I took the course and also graded for it -- having never taken the course before. It was on assembly language programming for the IBM 650. That interested me, but it was a pretty terrible course. But I was interested in peripheral things like neural networks and the early work being done in robotics, and I read on my own about that when I was an undergraduate and in the two years when I was in between. So I had developed an interest in that, and I had explored actually before I'd left my undergraduate program, explored the electrical engineering department, coming back there for graduate work primarily because that was the one place that was doing oddball things. That's where unusual things were going on, in the EE Department. Things like learning theory, artificial intelligence, and it was very primitive at that time. We're talking about the early 1960s. There wasn't any computer science department and I don't know that I could distinguish between my interest in hardware and machines and in programming. I don't know that I had a good idea of the distinction at the time.

O'NEILL: Were there individuals at Stanford in the EE department or elsewhere that you were interested in working with?

RALPH GRISWOLD: Not really. Basically the fact that the EE department looked like it was a place that would give

the opportunity to get an unusually broad education. In fact, I did a very non-standard degree. I took courses in logic, metaphysics, and strange things, when I was a graduate student in electrical engineering. No, there weren't any particular individuals and I never formed a strong attachment to any. It was just a place where interesting things were going on. I definitely remember being attracted by the people. In the physics department -- it was a very prominent physics department, had many Nobel Prize winners -- they really were not very interested in their students. I mean, I had an undergraduate advisor I never saw. I got a really bad feeling about the student-professor interactions of undergraduate students. But the people in electrical engineering seemed to be a little bit more human, a little more interested in the students, and when I talked to them it was a positive experience. So I thought, well, I would enjoy being in this department more because they seemed to be more human perhaps.

O'NEILL: That brings us up to about 1962 when you went to Bell and at this point I'm going to move over to Madge and catch up with her background. As I mentioned I haven't seen anything on your background and you started to fill me in earlier, but why don't you fill me in on tape, in terms of your education and background.

MADGE GRISWOLD: My interest has always lain in the documenting side of computer science. Basically my background is in journalism and I'm an historian as well, but I became interested in computer-based documentation very early. I'll step back a little bit farther than that to say that I became interested in typography, even early typography, my first year in high school and followed that through with school newspapers and so forth, and that's what promoted me into an interest in journalism. I received my bachelors in journalism and another bachelors degree in history in 1962 from Syracuse University. At the time I probably would have loved to have been also an English major and a journalism major, but the University would not permit it. I wanted a job in magazine publishing in the business press somewhere, or scientific press, and found that it was impossible to live in New York City either in book publishing or magazine publishing. So the one job that was open to me that looked very interesting to me was a technical editor's job at Bell Laboratories in Holmdel, New Jersey. I took that job and held it for seven and a half years. During that time, the department I was in introduced the first document processing programs, TEXT90 for an IBM 7090. Our department was using this to produce circuit descriptions. It was a very brute force kind of thing that both of us can describe because we both used it, and later a better version of that was produced for the IBM 360

called TEXT360. It was about that time that I met Ralph when both of us had documents that needed printing in a hurry and we arrived in the small computer center where the one upper- and lowercase print train existed and were contending for the same device and glaring at each other and he won. [laughs]

RALPH GRISWOLD: I would have to say that you recounted saying, "Who is this person anyway?" [laughs]

MADGE GRISWOLD: I believe I said, "Who in hell is Griswold? I want my job printed!" They said, "That's Griswold." You know, that's God, and step aside, he get's his job done first. So that's how I got to Bell Laboratories. I started there in 1962 about six months after Ralph did. I graduated from Syracuse in 1962, in June, and you got your Ph.D. in January, right?

RALPH GRISWOLD: It was conferred in January.

MADGE GRISWOLD: Later because of an interest in maintaining TEXT360 and an interest in typography and early computerized typesetting, I became interested in some of the research that was being done in the programming language research department, which Ralph was a supervisor in, and through work that we were jointly doing I ultimately got transferred to that department and began to work for that department. That was about 1968, I think, and we left Bell Laboratories in 1971. We had been married to other persons before that. We were married in 1971 and went to the University of Arizona. Shortly after that Ralph was approached by Prentice-Hall to write a book, which became two books -- the SNOBOL Primer and String Language Processing -- and he asked me to co-author SNOBOL Primer and that's how we began to write books together, and that has been my involvement along with editing newsletters and doing some funny things behind the scene, like finally handling a mailing list [laughs] which nobody else seems to want to do, so I'm doing that. But my interest has strongly been in good documentation, which Ralph shares, and in actually working on typesetting the books, which we have done.

O'NEILL: There was one other question that I should have asked before I switched over. Why did you go to Bell, and were there an assortment of places you were choosing from at the time, or was there a specific reason that you

wanted to be there?

RALPH GRISWOLD: No, there was a connection. I had started out my graduate work with a National Science Foundation fellowship supporting it and I had made a tactical error of not paying attention to their rules and failed to bother to pass my foreign language exam or even think about it and discovered that was a benchmark or a point that you had to do to continue support. The department didn't care in the least about it. It was just something that you did at some point, did it in a week or two when you got around to it, but I lost the support of the National Science Foundation because I failed to do this. Nobody informed me about it. The department, through some connection, got me a fellowship from Bell Laboratories. At that time, Bell Laboratories had graduate fellowships at various places and so I was shifted from the National Science Foundation support to Bell Laboratory support, and it didn't mean a lot to me except that it was nice to have financial support in graduate school.

MADGE GRISWOLD: So you were still at Stanford, just getting support from Bell Laboratories?

RALPH GRISWOLD: Yes. Basically it was a fellowship to support the latter part of my doctoral work, my dissertation in particular. I suppose that the department had  $n$  of these fellowships and they decided to give one to me or something. I don't really know. I wasn't involved in the process. And that didn't have much of an effect on me because I didn't think Bell Labs cared or followed up on these things. But when it came time to look for a job, that was a connection. They used this for hiring purposes and they asked me to apply to Bell Laboratories, which I did. And I applied to IBM, and Lincoln Laboratories, and a few other places that I don't remember right now, and got a number of interview trips set up. I should say at this point that I had a very negative attitude about computing. I'd got my degree in electrical engineering and I'd had some exposure to actually doing some computing and it was terrible, and the equipment was awful, and it was unreliable, and very frustrating. So I had a bad attitude about computers at the time. When I completed my degree and was looking for a job. So when I went out looking for a job, I discovered everybody wanted programmers. This was the time when there weren't computer science degrees, but they needed people in high technical positions that could actually run computers. They thought that anybody with a good education, and who was reasonably bright, could be made into a programmer. So everybody had jobs for

programmers. They were desperate for programmers and every place I interviewed, they wanted me to be a programmer. The term "programmer" means something different now, but at that time these were high level technical positions. I decided in the process of these interviews that I did not want to be a programmer. These people had large programs to write or new computers and were trying to convert things and I just really didn't want to do that. I wanted to do research. I did not, incidently, interview in academic environments. I think that was because my father had a reputation for being a brilliant teacher and I didn't think I could measure up. My experience in the Navy had not been very good, and so I was really looking only in industry. I did interview only in industry and did not apply to any universities. I don't know what, if any, guidance I had from my major professors. So I went to Bell Labs because they asked me to apply and I applied. I interviewed several places in Bell Laboratories and they all wanted programmers. Military communication systems needed programmers. I interviewed one place in Bell Laboratories, an isolated research group where they were working on some of the things that really did interest me like automata, Turing machines, and those kinds of things. That was interesting to me although I didn't really have a very good idea of what they were doing. I went back after this interview to Stanford and waited for job offers and I got a few, and I got a job offer from Bell Laboratories, and I got an offer from the general area in which this group doing automata theory was in, and I naively said, "Well, I'd really rather work for this group doing automata theory." That was not where the offer came from and I probably caused some consternation at the Laboratories at the time because I think they'd only let me talk to this group because I had expressed an interest in it and they were trying to recruit me, but they really wanted me in a job being a programmer. But they came through with a job in this other group except the first day on the job they handed me a deck of cards and wanted me to do a program. [laughs] So I got into computing by trying to avoid it and being somewhat mislead. I don't regret it, but it's a peculiar situation, very definitely a circumstantial, accidental kind of thing. I didn't feel very strongly about any of the jobs except I developed this bad attitude towards computing.

O'NEILL: How long did that bad attitude last? I mean, obviously you got to a job where you, in fact, did have to do programming.

RALPH GRISWOLD: Not very long. I mean, in the first place when I developed this bad attitude, I really didn't have

a good solid basis for having the bad attitude. It was more of a feeling that all of these people were eagerly trying to grab somebody to do a grubby job. So I had a feeling when I was interviewing these people they had desperate problems and they were looking for anybody they could hire to solve the problems. I had a feeling under those circumstances that it wouldn't be a very good organization to work for. The one I did go into was a research organization and I discovered I loved programming, so my bad attitude didn't last very long at all. But it's not surprising because it was based on ignorance.

O'NEILL: You mentioned in your article from HOPL-I that Farber went out and talked to the University of Michigan and that was one way that people started hearing about SNOBOL and that it was available. Was there an explicit goal on your part, or the part of the group that you were working with, to make it available, or was it more of the implicit, "Well, if people ask us about it we'll give it to them?"

RALPH GRISWOLD: Somewhere in between. We had originally developed it as a tool for our own use. Didn't have any anticipation that anybody else would want to use it. Dave Farber was very much of a gadfly and still is. He visited a lot; he liked to travel. He had contacts in lots of places including the University of Michigan, Bernie Galler. I think probably, as a group, we didn't have goals like that. As a group we were just doing something that was fun and all of a sudden became very popular, which was puzzling. Dave, I think, wanted other people around the country to know what we were doing, and so he wanted to get SNOBOL out into the rest of the computing community. I think ultimately we did, too. But again, from my point of view, if it had just been me, I probably never would have thought of it. I didn't have the outside contacts, we had interested users inside Bell Laboratories, I was naive and immature professionally. Dave was the front man and had the contacts and had to have the contacts. So I think that he kind of thought this was a neat thing and wanted other people to know about it and wanted it to be distributed outside, but there wasn't any group focus on this. There were just individuals who were enjoying themselves and not thinking very coherently about anything like goals and objectives.

O'NEILL: It occurred to me that during this time software was sent around by user groups, like the SHARE group, and I was just wondering if there was a model like that, where you wanted to get things out and have a community of

users, if that was a conscious modeling or if that was just the way it worked out.

RALPH GRISWOLD: Well, Dave actually was secretary of SHARE at that time, but most of the distribution that we were involved in was informal through contacts in academic organizations. The thing about this that I also believe is documented in HOPL-I proceedings is that Bell Laboratories didn't really have any mechanism or model for distribution of software. They didn't realize what it was, they were used to devices and hardware. They didn't have any idea that it might have any value or how to protect it. They basically didn't know what it was. You know, it could have been from another planet. Dave did want to get it out of the Laboratories to other places, and then, ultimately, we did, too. It became a very rewarding experience. There was a procedure for clearing technical talks. In Bell Laboratories, they were concerned for proprietary information so you needed to get clearance to give a talk, say, at the University of Michigan. You'd fill out a form and write a one page abstract, and somebody in the legal department would look at it and decide if this was okay or not. Well, they encouraged contact with academic institutions, primarily as a recruiting mechanism to establish contacts. The abstracts for the release like, say, the first University of Michigan talk, were innocuous enough and I'm sure not at all understood by, nor the ramifications by the people in the legal department. They just approved it. And Dave took the rather curious position, the strange position, that approval to give a talk on a piece of software constituted approval to release the software. Then having once had a talk approved, we used that as a precedent for all other talks so the entire thing was built on the first talk at the University of Michigan with a very innocuous abstract about text processing or something like this, and we were just out there distributing these without any real approval at all. We ultimately got into some difficulty when they discovered that quite a bit of money was going into software instead of hardware and it really was valuable and should be protected. But, no, we didn't use any formal distribution models. We distributed it by word of mouth. People learned about it, they'd call us and ask us for a copy of it and we'd send it to them. It was very informal and very much an underground kind of thing.

O'NEILL: You said that when Bell management, I'm assuming, found out that their money was going towards software rather than hardware . . . I'm a little confused because I thought the group you were in was basically a research group that wasn't necessarily working with hardware . . .

RALPH GRISWOLD: No, I'm talking about it in general. Historically Bell Laboratories had been involved in device development, hardware development, they patent it, you know all kinds of things. That was an important part of protecting their investment and using it for bargaining in agreements with other companies, so they had a legal staff that was very much focused on patenting with a long history of dealing with hardware devices. It was a long time before they discovered that software had value and that they should be worrying about it. I know for a fact that their expenditure of internal funds for hardware development went down and software development went up, so the legal staff found themselves in the position of being involved with a smaller and smaller proportion of where the company assets were going, so they became involved in protecting software. They took the initiative, in fact, of trying to patent software. That's the first initiative that came from Bell Laboratories because they thought they could patent it as opposed to, say, copyright it or cover it under proprietary agreements. But they were a long time coming to this conclusion. In the meanwhile we were, you know, sending it all over the world, and somebody just put it in the mail and sent it out. There wasn't any procedure for producing software. If we'd been sending out transistors, I mean, you know, we'd be violating company policy or something like that. But basically they didn't know anything about it.

MADGE GRISWOLD: Well, no one in the mailroom had been trained to recognize a magnetic tape going out or that might have stopped it, too. But there was nothing like we were talking at lunch about IBM watching magnetic tapes that came into the company. Nobody was looking at the size or shape of what went out so you could mail things out.

RALPH GRISWOLD: That's part of it, certainly, but I also think that in some sense there wasn't really an awareness about this. We didn't think we were violating any company policies. In fact, we weren't. It was just a question of having no policy. Our feeling was that this was the way you published in this area. If you're a research person, you publish your programs. Still true. In the absence of anybody saying we shouldn't do it and knowing our immediate management knew we were doing it, we were just distributing the results of our research. So the big change came when the legal department discovered that this was really valuable stuff and that they should have some policy for handling it. So we also knew there weren't any regulations. There's good advice about how, you just don't ask certain kinds of questions. I mean, if nobody says that you can't do this and you think it's in the company's best

interest. I still think it was the best thing in the company's interests to make this available to the academic community. They would have gotten very little money back out of it and probably nothing would have come of it if they'd gone another route. We thought we were doing what was in the company's best interest and in our own best interest and in the intellectual community's best interest. It's just there was no company policy for a long time. Ultimately there was one, at which point we came to some disagreement about it.

O'NEILL: You mentioned two of the reasons why it might be in their interests, namely they were both kind of negative reasons, that in fact they wouldn't make much money off of it, but were there other reasons why it would be beneficial to Bell Labs to have this out?

RALPH GRISWOLD: You mean to have out unrestricted?

O'NEILL: Yes.

RALPH GRISWOLD: At that time people weren't selling software. Everything was bundled with a hardware and there was no software market. I think initially they saw that it would be to their advantage to get a patent on it because they might be able to sell a patent to somebody else and it would give them protection from copying. I don't think they initially thought about selling it. The advantage to them was that they were getting good publicity, good PR. I frankly don't think that the company is all that public spirited. I think that even the contact they encouraged with universities was basically motivated by establishing relationships which allowed them to be in a favorable position for recruiting, not charity. It tries to appear that way sometimes, or it used to.

MADGE GRISWOLD: Also, there was a time before the unbundling of Bell Labs when AT&T and Bell Labs -- Bell Labs in particular -- wanted to provide some institutional advertising for itself, saying how beneficial it was to society. I seem to remember that in one of their ads which appeared in early 1970s, that SNOBOL4 was one of the things that was mentioned that had been a product of the Laboratories. They were interested in this kind of promotion of themselves as being a beneficial arm of the company because they were then this huge monopoly.

Now, of course, they're interested in selling everything.

O'NEILL: In this same light, and trying to get some background on Bell and what that was like, one of the biggest software projects that Bell was involved with, at least as far as I know, with the MULTICS project from 1965 through 1969. Can you describe the initial attitude at Bell towards MULTICS right at the beginning?

TAPE 1/SIDE 2

RALPH GRISWOLD: How you feel about MULTICS depends on where you were at Bell Laboratories. Bell Laboratories had grown enormously in terms of its computing needs. It was using IBM mainframes, but they didn't have anywhere near the capacity they needed. It was all batch oriented cards and they thought that they needed time-sharing, and so they had this enormous need that the company could see -- that when I say company I'm really talking about the upper-level management as influenced by middle management -- could see that they needed tremendous improvement in the quality of their computing -- speed, access, and also a lot more of it. The research division at Murray Hill, the people in computing there, made a proposal that Bell Laboratories develop this operating system, which was called MULTICS ultimately. My view of this, and the view shared by some people, was that the people in that division, they had a vision of a great operating system. They all had wonderful research ideas. They saw great opportunities if Bell Laboratories were to develop its own operating system. It had already developed the so-called BESYS-7 on IBM equipment. But there were people in that area and they'd been thinking about it and they had a lot of ideas and they basically made a proposal. The proposal in my opinion was outlandish. It was going to offer all kinds of innovations, things that had never been done before. Time-shared access, hundreds and hundreds of simultaneous terminals working on this machine. Everything you could imagine. It's almost science fiction. Bell Labs middle and upper management at that time knew nothing about computing. They always had, up to until around the 1970s, all the way up to the president, been technical people. They'd been promoted from technical ranks. They didn't hire managers per se, so they had technical backgrounds, but they didn't know anything about computing, they'd done their technical work in earlier times. They bought this, what to me and to some other people, was really preposterous. That you were going to do groundbreaking research and at the same time produce

marvelous service on some of your untried technology and Bell Labs was going to pin its computing future on it. So there were quite a few of us, admittedly not in this organization, who thought that this plan was not going to work. You don't put out a research program and expect it to deliver a product that the company relies on to survive on a day-to-day basis. We thought that what they promised was far, far, in excess of what they could ever deliver. So from where we were sitting we thought it was a boondoggle largely designed to enhance the resources of the computing research people. Obviously some of it was well meaning, but obviously some of it had been put up as a PR job. As it began to develop it became clear that it was going to be a disaster in the practical sense of delivering computing to the laboratories at the level that was being promised. Yet Bell Laboratories by and large was pinning its corporate future on this. This was company policy. But some of the organizations, like systems engineering and other groups in Holmdel, and Number 1 ESS, were opposing this policy and started to go their own way, saying we don't want to have anything to do with these GE computers or whatever they eventually came to be. We think this triumvirate, and the trinity, and all these things that they called it, you know, getting MIT involved and GE and so forth, this is not going to work. They went off on their own way to get IBM 360 equipment and used packaged software that existed. And, of course, UNIX inside the research division as, if you like, a counter effort. It was pretty well understood how that came about.

O'NEILL: Let me just stop you there for a minute because you said that it became fairly clear that it was headed towards disaster. Can you give me some idea of the kinds of signs you're talking about that made it clear, even though you may have been skeptical at the beginning. What sorts of things were happening?

RALPH GRISWOLD: Well, several things, I think. In the first place, in order for this to have worked and to deliver what it said, it required basic research and the implementation of that and the testing of it and the development of it, and things began to get very complicated. People were proposing all kinds of complicated file systems, and file backup systems, and protection mechanisms for files. These were clearly not very well developed ideas yet they were proposing to deliver on them in a very short period of time. The time frame began to catch up with us when we had run out of cycles on the existing equipment. That was one thing. The other one was this involving three companies and then having to reach some kind of an agreement between them. The fact that software development

was being done remotely at MIT and Project MAC, and the access to it was poor, and all kinds of complicated software infrastructure had to be built to test it. The time scale seemed preposterous and the ideas were unformed and untested, and in this business you are skeptical. I mean, if somebody says they can do something in three months, and you multiply it by some factor. It got very complicated. Things didn't get solved. The software didn't get written. There were these little disasters. I don't think it took a genius to see this, if you didn't have personal involvement. If you had a personal involvement, you could imagine it was all going to happen.

MADGE GRISWOLD: They actually got to the point of bringing a GE machine into Murray Hill as I recall. They immediately discovered that this was not going to work the way they thought it was going to work. In fact, part of the equipment was so noisy you couldn't be in the same room with it. Almost immediately we were getting word at Holmdel that this was going to be a physical disaster as well as a software disaster. I remember that was about the time IBM came in to make its presentation and there was the commitment to go with the 360s at Holmdel. But I do remember sitting at lunch with some of the programmers from Murray Hill and having them say, "This is just dreadful. This machine is not going to deliver what we wanted it to, just as a physical thing."

RALPH GRISWOLD: Those were signs that you could see, but I honestly think that the fundamental principle says that you don't do research and extensive development in areas in which you have no experience and expect it to be delivered on a very fast schedule and produce reliable production service that people have to have to do their day-to-day job. It was not a plausible proposal. We could see these signs, but you know, we could see signs of political problems among the companies and who's going to make the decision. One company, Madge remembers more details probably than I do, but the machinery wasn't up to snuff. It didn't work. It wasn't reliable. Anyone who had experience with hardware and software at that time just knew that this wasn't going to happen. Not to say that MULTICS didn't eventually run, but not anything like it was promised, and from my point of view if the company had gone that route completely, it would have had a very serious disaster.

O'NEILL: So after a few years some of the Laboratories started buying IBM equipment.

MADGE GRISWOLD: It was quicker than that.

RALPH GRISWOLD: While MULTICS was still being developed there was enough pressure from some areas to convince management that you really had to do something else because whenever this happened, it wasn't going to deliver to the more development-oriented areas. So they got approval to buy IBM equipment and install it, and that was Number 1 ESS that Nick Martelotto eventually went to the Indian Hill laboratories, and Bill Keister in our area, and a few others, basically were allowed to go out and buy some off-the-shelf new IBM-360-style equipment. There's a side effect of the MULTICS situation that I'm not sure how well known this is, probably it's not so secret. It was viewed as a failure within Bell Laboratories. It was acknowledged by upper management to have at least failed in delivering these computing promises. It did some good research work but it discredited computing research within the laboratories for many years. For these upper-level managers, vice presidents and so forth who didn't know computing but had been sold what I view as a bill of goods and then have discovered that that's what had happened, and having to backpedal and probably be quite expensive. It discredited research in computer science in Bell Laboratories for quite a while. That's one of the reasons I left. We were told, although I wasn't in that division, that in the future we would not develop any of our own software. We weren't going to write operating systems. We were going to buy it. We're not going to have another disaster like this. The people in research division at Murray Hill were dispirited and had been told to see how they could become relevant. I interviewed with them before leaving Bell Laboratories, and their morale was very poor, and they were talking about how can they be relevant to the Bell system, which is probably the wrong view for a research organization to take. The morale was terrible. They were basically discredited. It was that much of an internal failure that for quite awhile, of course this didn't last, but for quite a few years they lost a lot of good people and computer science research was discredited within the Laboratories for much of the management.

MADGE GRISWOLD: But I think that that brings a very important insight into how the UNIX system was developed and why it was named, for example, but also where it was developed and under what covers it was developed, and you can probably describe that better than I.

RALPH GRISWOLD: Well, I think this is pretty well known and I don't have any inside track on this, but Ritchie and Thompson and cohorts decided that MULTICS was going to be a disaster, too, and they got a little PDP machine up in the attic somewhere in research and decided they could write an operating system that would beat the whole thing. We actually got to see it in a very early stage. That was strictly an underground activity. It was against company policy. But they were convinced that they could write a smaller, sleeker, simpler operating system that would ultimately be a wonderful thing and they just went off and did it on their own. It couldn't have been entirely in secret, but it was certainly something of an underground operation.

O'NEILL: Yes, your explanation of the response to MULTICS helps explain why that would stay under the covers and small scale as opposed to being heralded as a big project.

RALPH GRISWOLD: And basically it was awhile before we were even told that it existed, but Dave Farber had all these political connections. I think they wanted to be able to show that it worked before they announced it. And, of course, it would be unpopular with many of their colleagues and probably was to have gone off, for a couple of people to have written a UNIX instead of a MULTICS. But it was really a pretty good operating system and might provide something for the future. I don't know what the internal politics were like there. I'm sure that there's a lot of that on record elsewhere. It must have been fierce. We were a long way away from it however. I don't know how many, maybe 30 miles away from it. But, yes, it was strictly an underground operation. As I say, it couldn't have been entirely secret. I mean the director of that organization must have known about it. On the other hand, Bell Laboratories management was so out to lunch, frankly, that I spent my nine plus years at Bell Laboratories without having an actual assignment, without having an actual schedule, without ever making out a report, and having no official support. [laughs] So I'm not saying that the entire Bell Laboratories was like that, but there was a policy followed to let's leave the research people alone and, you know, maybe they'll accidently do something good, the so-called sand-box philosophy.

O'NEILL: Did the fact that the MULTICS project was going on during at least part of the series of SNOBOL language developments affect you directly? Were there consequences?

RALPH GRISWOLD: They were negatives. We were using other equipment. Matter of fact we went to Princeton University to get access to a 360 before we got one into our own laboratories. At some point SNOBOL4 was listed as part of the MULTICS thing, but they never asked us for a particular proposal. There was just something written in their objectives.

O'NEILL: So on a piece of paper somewhere you were part of it.

RALPH GRISWOLD: On a piece of paper somewhere. We may have gone to one meeting, but they never asked for a follow up, never asked for a report. We did nothing on it. We explored it a little bit on the side. We had very low priority access to a system compared to everybody else, so the only effect it had on us was political and turmoil. It did cause this alternative computer solution to be brought into our laboratory. We got 360s and much better computing facilities than Murray Hill did during the time SNOBOL4 was being developed. The main negative effect that it had was discrediting internal software development work, and the attitude of upper management towards people and computer research in general. That created a negative attitude. In fact, we got an executive director towards the end of my tenure at Bell Laboratories who for the first time they brought in someone at that level position, as far as I was aware of, that did not have a technical background, but an MBA. In fact, we used to joke that he was in charge of lawn mowing and night cleaning crew. He was brought in to head the computing facility which was now going to be a service facility, no longer research. That cast a pall over everything because he didn't believe in this kind of work. So the environment was affected negatively, and I view that in large part as a consequence of the MULTICS fallout, but mostly we just tried to stay clear of it.

O'NEILL: That leads us into the next area which I want to talk about. Why did you leave Bell and move to Arizona? You've already stated that the atmosphere at Bell towards computer research had gone downhill steadily. In addition to that, were you now interested in getting into education and teaching? Was that something you actively sought?

RALPH GRISWOLD: I wish I could say so. There are some other things that influenced that decision. I already

mentioned the fact that we were pretty much told that future policy would be that we weren't going to do research in computing, or at least we were not going to develop our own software. We'd gotten an executive director which was a couple levels up from my position who was in a service position being as we were now a service organization as opposed to a place where original work was done. So professionally the prospects for doing the kind of work that I liked to do had been substantially diminished, and the atmosphere was poor. People were leaving. It didn't look very good. I also had been promoted a couple of times. American industry has a habit of taking people who do good technical work and giving them administrative responsibilities. It doesn't always follow that those people can do administrative work well. I think I did it adequately well, but I didn't like doing it, and I found I was spending more and more time on things like budgets, actually deciding where chairs and desks went and silly things like that, salary administration, things I didn't like doing; less and less time doing technical work which I did like doing. And the future looked even worse. I had taken the two promotions as alternatives to things that I had perceived to be worse, that is, being transferred under the supervision of someone and not being able to do what I wanted to do, so I chose to take promotions so I could control more what I did. The next level up would have given me a bigger office and more carpet and a fancier water carafe. Literally, these were the actual physical things out of a catalog. You got a silver carafe and dimmers on the lights. Anyway, there were certain perks that went with it, but with that went more and more administrative responsibilities, and I didn't want more and more administrative responsibilities. I didn't derive any satisfaction from them particularly. So it just didn't really look like a great future. I mean, it might have been financially gratifying. I don't really think so in the long run, and there was a certain amount of power associated if you like that kind of thing.

MADGE GRISWOLD: Well, if you rose far enough you got your own limousine and driver. It was that kind of an atmosphere within a corporation.

RALPH GRISWOLD: And it was also clear that if I stayed there I was going to have more responsibilities to Bell System type of things like operating companies and less opportunity to do what I wanted to do. I had a choice between taking the passive road and just letting what happened to me happened, but it didn't look good. So I went out and looked for a job and at that point my contacts were in academic institutions because of our involvement with

computer software. And I frankly was a little bit apprehensive of an academic position. I didn't know what one involved. I had very little decent education as a graduate student at Stanford about that. I had never worked for an academic department. I had visited them as a scientist from Bell Laboratories. I didn't know how they worked. I was apprehensive about being adequately good as a teacher compared to my father. I didn't know anything about university politics. I didn't know what was involved. So I would say that it wasn't that I sought it out, but it was the place where there were obvious job opportunities, where I could do the kind of thing that I wanted to do. In fact, when I applied for the job at The University of Arizona, I made it very clear that I did not want administrative responsibilities. I did not want to be a department head. Of course, I wound up being a department head.

MADGE GRISWOLD: Like being a programmer at Bell. [laughs]

RALPH GRISWOLD: Yes, exactly. Probably more predictable, I think, at that point. But, no, I just perceived that the university fit with my own value system, I'll say that. I did want freedom to do the kind of work that I wanted to do even if I had to give up part of my time doing something else. I did discover, even during interviewing, that universities valued the kind of thing I did whereas Bell Laboratories, if anything, discouraged it. They didn't place any value on it. There was another factor and that is the legal situation. At some point the legal department had discovered this thing I talked about earlier, that software was very important. They began to look at our work because it had become pretty prominent. When they really got into it they discovered we were distributing all this software, and they were horrified. They were trying to market software at that point. There was a product called Bloody B which is a block diagram compiler, and they were trying to sell it for \$5,000 a copy. I guess they thought maybe they'd make a lot of money off of it. My own view of that is if we start marketing my work that it's not going to sell, you know, it's just going to kill it. But they said, "Look, you know, you can't just go on distributing this stuff." They wanted to make a product out of SNOBOL4 and try to patent it or protect it somehow or the other. We were fighting this, actively fighting this. Again, one of these curiosities, Princeton University had been involved in the development because we'd gone to use their 360 when we didn't have one. I've never seen people back off from anything so fast. It turns out they didn't want to have anything to do with an involvement in something another company had a stake in because they thought, Princeton therefore could come back on Bell Laboratories and so they

immediately backed off. I would not have anticipated this. I didn't understand the situation, but it was sort of like a whole bunch of people being backed away from the table magically, you know, swoosh. They completely backed off and said, "We don't want to have anything to do with this. We aren't going to be involved, so you can send out SNOBOL4, but don't ever do anything like that again and anything else you ever do is not going to go out." So that was the environment I was sitting in when I decided to change my job. The involvement with Princeton was purely an accident. The fact that I even mentioned it to them was certainly not planned. [laughs] If I would have known it was going to work like that I would have used it immediately. It was just lucky, we might not have mentioned it.

O'NEILL: You've written that when you went to Arizona you were the first member of the faculty in computer science. Was that an incentive for going to Arizona, to build a computer science program there?

RALPH GRISWOLD: Well, if I said yes you'd have to certify me as crazy. Very few people want to go into a vacuum like that because of all the hazards associated with it. First of all, there was a computer science program there. The administration in 1968 at The University of Arizona had decided that computer science was an important area and they needed to develop a program. So they formed a committee. What else do you do, you form a committee. So they formed an academic committee reporting to the provost. It had members from departments with interest in computing -- mathematics, electrical engineering, systems engineering, management, optical sciences -- across colleges, and they had set up a graduate program with a Ph.D. and masters and they put together a patchwork of courses taught out of these individual departments. None of these people were computer scientists, none of them had any background in computer science. They may have had some experience with hardware in EE or with writing a program in the management department, but they had no academic background and no education or training particularly, and they got a lot of students right away -- about 60, I think. They didn't have any actual faculty. It was being run by a committee chaired by the associate dean of the graduate college. Then they went out looking for faculty. I applied there because of a contact that we had, a person from the optical sciences department of The University of Arizona, Murray Sargent, who had spent some time at Bell Laboratories and was interested in programming languages and knew about our work. We met him and knew him, and when he found out that I was thinking of leaving Bell Laboratories, he mounted a very aggressive recruiting campaign, on his own -- the University

administration be damned [laughs], he decided he was going to do it himself. He's that kind of a person. And he sent us postcards about how beautiful Arizona was and the visibility was 75 miles and it was 85 degrees.

MADGE GRISWOLD: Murray would call and he would pick days when he knew the weather was dreadful in New Jersey and he would call and tell us how wonderful it was.

RALPH GRISWOLD: For all I knew it was a wild west and camp fires, but I was invited for a recruiting visit. Now, what did appeal to me, in respect to the answer to your question, was that the university had not made any mistakes. Many universities started their computer science departments as a program in the department of electrical engineering as it was here at the University of Minnesota, or in the mathematics department. Actually this committee was a pretty good idea because it meant that no one college or department owned computer science. There was no commitment. These were just appointments to a committee, and they were going to develop a program from scratch, the department from scratch, without any baggage and without really any obligations to anyone else.

MADGE GRISWOLD: It wasn't in a college. They reported directly to the provost.

RALPH GRISWOLD: And I was impressed by the administration. They had a new administration then, and John Schaefer was president, who had been dean of liberal arts briefly, very young; Al Weaver, provost, who was an older faculty member from physics, but they put together a new management team at the university with the intention of growing and developing the university and the quality of the university. They were quite impressive in the sense that they wanted to cut through all kinds of the conventional problems and paperwork. They were willing to take risks, and despite the fact that there weren't any other faculty here and the members of the committee I met were not impressive, the students were. They were exciting and turned me on, and they were very eager. I was wanted, which is important to me. So I really wasn't all that concerned about coming into a department that didn't have any members, but I didn't come in to build it. They promised me that they would recruit a department head and I wouldn't have to be department head. They said, "We need someone to direct original research and your responsibilities will be research and we will provide the department head and the support." Of course, I wasn't naive enough at the time

to believe that might actually happen, but they were creating a department. They failed. But I didn't come in to build the department. That was not my goal. My goal was to get away from that kind of thing and to have an opportunity to do research and give interesting lectures on the side and it looked like a place where that was possible.

TAPE 2/SIDE 1

O'NEILL: So you didn't go to Arizona to build a department. Did you have strong views though on what computing education should be like in those days?

RALPH GRISWOLD: Well, I have strong views on everything whether I know anything about them or not. [laughs]

No, not really. I do think this, that if I didn't have them initially I quickly developed the view that it was important to have a real computer science department with faculty members who were credible, intellectually capable, computer scientists with professional identities as computer scientists because the committee was composed of people in other areas that either were interested in computing or perhaps saw an opportunity there. There were several who would have liked to have been in the department. Several of them would have liked to have been department head, in fact. And I think my early focus on this was -- we really need to build a department with good faculty members who are real computer scientists, not converted physicists like I was. That's not really fair because I'd been in computing for a long time, but I had to learn it. I never took a course in computer science except this one programming course. I had to learn what I know about computer science basically working with people, sometimes inventing things, and out of books or seminars and so forth, but I'd never taken a course in computer science. But I did feel it was important that these people be authentic computer scientists and they have an identity in computer science, that this is not the electrical engineering department with a computing emphasis, not be a mathematics department, and not be a collection of semi-failed academics who wanted to get out of the departments they were in and wanted to get into a hot new area. So it became clear that I was going to have to be department head or leave. They had searched for a department head for several years while I was acting department head and failed largely because people didn't want to come into a non-existent department, the question you asked. We set out to recruit. Fortunately, the upper administration of the university had very high standards and they were very supportive, but we were always very

concerned that the people we recruit be real computer scientists and that they be high quality. The professional identity was important. I would say that that was important. Since I was in the software systems area, I had to balance my own interests and my own knowledge against things I didn't know that much about such as theoretical computer science and hardware and the many related areas. We were very successful in recruiting. I think that most anybody familiar with that time would say so.

MADGE GRISWOLD: Well, we put a lot of effort into it.

RALPH GRISWOLD: We put a lot of effort into it, worked very hard, we made some mistakes but we got rid of the mistakes. We developed a quite high-quality department out of essentially nothing. The last time I looked we were rated 20th nationally, even though it's quite small. Probably it was better five years ago than it is now. I think my vision was to have a real computer science department that taught solid computer science and was not an appendage of some other discipline.

O'NEILL: Madge, can you describe your involvement in this? Did you ever have a position at Arizona?

MADGE GRISWOLD: Not in the computer science department. I did work briefly for the computer center which is not an organization one really wants to work for I discovered rather quickly. At that time I was also involved actively in pursuing advanced degrees in the department of history which was an academic interest of mine. So I had some part time jobs on campus, one in the department of history where I was a teaching assistant. The year we completed the SNOBOL Primer I also completed my masters in history and then went on working toward my Ph.D. I was not officially ever connected to the computer science department although I did a number of things for it, including a lot of work on recruiting. For example, we had no budget at all for recruiting, at the beginning so we did a lot of recruiting effort in our home. I spent quite a bit of time doing the local arrangements for "local color" kinds of things that one does to make a community appealing to a person you really want to recruit, including taking people into school systems, making sure that they see all the right people because most of these people have gifted children. These are all things that one really wants to do if one is doing really successful recruiting. I was not paid for that.

The University of Arizona has some very strong rules about nepotism and we didn't want to get involved in any of that. I've done some consulting in terms of buying typesetting equipment for the department. I've been involved with documentation from time to time, and I still do some things connected to the Icon Project. I haven't been paid for any of that at all, but I still feel involved in it.

RALPH GRISWOLD: I would just add that, especially during the early years of departmental development, Madge did a lot of things that an administrative assistant would normally do. We didn't have one, but she put a great deal of time into the department in one way or another, advising me and helping me with administrative kinds of things, and handling personnel matters and things like that. So in the early years of the department, maybe ten, the department really had two people working for it, and I sometimes had to remind them of that, and they were aware of that.

MADGE GRISWOLD: I think we considered the job a partnership. We considered it a two-person job.

O'NEILL: Even when you were going there?

MADGE GRISWOLD: Well, yes.

RALPH GRISWOLD: I'm not sure what you mean by that.

O'NEILL: Even going into it you considered it that as opposed to seeing what the situation is and figuring it out when you got there?

MADGE GRISWOLD: Yes.

RALPH GRISWOLD: It was a partnership as has been our collaborative work. Madge talked about her relation to computing and documentation, but it's a team effort in a lot of senses. There's just a lot of things involved with it that aren't visible on the surface, a lot of administrative things that have to be done.

MADGE GRISWOLD: I think in the early years certainly I was strongly involved in discussion of policy direction, getting the readings on people we were bringing in, doing a lot of things that an administrative assistant might do in addition to the kinds of standard things that administrative assistants do such as making arrangements.

O'NEILL: By your choice then, in order to not get involved with The University of Arizona's rules, you kept your involvement informal, never having a formal position at the University.

MADGE GRISWOLD: I think it was by choice. I think that the university has lightened its requirements now so that spouses can work together. It was a very conservative university except for the top of the administration. I took a job in the computer center, and the computer science department was also in the computer center. I was told by my first supervisor that we could not work on the same floor because husbands and wives were not permitted to work on the same floor. I just couldn't believe I'd heard this person say that.

RALPH GRISWOLD: To clarify that, we were in the same building, but in entirely different organizations. There was no relationship between the organizations, but there was this supposed rule that husband and wife couldn't be on the same floor of the same building.

MADGE GRISWOLD: There was also always a question when one person is supervising another and administering a salary, and we did not want to have that problem come up. We did not want to have jealousies within the faculty about who was making decisions. In some sense, and this is a very distant comparison, this is something which the United States is facing with having a president and a president's wife and she is working without salary for a very good reason.

O'NEILL: There are a couple other areas I wanted to talk about. One was the funding that you received at Arizona. You've written that you had ongoing support for a number of years from the National Science Foundation and a continuing contract with NSF. Can you describe the relationship that you had with NSF? For instance, did they

have frequent site visits? Were there iterative proposal writing sorts of things? Did you have the same kind of administrator or the same person that you dealt with at NSF over a long period of time?

RALPH GRISWOLD: Well, let me go back to the beginning of that. In the first place, when I first came to The University of Arizona I had no experience with grants or getting grants nor did I appreciate the essential nature of having grant support to be able to do research and develop a good department. The first fall I was there, with the assistance of the provost and the vice president for research, it became clear quickly that you should try to get funding. I wrote a proposal which I'm sure was very naive and sent it off to the National Science Foundation and it was funded. Interestingly, I had proposed to implement some software as a byproduct of the research and they struck that out because they said software developed at universities has no merit, it's not any good. Therefore it's not worth putting any money into it, so they struck that part out. I must assume that the fact that that proposal was funded was based on my past record of performance and the significance attached to the programming language work which I'd done. In answer to the rest of the question, there had been a series of grants, but it really hasn't been an ongoing continuing grant. There is one grant that started in 1972 and it terminated last year that basically had the same name all the way through except the one time somebody at NSF changed it without telling me. There were a series of individual grants. These grants were all single-investigator, modest-sized research grants, sometimes with more than one going on at a time. The one that started out was for programming language design. They didn't want to support implementation initially, but eventually they changed their tune on that. I kept submitting proposals for new ideas in programming languages and they kept funding them. There were other grants. There was one for program portability somewhere in the middle, and there were a couple of grants on implementation techniques for high-level programming languages. I wouldn't view this really as part of a continuing program. They had to keep getting grant approval. I didn't ever have any close association with anyone at NSF. Tom Keenan was the program director of my initial grant and was on my grants until he retired, which I was very grateful for, because he was difficult to work with. He made one site visit the entire time, and it was fairly early on. I think he said he wanted to see if there was really anything out here among the rocks and sand. Maybe he just wanted to visit Arizona, but he came out fairly early on to make an individual site visit. NSF hasn't done much of that in recent years because they haven't had the funds. The only other site visits we've had have been in connection with departmental wide grants

where a team comes out every so often in a big infrastructure grant to look at it. I had not had a site visit except that one when Tom Keenan came out. I've had different program directors off and on, Keenan to begin with and then Bruce Barnes and then Keenan back again, and Nat Macon in the later years, but I had never had a close relationship with any of them. I've seen them sometimes at conferences and other places. It's been pretty anonymous. My relationship with NSF has been to submit a proposal and get it funded or not funded, to deliver the required reports and do the research expected, and that kind of thing.

MADGE GRISWOLD: My recollection about Tom Keenan's site visit, although I'd never had the experience of having a social worker come into my home to check to see if I was an appropriate parent, I had completely that feeling that that's what I was being checked out to see or that that's what we were being checked out to see whether we were an appropriate site for a grant. It was just that sense. It was really very strong.

RALPH GRISWOLD: I think that in some sense you're probably right. The National Science Foundation has made an unusually large number of grants to our department for its small size and most of our departmental funding, not just mine but others, has been the National Science Foundation. I think that early site visit was to come out and see if this place was really real because there wasn't a department here at that time and it was a long way from Washington out on the western frontier. I suspect that in many respects that Madge is right that not just to check out the people, but to see if this is really a reasonable place to fund things because they probably were getting good reviews from the external reviewers but they didn't know anything about the university and the university makes a lot of difference to a granting agency. If you're from MIT you get funded. If you're from Las Vegas you don't. I think they were really checking this new place out to see if it was someplace, I guess they decided it was.

O'NEILL: Did you ever consider going to any other funding agencies or getting money from other sources or was NSF sufficient for your needs?

RALPH GRISWOLD: I never tried to go to another funding agency. NSF is the ideal agency for my particular kind of work. They're the only federal agency that really supports research as opposed to product development. I

understand that other agencies support research, but they really have something deliverable in mind, a network, or a product, or something like that. NSF gives you the least hassle -- the fewest site visits, the fewest reports, the fewest administrative things you have to do. It's very liberal about letting you change directions. I recall a few years ago, and this is actually with Tom Keenan, there was a question about some proposal or other and I had applied for funding for a software maintenance program, a capitalization program they called it. He said, "I thought we were already funding you for that," and I said, "No, the grant I have is for such and such," and he said, "Well, we really don't care what you do as long as you stay in the general area." I said, "Well, what do you mean by that?" He says, "Well, if you want to change from computer science to physics you probably should tell me." Now, that may have been his wild interpretation, but they really relied a great deal on the fact that having given a grant that if you ever saw an opportunity to do something different or if some new opportunity came up or if some direction didn't look profitable, from that launching point you could take another one, so they were very flexible. I had minor funding from AT&T Foundation, which is really more of a sop to an academic department, but I have not gone to other funding agencies. There are not very many opportunities in my particular area that I want to do research in and many of them are large complicated programs with a lot of ramifications that I didn't feel like I wanted to get involved with. So I've been entirely funded by the National Science Foundation for which I'm grateful.

O'NEILL: When you left Bell and went to Arizona, what part of the SNOBOL project stayed and what part went with you in terms of the work involved in distributing it and whatnot? I know you continued to do research.

RALPH GRISWOLD: Well, Bell Laboratories had no particular interest in SNOBOL. Basically it's something that came about by accident without their particular knowledge and it turned out to be successful therefore they supported it and perhaps even were proud of it, but it didn't figure in their plans in a big way. By the time I left, most of the people who had worked on it at one time or another had either gone or been reassigned somewhere else and there wasn't anyone that was going to continue to do research on it or be allowed to, in fact. I was allowed to because I was, I suppose, noisy and pushy or something and I believed in it. There wasn't anybody there that was going to try to take it over, so the entire intellectual side of it went to The University of Arizona. I had hoped that they would continue to, you know, provide support for the distribution which was significant at that time -- not big

but noticeable -- and that they would at least forward mail to me or something. As I recall, my impression was they were glad to be done with it and there was no other comparable effort and it sort of cleaned out an annoyance. For a while they did distribute it. They moved it to some part of the computer center at some point.

MADGE GRISWOLD: Yes, there were some rather lower-level clerical type people that were doing the distribution.

RALPH GRISWOLD: Anyway, it was no significant effort and at some point it was clear that they were just not doing this very well and didn't want to continue to do it. They had no obligation to do it, so in order to get it done right we sort of started doing it out of The University of Arizona. It was something that I kind of hoped that they would assign to someone and it would be done routinely because it was really kind of routine at that point except that questions do come up. People ask technical questions, and if you ask technical questions of a clerk who has no background to answer them and what happens? They don't get an answer or they get the wrong answer. In some cases I heard about the question six months after it came in, so it obviously was not working very well and it was clear that they had no desire to maintain this relationship. Anything they were doing they were doing out of some kind of feeling of obligation which they didn't have. At some point we just severed relationships and said, "Fine, we'll take care of it in Arizona." By that time I had facilities to do it at Arizona.

O'NEILL: Were there people talking about making this a commercial venture since it was already fairly widespread? Were there thoughts about that?

RALPH GRISWOLD: Well, there were. Not on our part. The product was entirely in the public domain. It was good enough that it would be difficult to make a successful commercial product when the competition was something that was free. There were two commercial implementations done for IBM PCs actually. One by Victor Berstis who was at IBM research but had a company on the side, Minnesota Software.

MADGE GRISWOLD: No, it became Berstis Software when he moved from an IBM office in Minnesota to someplace in New York State.

RALPH GRISWOLD: Originally it had Minnesota in the title. He had some kind of arrangement with IBM that allowed him to distribute this. They didn't want to be involved directly. I don't think too many computer companies really liked the idea of handling software because it's a big problem and it's a liability. They certainly didn't want to take on an oddball product like SNOBOL. No big company ever thought about it. The other implementation was done by Mark Emmer at Catspaw, a one-person company which turned out to be reasonably successful for a while and was implemented on a number of machines commercially. I don't think it has a big market at the moment, but of course SNOBOL is pretty old at this point of time. It's an old product. The book was out of print and destroyed a long time ago. So there never was a major vendor that wanted to do this. There were several computer companies that took it on as a free implementation for public domain product, these two PC products. The former one, the Berstis one, folded a long time ago. It was not really being very good competition for Catspaw whose implementation was much better. The other one that I guess is worth mentioning is Robert Dewar's SPITBOL which I guess was commercial. Certainly, parts of it were commercial. His was an entirely different implementation, not based on the public-domain one, originally done for a Burroughs machine and then for an IBM machine and then there was an IBM PC implementation of it that was never really marketed very well. Market never did take over. It's not in existence anymore, either.

MADGE GRISWOLD: We might tell you something about the book going out of print and the book contract and why the book is out of print.

RALPH GRISWOLD: Is it possible to defame publishing companies? [laughs] This is off the subject, but if you don't mind, I'll just say a word. I won't give all the history. The book describing SNOBOL4 was published by Prentice-Hall. In fact, Madge and I were involved and actually typeset and produced the camera-ready copy, the copy of the second edition for the publisher. Bell Laboratories used to sort of be pretty free about its employees publishing books and then they got a little tighter on it as to whether it was appropriate or not. Then at some point they decided they wanted to write the contracts. Bell Laboratories insisted on writing the contract and they knew nothing about writing book contracts so they wrote one that was totally unacceptable to the publisher. The

publisher was in the hospital in Des Moines or something and wanted to get this out, so they eventually sort of signed off on a very unusual contract. It's probably the most unusual book contract ever written and it gave Bell Laboratories the copyright, which was unusual, and required the authors to produce revisions if the publisher wanted them. How they would make them do it I don't know. But it did contain a standard clause about if the book goes out of print the plates would revert and that something would happen to the remaining stock of the books. It didn't give the authors very many rights. A few years ago there was some talk about revising the book but nobody could ever agree on how to do it and we couldn't find the person at Bell Laboratories who would acknowledge responsibility for the book. This was after the divestiture so the Bell Labs didn't really exist anymore. Its assets had gone to AT&T. Bell Laboratories acquired Bell Communication Research, Bellcore, and sort of divided it down the middle. AT&T/Bell Labs kept saying Bellcore has responsibility, and it kept saying AT&T has responsibility. So no revision was ever done and at some point we got notification the book had been taken out of print and the remaining copies destroyed. No one had an opportunity to purchase them, which is not normal. Normally you get them at remainder prices, cost of printing actually, but there was nothing to do about it because the contract was with the defunct organization and neither of the inheriting organizations apparently wanted to do anything to do with it. We got the notification that the remaining stock of the book had been destroyed after it had happened -- a clear violation of the contract. The vestige of Bell Laboratories could have sued Prentice-Hall for violating the contract. This sort of died out there somewhere. It's not the only book that's ever been destroyed by a publisher, I might add. We had another one that that happened to, but publishers are the pits basically. I'll go on record as saying that.

MADGE GRISWOLD: The reason I brought it up is not because I thought it was off the subject. In a sense, on the subject that when you lose the textbook, when the textbook for a language is pulled out of print, there is no longer support for the language. There's no longer the visibility for the language in the stores, and therefore I think that it caused the interest in SNOBOL to drop. Not the only reason, of course, but certainly a contributory factor.

RALPH GRISWOLD: And if you can't get the manual on the language you're interested in, it is discouraging.

[laughs]

O'NEILL: It's going to be a little tougher. [laughs] Libraries only have so many copies.

RALPH GRISWOLD: That's right.

O'NEILL: The last area I want to talk about was company sources. I read your previous interview and got a little bit confused [laughs] on The Bright Forest Company. Now, you're the president of that?

MADGE GRISWOLD: That's correct.

O'NEILL: And that's just a way to allow you to do things outside of the university?

MADGE GRISWOLD: That is correct. It was formed originally to do a software joint venture with Catspaw to develop a commercial version of the Icon programming language, an enhanced version of Icon. Yes, it's a vehicle for doing that kind of thing, and it's frequently done at The University of Arizona. There are a number of such corporations that have been spawned for that reason.

O'NEILL: Icon itself is similar to SNOBOL -- it's generally available and that sort of thing? This company is for specific enhancements to that?

MADGE GRISWOLD: It actually has several aspects to it. It was formed to produce ProIcon with Catspaw. Catspaw did a number of software enhancements to it. We actually produced the documentation and research and development consulting. It has done some other publications work in addition to that.

RALPH GRISWOLD: Yes, basically The Bright Forest Company was formed to allow us to produce a commercial implementation of Icon, which is a joint venture, because you can't really do that in a university environment. There are strong rules and regulations about conflict of interest between The Bright Forest Company and The University of Arizona. For example, The University of Arizona cannot purchase from The Bright Forest Company. I have to be

careful about what I do. It was set up for the purpose of producing this commercial implementation that Madge described. It doesn't prevent it from doing other things. It's just a very small, very privately-held corporation that is allowed to do business, but initially it was to develop commercial implementation of Icon for the Macintosh.

O'NEILL: Does the fact that you now have this company represent a change in your approach to how software should be distributed? Does the fact that you now wanted to make a commercial product, whereas earlier it seemed like you weren't interested in that?

RALPH GRISWOLD: No, not really. I think that from my point of view, the research done at Bell Laboratories and subsequently The University of Arizona, under grant support is in the public domain and we encourage the free distribution of it. The two things motivated the commercial venture. One, you don't have the resources within a university to develop certain kinds of products. We were talking about an implementation that would require a lot of work by someone to do and grant agencies don't fund that, so there are certain things you can't do in a university. You don't really produce products. You can't provide commercial support for a product in a university because the funding isn't available. Part of the motivation was to produce an enhanced version for a particular platform as a commercial product and to have the environment in which those kind of resources can be provided, and we hoped that it would be financially successful. It really hasn't been, but if it had been wildly financially successful then there might have been enough income to hire some people to build and to do other products. That typically happens, but you can't go very far in developing a particular product in a university because your funding is not for that purpose and people just don't spend their lives making this for free. You can't ask a student to freely contribute to development of a product like that. They're supposed to be doing research. So there are just certain things in which you can't do in a university. There are borderline areas, but it was done so that a particular product could be produced whereas Icon is available on lots of platforms. We can't, for example, produce a specific product for say, Microsoft Windows, because we don't have the funding or the resources to do it. If we wanted to do a specific product for Windows that would be comparable to a commercial product, we would have to go outside of the academic funding scheme. People do that. It's very common for academics to be entrepreneurial. This wasn't a particularly entrepreneurial undertaking.

TAPE 2/SIDE 2

MADGE GRISWOLD: We have a list of people that we still want to talk about as well as I told you some cross sections like discussing the impact of PCs. Life changed rather dramatically when PCs appeared and languages became available to a lot of people. You and I were discussing women in computing earlier. We might touch that in a private interview. While I'm not involved as a computer scientist or involved in SYSTEMS, for example, there are some observations I'll make on that tape or I could make to you but I'm not sure that it's really terribly important that we do it this afternoon.

Ralph said that they were looking for everybody to become programmers. When I was hired at Bell Laboratories, I was hired for a specific job as an editor at a much lower technical rank, even though I had a bachelors degree, than people with math majors who were hired in as programmers. I was told specifically by the personnel department, "We hire nobody but math majors or physics majors to become programmers." At that time they treated males and females differently. They treated people with degrees differently, and so it was quite a while before women rose in any kind of managerial ranks, and the first person who did was a woman who most closely resembled all of the possible, most obnoxious, macho characteristics that you could possibly imagine, and I think Ralph remembers someone at lunch saying, "I wish we could promote someone for some other reason than that she can say shit with her mouthful." But while he remembers everyone being hired as programmers, I remember them being specifically selected from math majors and taking anyone who had majored in math. In fact, I had a roommate who practically failed getting her degree from a small womens' college and still was hired as a programmer at Bell Laboratories at a much higher salary than I was. So back in the beginning of things it was quite difficult. You couldn't just walk in and say, "I really am interested in being a programmer. I want to do it." I think perhaps that if you were brought in by a certain group or recruited by a certain group, you might have gotten in.

O'NEILL: Someone with basically a math, physics, or science degree?

MADGE GRISWOLD: We know of people who apparently were English majors who got around that.

O'NEILL: At Bell they did that or at other places?

RALPH GRISWOLD: Well, I think that that was at a slightly different time. They had discovered that they really needed programmers and it really wasn't necessary to have a technical background so they had a PDT program -- programmer development trainee -- where they brought in people from the humanities and just tried to make programmers out of them, sometimes successfully, sometimes not. But they were literally desperate to get people to code. She was in a different time and a different situation.

O'NEILL: You're talking about the early 1960s versus this programmer development trainee program?

MADGE GRISWOLD: We're talking about 1962 versus 1966. One of the other things that was true at Bell Laboratories was that once you were in it was very difficult for you to move. In other words, if you were hired into an area or of a specific classification, you almost had to resign and go away and come back in order to be placed in a different level or a different kind of a job. My being transferred into Ralph's department for research and typesetting or document preparation required quite a struggle. I'm grateful that it was accomplished.

RALPH GRISWOLD: I can say from personal experience with having been a department head at Bell Laboratories that there was a great deal of discrimination on the basis of both sex and race. At that time the attitude was different than it is now. There were certain things a woman just didn't do. They might need a token woman such as the one we referred to, but it was pretty thorough going and it wasn't very hidden.

MADGE GRISWOLD: Not at all. I was interviewed at one point and considered for an assistant editor's job on the *Bell System Technical Journal*. I was specifically told by the editor that I could have the job if I promised not to get pregnant.

RALPH GRISWOLD: You should have made the promise. [laughs] Promises are easy.

O'NEILL: This was later on?

MADGE GRISWOLD: 1965 or 1966. Another time there was a supervisor in technical editing, I guess he was the head of the technical editing department that had a microfilm division and some other things. I had a summons for jury duty and he wouldn't believe that I had a summons for jury duty. I had to bring it to him and show it to him. Women were always told in that department that they got lesser raises because the men in the department had families and needed more money. These things all went on and they are interesting, but they are not terribly related to computing except as how Bell Laboratories viewed the people that it hired at the time.

O'NEILL: I think there are more connections to computing than we might realize in terms of the outlook of the people doing the development. I mean, you know, if you have a very homogenous group who are all doing the development, then perhaps it does affect the product that you get out and the succession of products. The simple example is the games that people write for children to play which if they are all written by men, and many of them are apparently, they turn out to be war games and games which appeal to young boys and don't necessarily appeal to girls. So I do think there is more connection maybe, not necessarily within the context of SNOBOL, but in general.

MADGE GRISWOLD: In general with computing, though, it was held out as a carrot for promotion. In 1965 they began to teach programming classes to the technical editing group knowing they were going to be bringing in TEXT90 and wanting people to have some computer familiarity. Of course, they taught us FORTRAN, and most of us weren't really prepared to start solving simultaneous quadratic equations, but that's the first problem that they taught us, along with  $n$ -factorial, of course. We were all drawn into this because we were told that we could get promotions and better raises when it came around if we'd get involved in this. So it was used that way. Ultimately, I got more involved and it did help.

RALPH GRISWOLD: From my position in computing, except for a few women who were in supervisory positions,

and they were sort of viewed as being there because the company needed to show some affirmative action. All women were in subordinate positions. I don't think any of them expected to be colleagues. It was very male-oriented. I think you have to understand that it's in this context that Madge talked about hiring mathematicians. It was a very engineer-oriented organization and engineers got better pay than mathematicians. It was a very male-oriented organization in many respects. I never had a female colleague or anything resembling one the whole time I was there. It was just part of the culture. I don't think it was anything more than that, but women were in support roles.

MADGE GRISWOLD: There was a time when we installed a 360 that we were responsible for and had the ATS system on it and we were also running Picture Phone and that was under your supervision. You had to have somebody administering that machine in order to get the time allotment correct and you appointed me to do that job. I was then working in the department and you just decided that I was the person in the department who could do that, and I then had some say over who got access to this machine at certain times. At the time we had a retired Army colonel who was working in Picture Phone who was rather alarmed that a woman was giving him orders, so to speak. It was just very different times, but they weren't long ago.

O'NEILL: No, surprisingly not very long ago at all. Okay, well I want to thank you both very much for your time.

[END OF INTERVIEW]