



Oral History of Elizabeth (Jake) Feinler

Interviewed by:
Marc Weber

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Marc Weber: I'm Marc Weber from the Computer History Museum, and I'm here today, September 10th, 2009, with "Jake" Elizabeth Feinler, who was the director of the Network Information Systems Center at SRI. [This group provided the Network Information Center (NIC) for the Arpanet and the Defense Data Network (DDN), a project for which she was the principal investigator from 1973 until 1991. Earlier she was a member of Douglas Engelbart's Augmentation Research Center (ARC) at SRI [which [housed] the second computer on the Arpanet. It was on this computer that the NIC resided initially.] Jake is also a volunteer here at the museum. [She has donated an extensive collection of early Internet papers to the museum, and has been working on organizing this collection for some time.] Thank you for joining us.

Elizabeth (Jake) Feinler: My pleasure.

Weber: I really just wanted to start with where did you grow up and what got you interested in technical things or things related to this.

Feinler: [Originally I hoped to pursue a career in advertising design, but could not afford the freshman room and board away from home, so I began attending West Liberty State College (now West Liberty University) close to my home. West Liberty was very small then, and the] art department [wasn't very good. The chemistry department was much better]., so I decided to major in chemistry. [I went on to do graduate work at Purdue University, and finished courses for a PhD in bio] chemistry. [Financially I was living on a shoe string, so decided to leave Purdue and work for a year or two before pursuing a thesis, so joined Chemical Abstracts Service in Columbus, Ohio as an Information Chemist. Chemical Abstracts was one of the largest data collections in the world, and I] got [intrigued with] big data compilations and never returned to biochemistry. In 1960, I heard about a job in California at Stanford Research Institute [(now SRI International or SRI).] I applied for it, they hired me, and I was in charge of [the Information Research Center there,] where we did [technical] literature search[ing] and all kinds of data compilations for the scientists at SRI. In those days, there were no computers that did this. You did it by brute force [using] little three-by-five [index] cards. I was working on a very big data compilation and the three-by-five cards were getting totally out of hand. I thought there ou[gh]t to be [an easier way to do this job, so went looking for some compute power within the Institute]. I wandered up into Doug[las] Engelbart's [Augmentation Research Center (ARC),] and [it looked] like they were having fun up there. They were all sitting [around], looking at television sets [and running a little device called a "mouse" around on a table. We all thought they were pretty weird,] and [Doug would] say "Oh, you're all going to be doing this someday," and we [all thought he was pretty weird too." I asked him to hire me, and] he hired me to work on something called the Resource Handbook

Weber: What year was that?

Feinler: This was in 1972. I had already been at SRI in another capacity for a while, so I started on the Resource Handbook and then [in 1974,] took over as [principal investigator] (PI) [for] the NIC project. That's how I got my start in computers. I didn't know anything about computers. I was essentially a user of computers rather than a programmer or a developer.

Weber: To step back, where did you grow up?

Feinler: I grew up in Wheeling, West Virginia, and I was the first person in my family to go to college. So it was all a brave, new world for me.

Weber: The things you did earlier at SRI, what sorts of things?

Feinler: I did all sorts of data compilations and literature searches. One of the big handbooks we did was a *[H]andbook [of P]sychopharmacology*. Then I did another big compilation for the [NASA] Sky Labs program on the, preservation of biological materials. Then, the one that got me thinking I needed a computer was [a large project] on fire retardants for our Poulter Labs. [On that project I worked with Lynn Spraggs to develop a bibliographic searching] system for computers, and it was working pretty [well], but we were timesharing on a GE network then, and timesharing in those days was pretty terrible. Sometimes it worked, sometimes it didn't.

Weber: Was it very slow?

Feinler: It wasn't that [it was] so slow once you got on. The problem was getting your share of the time.

Weber: Do you remember your first impressions of Doug, besides that he was doing something wild?

Feinler: Actually, I was working on a data compilation, as I said, and thinking it would be easier on a computer. [I was working on the bibliographic search system and h]e was [researching] all the sorts of things that a NIC required because he had just gotten this big contract to do the NIC, which stands for Network Information Center for those that don't remember NICs. So he would come down to my office and sort of ask me how did this, that, and the other thing work [in information centers,] and I would ask him how does this, that and the other thing work [in computers]. Finally, I told him I was bored where I was and why didn't he hire me. He said "Well, I don't have a job right now," and I said okay. So he came down a little while later and said "I have a job now," and I said "What is it?" and he said "We need a resource handbook." I said "What's a resource handbook?" and he said "I'm not sure but we need one in six weeks." So that's how I [became] part of Doug's group. They were putting together a demonstration at the [International] Computer [Communication] Conference [(ICCC)]. This wasn't the big "demo-[to-end-all-demos]" for which Doug is famous,] but it [was a meeting] whe[re] the Defense Advanced Research Agency (DARPA)] first demoed the Arpanet, or presented it to the public.

Weber: In Washington?

Feinler: I think this was '72.

Weber: But in Washington?

Feinler: Yes, in Washington. Sorry. So that's how I got into Doug's group.

Weber: Describe the group. What were the people like? Who was in it?

Feinler: I should describe myself first - back-combed hair, high-heel shoes, business suit because [I] w[as] always meeting the public and clients and that sort of thing. I walked into this group with their hair out to here and their beards down to here [wearing] Birkenstocks, and looking kind of like unmade beds, all sitting [around, some on the floor], staring at television sets. Sometimes I would say "What am I getting myself into?" I'm sure they thought I came from some outer planet, but it was kind of fun.

Weber: At that point, it was a pretty big group, wasn't it?

Feinler: Yes. It was somewhere between 30 and 40 [people.] Most of the time when I was there, it was about that size. I think the[re were] conflicts in [in the group because] the NIC was a production [project] and the rest of the system was [dedicated to research]. Those two things kind of fought each other because the machines were so small, and [one machine had] to do everything— [actually the computers themselves] were huge in size. They took up a whole room, but they were small in capacity. And to try to do everything on one machine was difficult. I think that was a major problem [for the group, but it] was generally not acknowledged that that was a big problem. [We actually] cheered when we got one meg of memory. That sounds ridiculous now.

Weber: What were your steps in setting up the NIC?

Feinler: I started with the Resource Handbook and what that was, was a [handbook describing] all the sites that were on the network. Originally, [the Arpanet] was supposed to be a resource sharing network, so we wanted something that [told] who was at each site, who were the [site] contacts, what kinds of things the [site] have to offer, [etc.] So that's what the Resource Handbook was all about. We also put out a directory of all the users on the network at the time. [These two documents were essentially the "electronic yellow and white pages" of the Arpanet. When I joined [ARC, I think] there were about 30 to 40 host [computers] on the network. [The NIC] took over [maintaining] the host table which was just a flat file in those days. Not much was online; almost nothing was online, so we did a lot of sending out documents, I think something like 70- or 80,000 documents a year, because it was also our job to keep all the developers on the network informed of whatever was happening. Steve Crocker started out with something called the Request for Comments, or RFCs, which were technical notes describing the research going on on the Arpanet and later the Internet.] The NIC distributed these in hardcopy to start with and then eventually, they were all online -- many things like that. The sites sent documents to us and then if anybody needed [copies], they could come to the NIC. We were kind of the "prehistoric Google." If you didn't know where else to go, you came to the NIC and we tried to find out who or where or what was available for you.

Weber: Before the NIC was started, how did some of these functions get done?

Feinler: They didn't exist. I'm sure that many people my age remember when you sent a letter, you had a secretary and you dictated that letter to the secretary, and then the secretary typed it and used White-Out and carbon paper and horrible things like that. One of the things that Doug had done, which nobody had done before, at least very few [had], was have you actually interacting with the computer where you

could do what you wanted to do on the computer, make changes. [There was no intermediary. Using his system, you could do everything yourself in it. In one system, you could program, you could text edit, you could write documents, all sorts of things like that. So it was a very sophisticated system way before its time and exciting to work on.

Weber: When you came, the Arpanet was already three years old. For instance, who had kept the host table before you came?

Feinler: There was a woman at, I think, SRI who kept it [for a while]. Maybe BBN did the first couple [tables] because they were in charge of the IMPs, the Interface Message Processors, that everybody attached their computers to. So they knew what the number of the IMP was and then they would negotiate with whoever was coming on as to what they wanted to be called. Everybody decided that letters were easier to remember than just a set of numbers [which meant that each computer on the net had both a number address and a common name address, such as SRI-ARC. Addresses] could've been just a set of numbers. There's another woman named Peggy [K]arp who kept the list for a while. [Then] I think there were about 20 hosts on the network. [When I began. I worked] with Mike [K]udlick and the two of us set some parameters so that there were ground rules for getting a name and making sure that we had a [sit]e contact. [This contact] later became [known as] the [N]etwork [T]echnical [L]iaison. The [Liaisons] were the technical people on the network that helped build it, so they were a very important group of people, and the NIC coordinated that group. If there was a document that needed to go to the network, we sent it to all the technical liaisons and we maintained distribution lists [containing all of them] when email came along. So they were a very important group and the group grew as the network gr[ew]. That was one of our jobs, was to coordinate that group.

Weber: There could be more than one technical liaison per site, or not?

Feinler: No. They changed around a lot but the[re was only one] technical liaison associated with [each] host [computer. W]hen LANs came along, there were [often] all kinds of [computers] behind [each host computer]. And then some of the sites [adopted the same procedure of having a technical contact for LANs or computers behind the host computer.] As it spread out into a group of machines, the[re] would [be] technical liaison that could [be] contact[ed if needed]. Eventually, there was also a host administrator because the technical liaison were mainly technical and often students without authority in financial matters or administrative matters, and they didn't want the [responsibility for decisions that were administrative and not technical]!. So we set up [H]ost [A]dministrators, which was another contact at each site, so that if there was anything administrative [decision] or [decision that had] to represent the organization, the [host administrato] made th[ose] decisions. [The host administrators were] another group [the NIC] administered. Eventually, there was [yet] another one called the node site coordinator. Those were the main contacts on the net. The NIC was the [coordinating] hub and sent things out to [one or] all of those people whenever that was necessary.

Weber: At the beginning, did you start alone or did you have employees?

Feinler: When I moved up [to ARC], I worked under Dick Watson and then finally under Mike [K]udlick, and that was for about a year. Then finally, [SRI made the decision] to spin Doug's group off to Timeshare Corporation. That was about '7[6] or '7[7] when [this occurred]. I wanted to stay with the

[internet] because the NIC [project served] the Arpanet, and by that time, [also] the Milnet [on what was fast becoming the Internet]. No, I guess the Milnet came later - but anyway, I wanted to stay on the Arpanet, so I decided I wasn't going to go with the [others to Tymshare]. By that time, I was the PI of the [NIC] project, so that project stayed at SRI and [the rest of] Doug's group went off to Tymshare. [Oops, I got off track] - What was your question?

Weber: How many people were working for the NIC?

Feinler: There were about 40 people in Doug's group, but they were doing everything. It was a large contract with multi-tasks. The NIC was one of the major tasks. So when they left to go to Tymshare, I had about three or four people [left in my] group. Ken Herrenstein was [my] programmer and I think Johanna Lansbergen [and one or two other part-time people] w[ere] there. I can't remember exactly when they came, but we were just two or three people at the time. Mary Stahl [joined the group] and Francine Perillo [who worked] downstairs [in another group] transferred [to the NIC], so I think that was about our group then. Then I had a subcontractor, [Glenn] Sherwood, who had been part of Doug's group [who helped us]. So we just tootled along in the background for a while [until] suddenly, the network [began] expanding like crazy [and] the NIC expanded along with it.

Weber: You said there was some competition between the ARC group and the NIC within it, right, for resources. How did that fit together?

Feinler: Looking back on it, I think [this conflict] was a problem for Doug as much as anyone, and [for the research] part of the group. The NIC had to produce things. They [needed to use the computer] to produce documents [and carry out NIC business]. We had a day-to-day job to do on this network, [whereas] some of the other people were doing [only] research-y things. [T]hey wanted to be able to take the machine down and bring it back up when they wanted to. There were always fights about what was going to go on the machine because, as I said, it was small [in capacity]. I think it was incredible that they did as much as they did. The NLS/Augment system was a big system, and [the NIC] used [it as our tool] and beat the tires a lot of times, just to see if it would do what we wanted it to do. I found [this environment] was a little difficult [to try to get a job done.] I never knew whether [the computer or NLS/ARC] was going to be there or not. The network was that way, too. It wasn't exactly robust in those days. So getting a job done was something else. I think that was difficult for Doug because he was a research guy. He had ideas and things [he wanted to try], and his group was slanted in that direction. But if you have a project that has deliverables on it, you deliver, if you work for the government, [and the NIC] was a government project. So I think that [conflict between production and research] was something of a [problem for Doug and] the group. [W]hen [many of the group] went off to Tymshare, it was difficult for [many of the] people that [only] wanted to do research because, again, they were in an environment where they were actually selling [a] product. [When Doug's group moved to Tymshare their DARPA project ended and the SRI-ARC computer went away. The NIC was by that time funded by the Defense Communications Agency (DCA). At first we worked out of a pie slice on a crowded machine. Finally] we bought [a DEC-10 lookalike machine] from Tymshare, which was known as a Foon[ly. It's name was a real problem.]

Weber: Why?

Feinler: [I had to go to Washington and convince the military that they wanted to invest in a machine called a Foonly. It was hard to keep a straight face.]

Weber: Why was it called that?

Feinler: That's just what the developer, [David Poole,] decided to call it. [There was a tendency by programmers to use the words "foo" and "bar" as place holders in programming. Dave had a sense of humor and thought the name was funny.] I think Tymshare finally decided to call it an F4 rather than a Foonl[y]. It was a DEC-10 lookalike. It was quite a nice little machine, but the name was a little difficult. I did have a lot of interchange with the Tymshare people because we had gotten the machine from them, [and were still using NLS/Augment which they provided and we altered to suit our needs. However, the internet was] about to go over to [the protocols], TCP/IP, and [Tymshare wasn't] quite [ready] yet. So there was a lot of back and forth on getting [TCP/IP] running [in the TENEX operating system,] and more problems with trying to [license the DEC] TOPS-20 operating system, which [Tymshare] had [promised] to [provide for the] Foonly. DEC backed out of that [agreement, which] created problems for us. So I had a lot of interchange with the Tymshare people.

Weber: Tell the story a little bit, sort of chronologically. You moved upstairs. You were working right in the middle of the ARC group. Tell what happened next.

Feinler: Like I said, there was this decision that [most of the group] would move to Tymshare.

Weber: But that's much later.

Feinler: It was only a couple years after I started. I started in '72 and they started to talk about this about '75. Then I think it was negotiated in '76. Tymshare didn't have enough space for the whole group so they rented space from SRI for a while. My office was right [—between] the [offices] Tymshare [was renting] and the SRI offices [on the same corridor], so I said I was on the Mason-Dixon line, right in the middle.

Weber: When you came, for instance, where were you sitting?

Feinler: There was something we called the "bullpen." There weren't enough [monitors] for everybody in those days. They were pretty expensive. So the bullpen had all the [monitors] set up there. And then, as time went on and equipment got a little cheaper, we had a NIC room [separate from] the bullpen.

Weber: The bullpen was for all of the lab?

Feinler: Everybody worked in the bullpen.

Weber: And that was with the bean bag chairs and the television [sets]?

Feinler: Yes, except they were actually Conrac monitors.

Weber: Describe what the room was like.

Feinler: It was an open room. I think at one time it had been a lab but the walls [had been removed] and it was [an] open [space], with some pillars. [It was in the middle of the building with access from two parallel corridors] The equipment was a Conrac monitor, which looked like a big [clunky] television set. The [monitors sat on] tables that had [a line processor and] mouse on one side and a keyset on the other. If you had to work on the system, [you used the first available monitor]. That's how you got your work done.

Weber: How many terminals?

Feinler: I don't know. There weren't enough to go around, I know that. Maybe about 25.

Weber: But quite a few.

Feinler: [Yes,] there were quite a few, maybe 2[5]. Doug had one in his office and [eventually] various people started getting them in their offices as we could afford [them]. You were always under the constraints of your contract. So each year, when the contract [was re]negotiated, you [w]ould [try to] expand [the hardware] a little bit [and get a few more monitors]. Then, of course, PCs and cheaper terminals and whatnot came in.

Weber: These were on tables on the floor? Were you sitting on the floor to use the terminals?

Feinler: No. Originally, I think the group did a lot of sitting on the floor, but by the time I got there, they had desk chairs. But there was a lot of rolling around: "Come and look at this," so the chairs were [rolling around the bullpen constantly.] Somebody said we needed a rug for the area because it was kind of noisy. [SRI said "No, we don't provide rugs for the offices,]" . The [group] w[as] very good at the "midnight supply," [s]o somebody [brought] this ratty old rug out of their garage and put it on the floor. It was awful. It smelled. It was all mothy [and moldy. S]ix months later, we put in for a [requisition for a "rug replacement" and lo and behold, we got a rug for the bullpen.

Weber: Did you have music?

Feinler: Ye[s]. Most people had music in their offices. The offices went all around th[e] bullpen. [Everyone was] assigned an office space, and [then] went out to the bullpen to work on [the] system. [E]ventually, everybody [got] equipment in their offices. A lot had to do with the electrical, too. There were a lot of electrical[connections] and phone [connections] that had to be changed [as well], so it took a while to get all that to happen. [Meanwhile e]quipment got cheaper so eventually we all had [terminals] in our offices, but to start out with, it was all out in the bullpen.

Weber: You each had individual offices?

Feinler: Yes. Sometimes we shared an office, but mostly, we all had individual offices. In those days, they didn't do cubes, thank goodness. [We had real offices] We even had windows.

Weber: I heard the lab went 24 hours a day.

Feinler: You couldn't get anything done on the machine during the day if everybody was on it. [A] DEC-10 probably had less than 100 logins at a time, and [even if you were logged in,] you couldn't do anything. [The computer] was so slow, that often programmers couldn't compile programs. [The NIC was] doing big database updates, and we couldn't do that during the day. So we often worked 24 hours and we did what we called "rollovers." That was the worst - when you had to man the helpdesk or something the next day and you stayed all night. [A]bout 4 o'clock in the morning, you were really out of it, about 5 o'clock [w]hen the sun came up, you'd start to come back [to life] again. [We drank a lot of coffee, coke, and Mountain Dew.]

Weber: Was there somewhere you could sleep, in a corner or something?

Feinler: The women slept in the restroom because there was a couch there. It was a law then. They had to have couches for women. I don't know why. [T]he guys just kind of flopped over their terminals. [A few installed couches in their offices].

Weber: If you walked in at 4 in the morning, there would be plenty of people there.

Feinler: Probably be someone there.

Weber: How hard was it to use Doug's system at first? You came in and you were told that you had to use this very unique system. What was that like?

Feinler: A lot of people said the system was very complicated. I don't think that was true. The whole system was very, very sophisticated. You could do just about anything on it. There was a learning curve, but then there's a learning curve on anything that's brand new like that. I didn't think [the editing commands] were [particularly difficult. Something that was difficult for me, trying to put out documents, was that the system [added] statement n[umbers to each statement] You could track down to what they called a statement, which could be a sentence or a paragraph, and the [system added] statement names or numbers [to each statement. NLS/ARC was] a structured [or outline] system to start with [and the structure was hard to change]. Sometimes, just for myself personally, that got in the way of the structure I wanted on the document I was trying to produce. [Also,] it was very difficult to produce documents from computers in those days. [Printers] were still [using] typesetting, so trying to find a printer that would take camera-ready copy from a computer, which was not [of] very good [quality] in those days, [presented] a lot of problems. It was just very expensive. There were a lot of hassles and mismatches and that kind of thing, but this was very new. People weren't doing it, so it was difficult to do sometimes. Other than that, I

thought the system was not that difficult to use to do text editing [(which was mostly what I did). W]hen email came in, [NLS/Augment was] very nice for [handling] email because you could take any paragraph out of anything you were working on and just send it off as an email [all within NLS/Augment]. That was very unusual at the time.

Weber: Like select it and do a command to send it.

Feinler: Ye[s. NLS/Augment] just sent it off.

Weber: This was the first computer you ever touched.

Feinler: I'd done punch cards and that kind of stuff, and I'd worked with a GE [tymsharing] system.

Weber: Did you know how to touch type?

Feinler: Ye[s].

Weber: How about the chord? How about the keyset?

Feinler: I found that was pretty easy, [and also] was very nice. You had the keyset [on the left on] which you could type any letter or character. [On the right] was a three-mouse button [on which] you could do uppercase, lower case, [and shift to] numbers, [and] characters. What was nice about [this arrangement was that,] if you were editing, which I did a lot of because we were putting out a book about three-inches thick, you didn't have to take your hands [off the mouse and keyset to] go back to the keyboard. You could just sit there and make your edits with your hands on the keyset and the mouse. Why that didn't carry over, I don't know, but I thought it was very nice. I still would like to have that setup.

Weber: So if you were typing long text, you would use the keyboard?

Feinler: [Yes,] if you typed a lot of text [you would use the keyboard], but often you were just editing text [- a character here and a character there].

Weber: When you came back to edit, it was easier to keep your hands on the mouse and the keyset.

Feinler: Right, because the mouse was the pointer, so you just found] what you wanted to change [with the mouse, and typed the characters with the keyset], and you didn't have to jump back [and forth] to the keyboard. You didn't have to keep changing your hands from one place to the other, and I thought that was very useful and very effective. But, for some reason, when everything went over to Xerox [they kept the mouse but] they didn't choose to [use] the keyset, so the keyset kind of died.

Weber: Do you remember the first time you used the system?

Feinler: I wasn't much of a computer user. The way you used computers at that [time] was you punched cards and you took them to [a computer operator] and handed them a bunch of cards. [NLS/Augment] was hands-on, and [in addition] there was this network out there, and I was sure that there was some huge plug in the sky that only I was going to trash. So it was a little scary for me personally. Plus, the fact that I was female and the first time I sat down, somebody came and yelled at me and said "Secretaries aren't supposed to be using the machines," and I said "Well, I'm not a secretary." Anyway, there was a little of that going on. That wasn't so much sexist as it was because of the jobs that needed to get done, so secretaries were kind of at the end of the food chain. Everybody was so busy, it was hard to find somebody to show you how things worked. It was kind of catch as catch can.

Weber: Did anyone teach you at the beginning?

Feinler: I think somebody sat down with me for a little while and showed [me] some of the commands. Then I just kept asking people. They did have classes [but] a class didn't come up for a while. [W]hen a class finally came up, I sat in on that. But meanwhile, I was trying to get th[e] handbook out [so I mostly flew by the seat of my pants so to speak.] People came in from the sites, too. [They came in and helped with the [site descriptions for the] handbook and helped with some of the documents we were going to hand out at the [ICCC]. I remember Bob Metcalfe was one. Peter Deutsch was one. A lot of people came through [ARC] and helped get some of the information together.

Weber: This was the conference where they asked each site to do a demo of some sort.

Feinler: Ye[s]. That was the [ICCC one] in '72. That wasn't Doug's famous demo. It was [a] conference [where] mainly, they were showing what the Arpanet was and what it could do. I worked with Jacque[s] [Vallee] who was also in our group at the time.

Weber: Who is he?

Feinler: He has many hats. He was a [Frenchman who was an] information scientist [as well as] a meteorologist. He's also the world's expert on unidentified flying objects, so he was quite a guy to work with, very interesting and a lot of fun. We decided that the NLS system was [too complex] for somebody who'd never [used] a computer or [who] just walked in off the street. [W]e needed something that was simpler than the commands in NLS. So we came up with what we called NIC Query. It was very simple. You hit an "A" and you got some information; or you hit a "B." It was [a very] straightforward [menu driven] system. It turned out to be] popular because [it was so simple. P]eople just didn't interact with computers then. They didn't touch them, so[it] was very interesting [to interact directly with one.] We found it was harder to get higher-ups to touch them -- because they were afraid they would look foolish -- than it was to get secretaries or people that were used to typing, or didn't care. So that was kind of interesting.

Weber: How would the query work?

Feinler: If you wanted, say, to look at what was in the Resource Handbook, you could type "A" and then it would give you a little tree-structure[d menu] that you could go down. But you didn't have to type words. You just typed 1[s] or As or whatever. It was very simple. Then it would give you information that was under th[at letter or number]. The whole thing was tree structured and Engelbart's system was tree structured, so [it] was simple to do. [We simply] kept the user from having to type any kind of commands because they weren't familiar with that sort of thing. They just typed an "A" or a "1" or whatever it told them to do.

Weber: They were choosing from a menu basically.

Feinler: Yes. It was menu-driven.

Weber: The system was tree based but then there were hypertext links that could take you anywhere, right?

Feinler: Right. Yes. Hypertext was [a very important] part of Engelbart's system. You could either have a hidden link -- you didn't realize that you were being taken somewhere else; the [system] would [take the link automatically] -- or [a visible] link like you see nowadays [as a] URL[that you clicked on to] take you to another place. That's a very powerful tool as we all know now. It's the basis [on] which the web is built.

Weber: Were you adding links when you were creating documents?

Feinler: Yes. Another thing that Engelbart's system had, which I haven't seen [in today's tools, was level clipping]. I've seen [programs] try to do it but very ineffectively. [W]ith one command, you could [view only the outline of a document; then] with another command, you could expand [the outline to a full text document,] and you could expand [the outline to] one level or two levels or however many levels your [outline] had. That was very powerful because you could go back and forth between your outline and the content of your document. [When writing the Resource Handbook, which was about a three-inch high document, [level clipping] was very effective to use. [When] Engelbart's group left, [the NIC] had access to [Tymshare's] NLS/Augment system for five years, [however,] it wasn't working well under TCP/IP. [Few others on the] network w[ere] using [NLS/]Augment, so very shortly after [the group left SRI, the NIC] evolved out of that system. We still used some parts of it in the background for a while, but we developed all of our own [programs and data base] tools, and [delivered most information to users via network servers].

Weber: Under NCP, Augment worked well over the network but not TCP/IP?

Feinler: No, TCP/IP was coming in and it was not working on the machines that we had Augment on at the time. There were some problems there. [NLS/Augment ran under the TENEX operating system, and TENEX had not yet been converted to TCP/IP. We were on a machine running TOP20 operating system and there were incompatibilities.]

Weber: But they were using the older Arpanet protocols.

Feinler: Yes. They were using NCP. Plus, the fact the rest of the network was geared towards [text file] - most of the things that you'd exchange [across the network] were text files. Augment had its own file system and it was not compatible with everything else that was out on the net. So we were trying to be as compatible as we could with other sites. [Also, the NIC] didn't have [enough] programmers [to maintain the NLS/Augment system on our machine. NLS] was a big system. It took a lot of people to keep it going, so we evolved [to] our own [more efficient programs]. We built our own database system. We kept trying to get the client to buy a database system, but somehow or other, they didn't think that was a problem. So we built our own.

Weber: When you say "we," you had programmers assigned to the NIC.

Feinler: [Yes. Ken Harrenstein built the database system] we called Void, or some of us called Avoid, depending on how much data we had to enter. It was a very nice database system [for the time, very efficient and networthy].

Weber: He was part of the NIC?

Feinler: He was the chief programmer for the NIC and then finally, he was the system architect for all the [NIC] software. I had hired him [when he graduated] from MIT when I was working for Engelbart, and he [stayed at SRI on] the NIC [project] when [Engelbart's] group left to go to Tymshare.

Weber: But he understood NLS? He had also worked on NLS?

Feinler: He was [a] very gifted [programmer], and he knew NLS. [He was also very familiar with network programs and protocols. He] was [the] one that evolved us away from NLS. [We] used [NLS/Augment] when [we were] under Doug and then [in transition for] about two years. [Then] we [stopped] using it anymore because we didn't have access to all of it, [w]e couldn't maintain it, and it wasn't compatible with what we were doing with the NIC. [I used the text editing portion for quite a while, but most others went to editors such as EMACS.]

END OF TAPE 1 / BEGINNING OF TAPE 2

Weber: So you used NLS for when you were underdog, but then after they left to go to [Tymshare], what another two years, you say? One or two years?

Feinler: Yes.

Weber: And was there any bad feeling with the people in the ARC group?

Feinler: Well, I think there was a fair amount of confusion. Some people didn't want to go. They wanted to stay on the [Arpanet]. They didn't want to be part of a commercial net. The group was quite a group [with lots of diverse opinions].

Weber: Oh, but sorry, were they upset that the NIC went away from using NLS?

Feinler: That I don't know, because the NLS [providers] were then at [Tymshare]. And so I really don't know how they felt about that. I think more there was a lot of turmoil when the group split up to go to [Tymshare]. They definitely wanted to take the NIC [project] with them. And I didn't want to do that. All my friends were at SRI, and I wanted to be sure that I stayed on the [Arpanet], which was the beginning of the Internet. [Also, it was my understanding after the fact, talking to people at SRI, that SRI never intended for all of the group to leave. Rather, they expected] that a research team would stay at SRI, and the rest of the people would go to [Tymshare] as a production [team. That is, Doug would have stayed at SRI and provided] the research would [for NLS] to [Tymshare], and there would [have been such] an agreement between the two organizations. But Doug's group had their own ideas, and they incorporated themselves[...] I believe that's what they did[...] I wasn't part of that, I was just watching it. [The group] did not want to be cherry-picked. They wanted to stay together as a group. [The incorporation] created all kinds of [different problems, so that the original concept [of a cooperative agreement between the two organizations for research] got scrapped.

At first, the [ARC group] didn't even have Doug as part of it. [Then finally, they decided without Doug they wouldn't amount to much of a group. So they decided to include Doug. And then, as I said, [once the final agreement was reached between Tymshare and SRI] part of the [now Tymshare people] stayed at SRI because they didn't have enough space at [Tymshare] to house them all, so it was very confused for a while as to who was where, and who was going where. And some people really didn't want to be a part of that, so they left. Charles [Irby] left, [Jon Postel] left. There were others that left [The Tymshare arrangement] just didn't feel right to them, so they went on to other things. I was the PI of the NIC project at that point, and I wanted to stay at SRI. So I told the [ARC group and SRI] right off that I didn't want to leave, even if the project went, I didn't want to leave. So there was a lot of confusion. There was no such thing in those days as "venture capital." If there had been, they probably would have found some venture capital and spun themselves off somehow. And they did try to raise some money, I believe, but that didn't work. So eventually, they all went over to [Tymshare unless they decided to leave altogether. So they did keep themselves together that way. [I don't think it would have been a bad model [to have] had researchers at SRI, and a production [team] at [Tymshare], but that didn't happen. [There was a lot of confusion at that point, and people were disgruntled. [Money] was tight [because] there was a mini-recession about that time, and so finding funding was difficult. [A]ll [of] this was going on at once [a]nd it created a lot of turmoil. In the meantime, I'm trying to get a job [one] there [at SRI] because the NIC [project] never stopped, [We] had to keep going and going, no matter what. [So they were] interesting times.

Weber: But if the NIC had gone to [Tymshare], it would have not been connected with the A[rpanet] anymore.

Feinler: It could have been. [Tymshare] would have had to [become] a military contractor. [However, the situation was very unclear. Tymshare could have connected to the Arpanet or it could have sold time to

military customers on its own network, called Tymnet. Or it could have sold time to non-military subscribers only. No one knew how it was going to go – probably including Tymshare].

Weber: So what would it have been? A commercial NIC, in a sense.

Feinler: Well, BBN was a military contractor, SRI was a military [contractor, and Tymshare] could have been. And I think once [the ARC group] went to [Tymshare], they [did take] some military contracts [with them]. I don't [remember]. I'm pretty sure they did. [And Tymshare did have machines on the Arpanet.

Weber: I'm having trouble understanding how. The NIC seemed so tied to the Arpanet. It's the network information center for the Arpanet. So it could be administered from [Tymshare], but it would still have to serve the Arpanet, right?

Feinler: It was just that a NIC at Tymshare would have been there to support users in an NLS/Augment environment, whereas a NIC at SRI was there to support users in an Arpanet/Internet environment. The Arpanet was an ASCII text environment and NLS wasn't. It no longer did the things I wanted to do to provide a NIC. Eventually, I'm sure, [Tymshare] could have done [the NIC] if they had wanted to. Or they could have sold time to the government on [Tymnet]. It just wasn't clear to me what their business model was going to be.]

Weber: And so you felt you identified more with SRI than with the ARC group?

Feinler: Yes, I had been at SRI for a while, before I joined Doug's group. And I liked the environment there. I was already a contractor [a]nd so I joined Don Nielson's group after Doug left. Don[']s group] was working on [Packet] Radio, which [was] also Arpanet sponsored, [so] it seemed like a pretty good match. I was with Don's group for a while. Then Don moved up to be a vice president, and I moved up to be the [Network Information Systems C]enter director.

Weber: So when you were working under Don, you were still running the NIC, but he was your manager.

Feinler: [Yes, h]e was my supervisor. He was a center director then, and then he moved up to be the vice president.

Weber: But he was the director of the NIC. Or was he?

Feinler: [Well yes and no.]. It was a project under his group [but I was still the PI.].

Weber: Right, yeah. And the Arpanet funding for the ARC group, that [ended] around the time they went to [Tymshare], right? And that was one of the precipitating factors or not?

Feinler: Well, it had been a rather large project. I think upwards of over a half a million dollars. It was not clear, because they had a blanket contract, and they had various tasks. But the main reason they were on the Arpanet was to provide the NIC. And it was a large part of the project. And then [in 1973 or 74] -- I think it was-- I'm not sure of the time, we had a pretty good recession. So funding was really cut back. And the NIC project was cut back to a hundred thousand [dollars]. And that's when I took it over, and [about that time Mike] Kudlick, Jacques Val[lee], Paul Rech] and Dick Watson all left the Institute, and went to other places. And then the next time people left was when they actually went off to [Tymshare] in '77. But [in 73-74 there] was quite a funding hiatus. When you have a group as big as Doug had, 40 people, finding funding for all of them in a down time is just tough work. So that was a part of the problem. But another big problem was the size of the machines. It was just very difficult to do everything on one machine. The machine was provided by ARPA, so they had the final say of what went on it, or what got done on it. So there [was always a struggle] of trying to get your work done with these different restraints.

Weber: And [of which] center [was Don Nielson the head]?

Feinler: Telecommunications Science Center. [They] had the [Packet] radio project. It was a very big project [on which] SRI was the lead contractor]. They also did the Deafnet, and, there were other things and other projects under Don. So the NIC was just one of the projects under Don.

Weber: And what year did you switch to being under Don?

Feinler: I believe that was '77. And then I stayed under Don, he was either the center director or the vice president until I left SRI. And he was very nice to work with, as many of you already know. [He] was very supportive, and allowed the NIC to grow while it was there. [In] the early '80s was when TCP/IP became a reality, and [the network] was going to cut over to [these protocols]. That was another time that was very hectic. You might say [all hell] was breaking loose on the network, because everybody had to convert to these protocols. [The NIC was] coordinating and getting documents out, and RFCs were coming right and left, [so] that was [a] pretty hectic time on the net. Somebody high up in the joint chiefs or in the defense department put out a directive. And a directive that comes out of the military, if it goes to military sites, is not something you negotiate. You just do it! I don't know what the man thought when he put it out, but he said [something like,] "Now hear this! On January 1 of 1983, you will cut over to TCP/IP." Period. A[pparently, he did] not know that most of the people who were going to do the work were [college] students [or people at universities], and they were going to be on vacation. Nobody thought about that at the time. [So many of these people] came back. You know, the gauntlet was down. Their work was on the line[, a]nd they were going to make [TCP/IP] work or else. So people were coming in from everywhere to work on this thing to get it done by January 1, 1983. And the military, I think, was oblivious of the chaos they had created.

Weber: So they were working 24 hours.

Feinler: I panned around the network on New Year's Eve, right before January 1, 1983, and here [were] all these people working like crazy! I never took it upon myself to speak for DCA, because they were my contrac[t]ing agency, unless they told me to [do so]. But [that night] I took it upon myself to send out a message saying, "Thanks," to all the [L]jaiso[n]s]. And when I saw the DCA people later, I said, "I sent out

[a thank you] message [on your behalf],” and they said, “Oh, yeah, thanks.” You know, like [it never even occurred to them].”

Weber: And all of them made the deadline?

Feinler: No, no, not everybody made the deadline. But enough did that it was a success. They had [done] lots of work before that. What they tried to do was get implementations for each one of the operating systems [in use on the network], and then make those available to anybody that had that operating system. But still, you had lots of things on your machine that had to be changed, and had to be programmed, and didn't work. [During that time Jon Postel] had these things he called “bake-offs.” where [anybody] that was supposed to have an implementation [ready] would report in what was happening, and whether it worked or not. And that had gone on for a couple of years before they finally cut over to TCP/IP for real. [I believe] SRI [did] the first implementation of TCP/IP. Jim Mathis, who worked for Don Nielson, was a graduate student under Vint [Cerf], who was then [a professor] at Stanford. I believe that's true. You'd have to check that out with Don. [So SRI was in on the TCP/IP development and implementation] from the get-go for one reason or the other. And then all of our machines had to be running it, too, and not everything ran under TCP/IP. It was quite a conversion. It was really [kind of a technical miracle], if you will! It was very interesting to watch it all happen, [a]nd see all the sites make it finally.

Weber: And when you say SRI had one of the earliest [implementations], meaning how long before?

Feinler: Well, I'm not sure when Vint left Stanford, but it was in the '70s, I think, when they were starting to work on it.

Weber: So you had something up and running by the end of the '70s, probably.

Feinler: [Jon Postel and others in the ARC group were working on TCP/IP before Jon left SRI, and many people, such as Jim Mathis, in Don's group were also involved They] were testing it out as a protocol to see whether it was viable or not. And I think it was Jim Mathis that did the first implementation.

Weber: You were in the [Packet] Radio Group. You were in Don Nielson's group when they were doing the internetworking experiments.

Feinler: [I was in Don's group, but was not part of the Packet Radio project. Rather I was an observer of what was happening with protocols at that time, Several groups at SRI were working on developing and implementing the TCP/IP protocols including ARC before they left and Don's group].

Weber: But were you following that very closely?

Feinler: The [Packet] Radio project wasn't classified, but it wasn't something that was publicized on the net, except for those people who were working on it. So I mean, I was watching it, but I wasn't a part of it. [Packet radio was another big project in Don's group.]

Weber: But you knew about it.

Feinler: Oh, yeah, I knew about it.

Weber: And you knew about the van going around full of Generals and stuff.

Feinler: Yes, that was fun when they would have Generals in an airplane, and they had the bread truck going down the freeway, and they'd all be talking back and forth. And I think they had a big [aircraft] carrier [at sea] at one point, and they had a lot of military people on the carrier, and they were all talking back and forth, and this was big stuff in those days. So we had a lot of fun. And a lot of it didn't work, and [they] were behind the scenes trying to get it all to work. So that was a lot of fun. And they were always trying to have the perfect demo of everything, and of course, demos never worked. It seemed that always some glitch would come up when you were trying to do a demo. That was a big joke.

All kinds of people would call [the NIC. Many host computers on the network' were provided by DARPA or were attached to the network because] they were doing [networking] research to begin with, or military research. But [behind the host computers were] machines that belonged to the site, and they were doing whatever the site was doing. So some were very well monitored, and others, anybody that came in could get on the machine and do whatever they wanted to [do]. It was the most fun in town as far as computers went. [We would] get a lot of kid [hackers that] would come [on to the network through these machines and they'd call the NIC, because they figured that maybe they could find out something about [the network] from the NIC. So we had all kinds of kid hackers calling us. And the name of the game in those days was if a kid bugged a site enough, someone at the site would [hire [him] or give him] something to do. Otherwise, he'd drive you nuts. So there were all kinds [of "subrosa" users]. For instance, Marvin Minsky had twin[s - a girl and a boy. T]hey were always on the net. And they had friends out at SAIL (Stanford AI Lab), and they were always on the net. And [there were other kids' on the net. [T]hey weren't obstreperous. We called them hackers, but they weren't obstreperous. They would usually try to find something that they could fix, or some little [job] they could do, so that you wouldn't throw them off. And so there were sort of this sub-rosa group of people that were on the network that probably shouldn't have been. But they were helpful. They would help you do something.

Weber: And you said they would communicate with Generals, and sometimes they wouldn't know who each other was.

Feinler: Well, we put out the *A[rpanet D]irectory*, which was essentially a phonebook for the network. And one of the things you have to remember [is] that this was just after the Vietnam war era, and the military was not popular with students in those days, and vice-versa probably. You had all kinds of people that had political slants that weren't compatible. So I did not want to put people's [titles in the directory. First of all, it would have been a nightmare to keep up, and the minute you got some high ranking person wrong, you'd hear about it. And we were at everybody's mercy to get their names and addresses. It

wasn't something that they had to do. I mean, their military superiors did not say, "You must put your name in this [directory]." So we were always kind of angling to get everybody's names and addresses anyway. And I refused to put titles, because I thought that if everybody knew who they were talking to, that might not work very well. So we had all kinds of people talking to each other]. A kid hacker would be talking to a Nobel Prize winner, and somebody that had been an anti-Vietnam war 'protector' would be talking to military guys that had just come back. And I think that had a lot to do with making the network very egalitarian. Everybody talked to everybody. For the military this was practically unheard of. I mean, when email came out, it really created a whole different kind of communication in the military. [Before communications went up through the ranks.] If you were army [and wanted to talk to the Navy], you went all the way up, then you sent something over to the Navy, and it went all the way down to whoever was supposed to get the message [and] there were checks and balances all the way along. But finally, everybody was talking to everybody. That was interesting.

[Another problem occurred as] the military started using [the network] as a day-to-day tool. [The] File Transfer Protocol (FTP) at the time used the default] "open." In other words, if you created a file [in your own directory, and your computer was attached to the network], anybody could FTP [the file], unless you decided you didn't want it FTP'd, it was up to you to change [the priority], so it couldn't be FTP'd. Well, I kept saying, "The default should be the other way around," because so many people didn't know this was going on. And stuff was flying all over the net that never should have. But finally, I guess, people got onto the fact that they had to put some control on a file, if they didn't want it FTP'd all over the network. [That was another interesting phenomenon on the net.]

Weber: Did that produce any conflicts, or situations?

Feinler: [Yes, it did.] I think in the early days, "security" was kind of a bad word, because people were developing this [network], and they were researchers. They wanted stuff open so they could see what was happening. They could trade stuff back and forth. They could test each others' [programs and implementations] against their own, that kind of thing. So it was very research-y. [Lack of security wasn't] something that was done on purpose, I don't think. But sort of the feelings were that, "We want it wide open so we can develop the best thing we can come up with." And of course, military can't be wide open. When they started using [the net] as a user tool, then [there] was a different point of view [about security]. So those were little conflicts that went on and the eddy currents underneath. I know one time we had somebody call from the CIA, and [he] said he wanted an account. And he wanted [an account] name like "Apple" [or] "Mango," [something] like that. And he didn't want [his] own name associated with the account. And so I said, "Well, I don't think you want to put those names on your account." And the guy was kind of upset. He says, "Well, why not, we want to be anonymous." And I said, "Well, then just pick an alias name. Be "Joe Smith" or something because [the] names [you chose] will stand out like a light bulb on the network." Anyway, he finally changed the names to something else. There were all kinds of things where you were working with a different community, and they had different points of view of how things should go.

Weber: And when you say like he would have been talking to on the phone, you would have been talking to him on the phone about this, right?

Feinler: Ye[s. From the beginning] the NIC provided a telephone “hotline” and answered “snail mail” requests]. And then finally email. And then as time went on, [more] things were done online. But to start with they were all done offline, because there wasn’t anything online in th[e early] days. [However, even when I left in 1989 the NIC maintained a “hotline” with a bank of incoming phones and trained reference people answering the phones.]

Weber: And the conversations between people were mostly one-on-one email, not message boards or anything.

Feinler: There were a lot of working groups. [These] were [email] distribution groups.

Weber: So they would be cc’ing to a group?

Feinler: Yes, but that came later. Well, first it was [one-on-one] email, and then distribution groups [began where you could send a message to a group name, and the message would then be distributed to each member of that group. The NIC maintained [or coordinated] some of the distribution groups, like TCP/IP [and] Namedroppers.

Weber: Namedroppers.

Feinler: That was the name of it. Jo[n Postel] was the coordinator of it, because [his group at USC-ISI was] developing the domain naming system at that point. [The NIC] maintained the records of it. We had all the records of it [because we were the naming authority and were implementing a version of the domain naming system. [T]he working groups were really interesting [b]ecause they did the work of getting the network going, and getting different systems going, and ideas going. [Some working groups were closed, but for most of them, if you had an idea, [it] didn’t matter who you were, you could contribute. Some of them were more controlled than that, [b]ut it was pretty wide open. It was very democratic in the sense of ideas. Anybody’s idea, if it was a good one, would be listened to. And I think that had a lot to do with the success of first the Arpanet, and then finally the whole Internet. That was the mentality of the people that were designing it. And I think that we can attribute that [way of doing business] to Steve Crocker who started out saying he wanted as little red tape as possible, and as many good ideas, and that kind of held.

Weber: But that was before you arrived that he did this.

Feinler: Well, he started the RFCs, and I think it was about the third one, he sent out some ideas that said, “Let’s don’t make this very bureaucratic, let’s make it full of ideas.” And that held. Anyway, it wasn’t too far after that, that I came along.

Weber: So you inherited that, in a sense.

Feinler: Yes, but the network inherited that as its mode of operating, and it held them in good stead. [E]verybody had the feeling that [they] were going to build this thing [right. They were] going to try it. [They were] going to kick the tires. It [was] going to work. And they were very outspoken. It was with some trepidation that you would [make a suggestion to one of] these working groups, because if you came up with an idea that somebody didn't like, they'd let you know in a hurry. There was a lot of back-and-forth, and if anybody got really flaming, they got thrown off the working group. I remember one [instance where a young guy] just kept flaming and flaming, and the [group coordinator] kept saying, "Please do not make these personal comments. If you have an idea, fine. but don't take potshots at people whose ideas you don't like." And [the guy] just wouldn't stop. [Finally the coordinator got angry and sent out a message that said, "All right, it's come to this." That was the subject line. Then the message was, "Your mother wears combat boots!" This was a saying from World War II, and the [the recipient was so young he] didn't even get it. [It] was kind of funny to see. [The young flamer] says, "I don't get that. What's it mean?" I think those that were older knew what it meant.

Weber: Actually, I never did know what it meant.

Feinler: Well, what it meant was in World War [II shoes were scarce in Europe, so if a soldier] gave combat boots to a girl, it was for favors. So when you said, "Your mother wears combat boots," that's about as bad [an insult as you could give. You were essentially saying your mother is a prostitute]. But the [flamer] didn't even know he'd been insulted. So there were a lot of mismatches like that on the net that were kind of 'funny' to watch.

Weber: But did he stop after that? He got the message.

Feinler: He did, because he was told if he didn't stop flaming, he'd get thrown off. So he finally calmed down.

Weber: And you said email came in after you arrived. When did it arrive?

Feinler: It must have been about the mid-'70s, I think. Well, there was email, and sort of email when I came. In Engelbart's system, you could send messages to machines that ran NLS. But network email, I think, was about the mid-'70s. Ray Tomlinson [came up with the first program, as I recall.]

Weber: Yeah, '72, '71/'72. But you didn't start using it a lot until the mid-'70s.

Feinler: Well, I was using it [shortly after I started on the net] in '72. And I remember going back to [a meeting at] BBN, and Bob Thomas had some ideas about coming up with ways to send messages from host to host. [However], to my way of thinking, John [Vittal] came up with [the ultimate mail program] called MSG. [It had just about all the features that any message [system] has today. It was very good. And that [mail program] just spread like wildfire. MIT had [a similar] message system. [Email] kind of happened all at once. It just spread like wildfire. That was the killer app, I think, to start with, [a]nd then probably the next one was the web. But those two, I think, really made the network.

Weber: And under NLS, the Internal email, did people use it a lot, or not?

Feinler: Oh, yeah. The problem was there was only one NLS system. And that was [on one] machine.

Weber: You could only talk to people who you could go down the hall and talk to anyway, right?

Feinler: No, you could send messages [to people] out on the net if they had [an NLS account.] Dick Watson [at ARC] was [developing a mail pro[to]col], about] the [same] time Ray was doing the same at BBN. But anyway, email was something that once the idea [that you] wanted to send [a message] from one machine to [an]other [occurred], it] just spread like wildfire. And so, SRI was in on that at a very early time. And we could send messages within NLS, but you also wanted to send a message from NLS to some other machine, [a]nd that had to be converted to whatever the network was accepting.

Weber: But that was mostly after '72 or so.

Feinler: Yes, it kind of all went on at once. Different hosts had different ideas [that finally merged into the mail protocols].

Weber: But within the ARC lab, did people really collaborate much by email? Were there discussion groups on email within NLS?

Feinler: Well, they had something that was more like texting is now. You could send somebody a message, and it would come across the top of your [screen], it didn't interrupt what you were doing. It came across the top of your work, and you could then get back to that person. So I'd say that was the first thing that I was aware of. NLS was big, and lots of people were working on things. I wasn't always aware of everything that was going on. There were definitely working groups in NLS, but I don't remember whether a message could be redistributed to all members of the group, or whether one had to type in all the names being addressed.

Weber: And so netiquette and flaming came in right at the beginning. You remember.

Feinler: Well, we tried to keep people reasonable. And then the NIC, as a contractor, had to do what the [contracting agent] wanted us to do. So sometimes we'd have to send out [official] directives saying that you were supposed to be a military contractor, government contractor, or have some kind of [official] reason to be on the network. [Some] sites paid attention, and some sites didn't, so that created some mismatches along the way.

Weber: Were there any conflicts from people talking to each other so freely?

Feinler: Well, it was [very odd and new at the time.] I think people are finding that out now the way they [can] us[e] the net in a very social way. This happened back then as well. I mean, you would be talking to

somebody and working on something with somebody, and feeling like they were “your friend,” and you knew them, but you’d never laid eyes on them. And it was a strange context. I remember going to MIT once. Ken Harrenstien was at MIT, and he and I had chatted back and forth on the net, because he seemed to be [around] at midnight, and I seemed to be [around] at midnight, We’d take a break and chat back and forth. And he was asking me what was going on at our site. And I was asking what was going on at his site. At MIT, there were a lot of good programmers, and they had a lot of good stuff, and he helped me find some stuff for the NIC. Anyway, we got to be kind of like friends, talking back and forth. And then we’d get in a chat session with some of the other people. [So] chat sessions – we called it “linking” in those days [– were common]. Anyway, I had to put my resource handbook out, and we were having a lot of problems with getting a printer to take [computer] tapes, or take camera ready copy from a computer, and get it printed out. [Stanford] had a Xerox graphics printer [XGP]., Xerox had put these printers, they were laser printers, at CMU and MIT, Stanford and ISI. Anyway there [were] just a few of them out there. They were experimental, and they were great, because you took the text right off your machine, and it went right to the graphics printer, and printed out formatted text. That was unheard of in those days. [All we had were] line printers. And [the XGP] had font selection. And oh boy! That was hot stuff! So Ken introduced me to a fellow at Stanford, [Brian Harvey. The two of them had been working on email stuff for a long time, but they’d never met each other. And Brian Harvey roomed with Brian McCune. Okay, so the two Brians were at Stanford, and Ken was at MIT[, and] Ken kept saying, “Well, you [should] talk to them, because they have an XGP at Stanford, and I bet [they could help you run your resource handbook off on the [Stanford] printer.”

Weber: What year was this?

Feinler: This was, oh, mid-'70s sometime. [T]hat sounded great, [so] I hired Brian Harvey as a sub-contractor on my contract to help me do this. Well, [to] make a long story short, computer music was just coming out then, and [Brian Harvey] got a chance to [go to] the Pompidou Center in France and work with their music guys, and he just couldn't pass that up. So he passes his sub-contract with me over to Brian McCune, and leaves town. I'm trying to get this resource handbook printed, which is a handbook about three inches thick. [We] had people at MIT and people at Stanford helping me get it set up and everything, [and we had it all ready to print. You had to get special [permission] over at [SAIL] to run a big program on their machine. So Brian had done that. He was a graduate student over there, and he had gotten special [permission because the job was] going to run all night long. [It] turned out that some graduate student wanted to run his thesis off, and he was ticked because I wasn't part of the graduate program over there or anything, and so he complained to John McCarthy. [We] were [in the middle of] running [our job when] at 2:00 [a.m.] in the morning, John McCarthy comes in and screams, “Get that [job] off my machine!” And I'm going, “Oh, boy! I'm dead in the water.” My whole contract depended on getting this thing printed. Fortunately, two or three graduate students took [John] to one side, and pleaded with him to let me finish [the job,] so finally, he came back, and said, “All right, you can finish it, but [n]ever run anything on my machine again.” So, “Thank you, John.” That was a funny night! When the thing finally finished about 5:00 [a.m.] in the morning, we all went out and celebrated.

Weber: Where would you go out at 5:00 in the morning?

Feinler: Well, I don't remember right now, but there was some pancake house or something we went to. [Usually, we] went out for Chinese. Everybody went for Chinese in those days. And there were all these contests [as to] who had the best Chinese food, whether it was on the East Coast or the West Coast.

[There were endless discussions as to which coast] had the best pot stickers, who had the best hot food? And it went back and forth. And there was a fellow out here, Louie-- I don't know Louie's last name--- But Louie loved to [cook and] he had a restaurant, and he loved all the hackers that came [to his restaurant.] He thought that was great. [A] lot of the people from the [Stanford] AI department [came to Louie's]. And so Louie was first for a while. Then there was another [restaurant] on the East Coast [and another one in Oakland. Their merits were hotly contested. Les Earnest [ran the AI lab at Stanford which was way up on a hill in Palo Alto far away from everything. They had vending machines up [there,] and everybody was always [asking] Les, for change [for the vending machines]. Les rigged up a charge] system, so you could [access] the vending machines [from] a computer [terminal], and then you got a bill at the end [of the month. Naturally they had to have] Louie's pot-stickers in their vending machines.

END OF TAPE 2 / BEGINNING OF TAPE 3

Weber: So Les Ernest set up a way to have pot stickers in the vending machines?

Feinler: Yes. They'd send somebody down to get pot stickers and bring them up to the vending machine. Then you could play Double or Nothing on the vending machine. You would log in and say what you wanted off the vending machine on the computer, and the food would drop down and then you'd get billed for it. If you wanted to [try] Double or Nothing, you could do that. Les kept chips and all kinds of stuff [on hand], for the vending machine.

Weber: Wouldn't pot stickers be cold in a vending machine?

Feinler: They had a microwave so you could [heat them up.]

Weber: But they were frozen or just cold?

Feinler: No, they were just cold. They'd go every morning and get food for the vending machine. I don't know which Chinese restaurant ever won [the contest of which was best], but there was always [a] contest between [one or] two. Because of the back and forth between MIT and Stanford, I got to know several of the [students] at MIT, although I'd never seen them. This was the same kind of thing [people experience today]. You had these "friends." I was going to a meeting for the American Society of Information Scientists, which was in Boston, and Ken set up a Chinese banquet. There were 15 people there from MIT, I believe, all of whom I felt that I knew but I'd never seen. That just about blew my mind to go to something like that, and it was really a lot of fun.

Weber: Were people what you imagined them to be, or not?

Feinler: Some were and some weren't. It was interesting to see the person in person that you thought you knew one way or another. That was very interesting. Then, Brian Harvey and Ken had worked for a long time back and forth on [an email program]. They did a lot of work on the original mail distribution system and mail bagging, so that you [could] bag up the mail and deliver [it] to one host and then split it

and distribute it [to individuals] at that host. [To continue...they] had worked together but they had never met each other. So when Brian was going off to France for his Pompidou Center stint, we decided we needed to have what was then called a "hack", a kind of a special [event or surprise]. So the hack was that we were going to fly Ken out without telling Brian, and Ken was just going to show up at the Chinese banquet. So we all came to the banquet. Ken was standing behind me [when we] walked in and [he] just stood there. Brian looked at him and he didn't know this person. He looked at him and looked at him and all of a sudden, he [yelled] "KLH!" That was [Ken's] handle. Ken grinned and everybody thought that was a great hack, that we flew [Ken] in from Boston for [Brian's farewell] Chinese banquet. So there were all kinds of social things like that going on. They were a lot of fun.

Weber: What were those two guys like?

Feinler: Brian Harvey was a very interesting person. I think he's over at Berkeley now. He was very interested in teaching students and kids about computers, so he had a computer lab. I think his mother was a teacher, [and] he [too] went into teaching. He ran a computer lab [for high school students] where the students did absolutely everything. They ran it. They monitored it. They came up with the rules. He kept a log for a long time on the class and I don't know what happened to that. It was very interesting though. His frustrations, too because he was very idealistic about this, and it wasn't quite that idealistic. But he did a really good job of [teaching]. Ken worked with me for many years. Then he went off to...[the big data base place – I'm blanking.]

Weber: Oracle? Sybase?

Feinler: Oracle. He went down to Oracle and now he's at Google. He's a very talented programmer. He just happens to be deaf and we met on the network. Then I got to know his parents because SRI had an 800 number at the NIC. Long distance phone calls were very expensive then, so he would link to me and type, and I would call his parents, and we'd have these roundabout telephone conversations. I still keep in touch with his parents.

Weber: How would you communicate with him one-on-one?

Feinler: He was very gifted at lip reading and sign language. Unfortunately, there weren't many signs for computer things in those days. I didn't realize how difficult it was for him but we mostly communicated either one-on-one lip reading or typing at the computer. Then, after we left Engelbart's group, he didn't have interpreters [or] anything there [to help him]. [We would hire interpreters for meetings and things, and many of them were very good at data entry and data work because they were very careful observers]. They really noticed everything because of their interpreting work, and they were really good at [data work]. So we had several interpreters who were actually hired to do data work, but they were [also] available as interpreters. That worked out pretty well. Hal Huntley was the first [interpreter we hired,] and he's still at SRI. He maintains machines and system stuff. So that was another interesting sideline of our work, that we were able to have these interpreters and have them [handle our] data entry, which they were very good at.

Weber: At a meeting, he would have his own interpreter basically.

Feinler: Yes.

Weber: Was Su Hong one of the restaurants you went to?

Feinler: [Sometimes. However, w]e mostly went to Louie's. Finally we went to Su Hong. Su Hong wasn't even there then, but Louie just loved doing a Chinese restaurant and he loved having these [graduate] students [gather at his restaurant]. He was married and had a little boy, and the kid hung out a lot in the restaurant, and his wife wasn't real happy about that. So she kept talking him into closing the restaurant. [He would] close the restaurant and [before long he would open another one. Louie would sell the restaurant: "I'm out of the restaurant business." Then pretty soon, you'd hear that Louie started another restaurant. I know of three that he started; [then] I lost track of him, but Louie just seemed to always like having the AI group hang out in his restaurant. He was a very good chef. He ran the thing but he also did most of the cooking.

Weber: Where were his restaurants?

Feinler: [One was] in Town and Country Shopping Center and one was close by Su Hong [in Menlo Park], somewhere there on that street. I'd forgotten where the third one was – University Avenue in Palo Alto I think - but everybody followed Louie.

Weber: That's where a lot of SRI and AI lab people would meet?

Feinler: Ye[s]. The [Stanford] AI lab was way up on the hill. Where was it? I can't think of it – Page Mill Road? It was way out of the way, so mostly when they were ready to go eat, they would go to Louie's. People were up there all night. They'd go in the morning for somewhere to get food. Everybody was always looking for food, mostly pizza and Chinese. I spent a lot of time up there because of this book we were trying to get out. That was interesting for me because the[se] were really sharp guys and I learned a lot about what was going on on the net from them. I was mainly a user of it, pretty much, until later. Then we developed our own programs. We developed some of the big servers, like [WHOIS] and [NAMSER]r and [BIBLIO] and [TACACS]. Some of those were services on the net that people could use. When I took over [the NIC project], it was about a \$100,000 project, but when I left, it was a[n] \$11 million project, so it had grown quite a bit. The group had grown to be about 40.

Weber: Give dates for some of those servers.

Feinler: They kind of grew along the way. [WHOIS] was probably one of our biggest servers. We stopped putting out the directory, which was essentially the network phonebook, and we put all that [information] under [WHOIS]. So you could say "Whois Jake Feinler," and it would come back and give you my name, address, email address, affiliation on the net, that kind of thing." Or you could say "Who is host such and such," and it would tell you its host name, host address, who was the host administrator, that kind of thing. So we tried to design servers] for what we called episodic users. Somebody might use the NIC a lot or they might use it every six months. We wanted [our programs] to be something that you could just walk up [to], use, and walk away. You didn't have to have a big learning curve. So most of our

servers were along those lines. Then we had a server, [NAMSER that] if you wanted to refresh your host table, it would do it automatically. First the host table was a flat file and then it kept getting bigger and bigger and bigger. Finally the names were too big for the space they had allowed. That's when they went into the domain naming, which was a tree structured system. So [the NIC managed name service for all the years, [from 1970] until '91, when SRI lost the contract.

Weber: [WHOIS] existed in some form from very early on. When?

Feinler: There was something in NLS called the identfile, which identified everybody that was using the NLS system. Originally we built on that. We used that software to put out the directory, which was a hardcopy publication but then all the information was online too. When we stopped doing the directory, [WHOIS] was already there. There's an RFC and I think it was very early '80s -- it might've been a little bit earlier than that -- and we put out an actual RFC describing [WHOIS] and how to access it across the net, what you had to do. It described] the protocol to [connect] with [WHOIS]. Then [we worked on] the [BIBLIO] server for a long time. We were just about to make it available to the net, and then the contract changed and the people that were supporting [the contract] changed. So we finally just used it for an information center that we kept in Washington for the client. This was [located] at [the] DCA, [Program Management Office (PMO)] that ran the network.

Weber: What date roughly?

Feinler: That was later. That was probably '87, '88. [BIBLIO] was a bibliographic system. You could search for an author. [publisher, date, etc.] If the [item] was online, like an RFC, you could send it directly to your host. You could get all the hits in the bibliographic system and then see which ones were of interest to you, or who had them. What we were trying to do for the net was to tie it up with Dialog. Dialog was a very big commercial bibliographic search system in those days, but it was separate. It wasn't on the Internet and you had to pay to use Dialog. We were trying to pay them and then make [there services] available to DDN users. We did all the work for that and the reach-through. We had to coordinate our data elements with their data elements and so forth. We did all the work for that but we never released it on the net because it looked like it was going to take up a lot of resources. So we used that program between our site and the DDN-PMO, and they used it. But we did come up with that server.

Then we had another one called [SAM], which [stood for] simple access to email. [This] was before the [personal computers were attached to] LAN[s]. Everybody was getting PCs, their own separate PC, but when they used them on the net, they were just like a dumb terminal. So people would [use their PCs as terminals to read mail on their host machines, and the host machines were totally bogged down. Trying to read your mail on the host machine was hopeless. So [the NIC] came up with a little program, similar to what people do today, which reached up, got your mail, downloaded it, and it looked like your email system on your PC. The kinds of things you could do were forward, reply and all those kinds of things. We were doing a [beta] test of SAM with the military. We wanted to use [the] Kermit [upload/download protocol], which was the protocol for downloading things to personal computers. The guy that wrote Kermit, made it available for free but he didn't want us to use it for military purposes, so we were kind of stuck. [Consequently, we] went with a company called Transcend, [that] had a similar protocol. The problem was that people thought we were selling something on the network because we [had licensed] this commercial product just to download and upload, and that got to be a problem. We just went to beta

test with Sam and that was about '88, '89. Then I left the net in '89, so Sam kind of died on the vine. But it was a good idea at the time. It was the same model that everybody uses now.

Weber: POP already existed, I think.

Feinler: There were [several similar protocols]. This [one] happened to be commercial and we could [license] it and embed it, and we had licenses to do that. We didn't want to get something that once we got the military involved in it, then they couldn't buy it off the shelf because that's what they wanted to do, [buy COTS products.] You'd have one person sitting here and one person sitting there [in the same office], and they'd both be working on the same thing, and they didn't even know it because in those days, you couldn't send mail around [an office or company internally from one personal computer to another]. The local area networks were just coming in and [people] were just starting to be able to do that. The host machines were j[totally] bogged down [with people] logging in to read their email or work online.. There were too many users. So [SAM] was just an idea to help offload the systems that were bogged down.

Weber: When you sent an email, let's say in the mid-'80s, usually how long would it take to get there?

Feinler: It was instantaneous.

Weber: But if the servers bogged down, it could take you a while to get in.

Feinler: Originally, you went up to the server to read your mail, so you were hanging on the [host] machine and you were sending and receiving mail on the host server, not on your PC]. Your PC could handle it but the protocols weren't there [yet] to interact with the net except as a "dumb" terminal. So if you had all these people trying to do email on a host server that could only maybe hold 50 or 100 logged-in users, it got hopeless after a while. So that's when they were looking for different ways to offload [the logged in users]. If you just went up and grabbed your mail and took it down to your personal computer, that didn't take very long. But if you were going to be hanging on the [host] machine doing all your work that took a long time. [The] local area nets really changed the network quite a bit. Once LANs were available, it was like a tsunami wave, and [led to] a totally different way to use the network. Lots of people had personal computers but they were not networked, or they were networked on private [networks] like DECNet, or IBM [who] had there own private networks, that kind of thing.

Weber: Were there many other women involved in this?

Feinler: I had quite a few women working in my group. There were a lot of women on the net but they seem to have been forgotten [over time]. MIT, there were quite a few [women] there. When I first went to MIT -- Radia Perlman. was busy freeing the johns because the women had to go down a couple of [floors] to go to the john and the men's john was on the same floor [as the computers]. So she was freeing the johns. I thought that was [an] interesting concept [I]berating the johns. At ISI, there were a number of women. There were a number of women at BBN, MIT. Most of the sites had some women. I've got a list of them somewhere. As I think of them, I'm writing them down, but when you ask me, I blank on

people's names. There was a women, Ellen Golden, at MIT. She ran some of the information stuff at MIT and they had several machines, so she was kind of the center of things there. And there were a lot of lonely graduate students out there in those days, so we kidded around [that] she got to be Abby and I got to be Ann, Ann Landers and Abby [van Buren].

Weber: And you would answer them?

Feinler: Right.

Weber: When you went out in groups to the Chinese restaurants, were there usually many other women there or not?

Feinler: Not usually. The time I went to MIT where I said I met 15 people. Marvin Minsky was there. He was a professor and he was the head of [the MIT-AI] Lab. He was one of the ones that didn't want to be bothered with [a lot of] security. He wanted the host to be accessible so that students could learn. If the machine went down, it was because the students didn't know enough to run it right, so they ran everything there pretty much. [That host rarely went down.] Minsky had twins -- a daughter and a son. They were there [at the Chinese banquet. Henry] Minsky was the son. He was about 10, and he didn't have a middle initial. Everybody had three-letter handles at the time, so we put a Q in [his handle] so he'd have a middle initial. [He was always known as HQM. MIT] had gotten a huge graphics display or -- I didn't know what it was. It was a huge graphics display. It looked like [a movie screen], huge, and this was very unusual and very neat and new. Henry had been playing with this display] all night, so in the middle of the Chinese banquet, Henry just went plop. He fell asleep right in the middle of all the food and everything. We let him sleep because he'd been up all night working on the graphics display] that had just come in. So when someone slumped over their terminal from lack of sleep that was always known as an HQM fold over. The twins also had an older sister. She was there. So the twins and the older sister were all there. I think Ellen Golden was there, so there were a number of women. Like I said, there were a number of women that had key spots on the network. I've got a list of them. I keep meaning to publish it sometime, [if I ever get around to it.]

Weber: In general, women were accepted well by the men and there were no problems in integrating?

Feinler: Except now, nobody can think of any women [who were] on the net. Joyce Reynolds worked with Jon Postel and our group started something called Using or User working group. I was head of an IFIP working group for electronic mail. There were two parts to it. One was the systems group and one was the user group. I was the chair of the user group. We tried to parlay this effort into an Internet user group, some kind of a working group for users on the internet because as the internet grew, especially after we converted over to TCP/IP, there were lots of people out there that were just using the net. They weren't trying to build it. It was their day-to-day tool. So they had a different perspective and different needs than the people that were building the net, and knew it from scratch. We started that group at the NIC. If you were trying to send mail, there were all these different mail systems and protocols, like BitNet and UUCP. You were always trying to get mail back and forth among different nets. At first, the user group was called !%@ because those were all the different symbols that were used for different email systems, and that was a joke. One of the guys from Berkeley came up with that name. Then this user group evolved into a pretty big IETF working group. I turned it over to Mary Stahl who worked with me,

and then Mary turned it over to April Marine, who also worked for me. Then I think Joyce Reynolds took it over. Maybe April took over after Joyce. But anyway, that whole effort became one of the big working groups, and it turned out a number of RFCs called FYIs, which stood for For Your Information. This was how things worked on the net and how you did things on the net. The FYIs were well accepted, and introduced a new user to the Internet and its customs. I don't follow the IETF anymore, but the User working group was part of IETF. So that was one of the things that we were heavily involved in. The working group, the IFIP working group, was really interesting because it had people from all over the world involved, like Louie Pousin, Najah Nafah and Liane Taruco.

Weber: Who's the third?

Feinler: Liane was from Brazil. Najah and Louie were from France. They were very heavily into networking and email services, mostly in Europe. We were all trying to get email standardized, and trying to interface whatever they had with whatever we were trying to do. So it was a very interesting group of people.

Weber: How about from England? Were there many people?

Feinler: Yes. I don't remember right now who--

Weber: Peter Kirstein

Feinler: Donald Davies started out with the group, but I think he dropped out early on. I'm not sure who all were members from the UK. —Both the user and the systems groups tried to meet at the same place every time we met, and then we would all get together for a plenary at the end to exchange ideas and progress reports. I think a lot of that work eventually moved into the ISO and CCITT protocols. Much of IFIP work did that. IFIP working groups did the preliminary work, and then this would move into the formal protocol committees.

Weber: Where were your meetings held?

Feinler: They were held all over. Once we met at INRIA, in France. We met in Brazil. We met in Germany, England, Canada. Those are the places I can remember. A couple times in Germany I think. After I left, they had meetings in Japan, so it was very international.

Weber: Those were social occasions as well?

Feinler: Yes. We all got to know each other. We were all working on documents and standards recommendations. Then I think a lot of that fed into ISO TC6, if I remember correctly. Jim White, who had been part of Engelbart's group I think was the chair of the ISO group that came out with the international messaging protocols. There was lots of interaction back and forth among the groups.

Weber: Louie Pousin was in the email group.

Feinler: Yes. I can't remember if they were in the system or the user; maybe in both. I can't remember now. Ron Uhlig was sort of chairing both sets, and we would get together, as I said, in a plenary at the end of each get together.

Weber: Had you traveled outside of the United States before?

Feinler: Yes, I'd been to Europe, Australia and various places. I liked to travel but it was fun to travel on the job, meet really fascinating people.

Weber: Again, these are people you'd had emails with, so you felt you knew them.

Feinler: I didn't know many of these people until I got into the working group. They were the people that signed up and said they wanted to be part of it. That's usually the way working groups work, is somebody started it and asked who wanted to join. Various people that had interest in that topic would join. IFIP 6.5 went on for several years. A lot of the papers are in the collection at the Computer History Museum. Over the years, Engelbart had had over a thousand documents of his own when he started the NIC. That was one reason he wanted to be part of it. He already had a pretty good collection of documents. Then many of the sites on the network would send us their documents, so we were a repository for various site documents. Things that had to do with the network usually funneled through the NIC to everybody else, so we had those. When Engelbart left, he had a bank of filing cabinets, maybe 20, 25 filing cabinets in his office, plus other documents that the NIC had. SRI wanted the space so when Doug moved out, the janitors came and just took these filing cabinets, dumped the contents on the floor, and were just about to haul all to the dump. I came in that night and saw the mess on the floor. A lot of it I still needed for my project because I was staying at SRI. So I had to call the president of SRI in the middle of the night and say "Tell them to cease and desist." Everything had literally been dumped on the floor. What a mess! We had to get all this off the floor in a hurry. So everybody that could, grabbed a box and just jammed stuff in. It was apples and oranges and bananas and who knows what, just stashed into these boxes. That was back in '77 when Engelbart left, and I just put this stuff in a vault that we had. Then I had to clear out the vault, so I moved everything to my garage. I left SRI in '89, I took my own stuff with me, but the project was still going on. So when the project ended in 1991, SRI called me and said "Do you want any of these things that people left behind?" I said sure. So again, it all went into boxes and the stuff I had in my garage got dumped on the floor during the earthquake because the bookcases I had them on weren't nailed down, so they all fell over. So literally, it was as if you took all of this stuff, put it in a big mixing bowl and stirred it up. That's what I brought down to the Computer History Museum. For those of you who remember the NIC, it still lives and it's there at the history museum. We've salvaged quite a number of the papers that went through the NIC over the years, so we were a good match.

Weber: During these years, it sounds like you were working a tremendous amount. Was this really your personal life as well?

Feinler: I did. I think the thing that was the hardest for me was the excessive traveling. I had to go to Washington a lot because that's where the client was. A lot of times, it was drop everything and go to

Washington. The NIC never quit. The phones were ringing, and the email-- You'd get several hundred emails a day and it was like it never ended. So you'd leave a mess behind, you'd be gone for a week, you'd come back and it just kept stacking up. So I felt like it was never ending and you couldn't quite get a handle on it. I also sometimes felt like I was neither here nor there because I was going back and forth a lot. So I'd have friends on the East Coast and friends at home. It did interrupt your social life a lot, but then there was this little social life that went on at midnight. Everybody was there, so you were going out for food and that kind of stuff. So it was a little unreal, I guess, or surreal I think is more like it. I often felt like Alice in Wonderland, or Alice through the looking glass is more like it.

Weber: What was a typical day like during this period for you?

Feinler: It was different at different times over the space. In the early days, I was busy trying to get these big documents out that we produced, and that was a real hassle. Getting the content, I had to get that from all the hosts on the network from contacts on the network. There's an old joke that goes on and on about Joe Smith. Everybody knew Joe Smith. If you want to make it a shaggy dog story, the story goes on and on. But finally, Joe Smith is having an audience with the Pope and somebody in the courtyard looks up and says "Who is that up there?" and reply is, "I don't know the one in the red beanie but the other one is Joe Smith." I was kind of like Joe Smith on the network because everybody knew who I was, just because they were funneling stuff back and forth through me. We did finally try to make everything generic so it didn't have my name on it, but in the early days, most things had my name on them. A lot of people knew me, but I didn't know them. So that was a little weird. In the early days, the main effort was getting those documents out. That was quite a lot of work and a lot of interaction with other people, all the time maintaining a hotline. The NIC always ran a reference service, people calling and email coming in. Then, as time went on, the contract got bigger and we were developing programs and we were administering the naming and addressing. Later we did the audit trail and billing system and the TAC user registration system. We did the database part of it and BBN did the security part of it, and it was a team effort. So we did a lot of back and forth with BBN.

Weber: The audit trail and billing system?

Feinler: Yes. Originally, the network sponsors paid for the network. DCA would come up with the total cost of the network and they just divided it between the sponsors. Some sponsors used the network a lot and some sponsors didn't use it much at all. Everyone wanted a better billing system, so after the TCP/IP cutover, that was about mid- to late-'80s, we started on a true audit trail and billing system. Also, in the early days, if you had a TAC phone number, you could log into a TAC. Everybody would give out these phone numbers, which they weren't supposed to do, but they did. Then you could go through a TAC. Terminal Access Controller is what TAC stood for. So a terminal could go through and get on the network. If you had anybody you knew on the network that would give you a directory, you could get on the network. So after the TCP/IP cutover, they had formal TAC access. You had to have a TAC card and you'd be registered as a formal user. We maintained all of that. The work changed over time and, of course, there's a lot more of it and more people. By the time I left, I was more of a manager than a doer, but I always liked being part of something.

Weber: In the early days, you had to be there early in the morning in case the phone rang, right?

Feinler: Yeah. In those days, we ran the hotline from 8 to 5 because that's when SRI was open. But then as time went on, we ran it from-- because mostly we were dealing lots of times with the East coast, so we ran it from 5am until about 7pm, I think.

Weber: What time would you usually come in and go home.

Feinler: All different times. It depended on what we were doing. In the early days, I spent a lot of time working midnight to dawn because you couldn't get anything done on the machines. If you had to run something big or compile something big, it just wasn't going to happen until midnight to dawn. Then as things went on, we had our own computer center. We had the Foonly and we had the DEC-20. That was the Network Information Center machine that had all the information that people were getting across the net. Then we had a lot of Sun workstations by the time I left.

END OF TAPE 3 / BEGINNING OF TAPE 4

Weber: So you were saying there really was no typical day.

Feinler: Not really, mostly your day was built around the machine, how accessible it was in the early days. And then as time went on a lot had to do with what was happening on the Net, whether there was some big conference or event that was going on. The NIC often showed up at conferences with the books that we published and the services that we provided, if there were a lot of new users there. One of the things that I was always proud of, we tried to be, as best we could, a facilitator for both ARPA and DCA. And also explaining the network mores and, you know, MO; the method of working on a network and so forth. For instance, if somebody new came on, I remember when the NASA Science Internet was looking at the Internet and they were mostly on DECNET at the time. And I met Tony Villasenor, who was pretty much managing all the NASA Science Internet at the time and he didn't know who the ARPA people were, he didn't know who the DCA people were. And I felt it was important for me being the hub of information to make sure these people knew about each other, because it made a lot more sense if everybody joined in these working groups and came up with the best possible solution for everybody, than if there were all these parallel efforts going on. And often, we would sit there and you'd just see that, you know, the wheel getting reinvented again and if you could get these parallel groups together, it usually worked. And I think we did a lot of that. ARPA administered the ARPANET... you know, the research that went on and so forth but after the third year I think it was, in the mid 1970s, they stopped operating the network. Instead that got turned over to the Defense Communications Agency whose mandate in the Department of Defense was to run communications networks. And some of those people, I remember one fellow, had a half day notice before he was made head of the Internet. it was like, what's an ARPANET <laughs>, you know? So new people would immediately come to the NIC, we would try to get them in touch with the main people that they needed to know about and so forth. And I remember the DCA folks came out, and Jon Postel still worked for us at SRI in those days before he went to ISI and...

Weber: What year would that be?

Feinler: Mid '70s, probably '74 maybe somewhere around there. And Jon, for those that don't know him, was one of the stalwarts of the network and he was a very unassuming, nice, quiet reasearchy kind of

guy. And he had a beard, long beard. And he always wore flip flops, but they were Indian shoes that he got at Cost Plus.

Weber: Moccasins?

Feinler: No, the kind with a loop for the big toe, and when he was dressed up he wore his hiking boots. And so the fellows came out from DCA and they were all dressed in natty suits and were all spit and polish, well, you know, polyester suits in those days and polished shoes and what not. And they said they wanted to talk to the head technical guy. So I go and get Jon, and Jon comes and he's got his-- it was cold then so he had his lumberjack jacket on, big black and red checks, and his hiking boots, he was dressed for the day. And so they talked to Jon a little bit and one of the guys motioned me to go out in the hall. So I went out in the hall and he said, "I want to talk to the head technical guy." And I said, "That's him, Jon Postel" <laughs> He wouldn't believe me. But anyway, finally he got it through his head that Jon was the head technical guy. At the same time I had a secretary named Adrian. Adrian was a black guy and in those days afros were in, so he had an afro and he always wore bib overalls which was fine for Engelbart's group but it didn't sit too well with DCA <laughs>. And they asked me who is this person? And I said, he was my secretary, and they said, "Well, does he always dress like that?" And I says, "Yes." And I said, "I didn't notice that how one dressed had anything to do with how much work they got done." Adrian was really a good worker. That ended that conversation.

Weber: Did you say he had painted nails as well or something?

Feinler: He had very long fingernails at the time too. Why I don't know, but anyway, the visitors were a little taken aback by them...

Weber: Style?

Feinler: ...by the dress and lifestyle out here in California.

Weber: But you stayed fairly conservatively dressed and coiffed.

Feinler: Well, partly because all of my friends were elsewhere in SRI and the rest of SRI was more normal than Engelbart's group at the time.

Weber: But did you, most of the people at SAIL and in Engelbart's group were more kind of hippy, hacker types then.

Feinler: Well it was the '70s, you know, and so everybody dressed like hippies and, that was the norm.

Weber: But not in most of SRI.

Feinler: Well they were casual, but they weren't quite that far out at the time. Beards weren't quite in then and so forth, that came later. There was kind of a culture clash. Doug came up to me one day when I was going out for lunch with someone to a rather fancy restaurant, so I was all decked out with the back combed hair and the spiffy clothes and the high heeled shoes. Doug came up to me and he said, "You don't have to dress like that." And I said, "Why Doug is there a dress code?" <Laughs> He just wandered off. He always kids me about that. And he used to always say, "Well we did that 10 years ago." Everything you came up with, "Well we did that 10 years ago." So one time we had a picnic and the sun was very bright. Somebody took a picture of Doug with the sun in his eyes. Doug was taking a bite out of a sandwich and he was squinting his face, and so they put a caption under the picture that said, "I ate this 10 years ago." <laughs> We had a lot of fun with Doug. Almost all the young guys in the group had beards and Doug didn't at the time. And so they decided Doug should grow a beard. His name is Engelbart which actually means in German, "angel's beard." And when he grew a beard it was clear down to his chest and it was snow white, and he looked just like Father Christmas or something <laughs>. So that was fun when Doug grew a beard. He shaved it off. He said it was too much trouble.

Weber: What was he like to work for?

Feinler: He was an interesting guy to work for. He always had in his head, a vision of where he wanted to go. There were certain people to whom he was really good at communicating his ideas, and other people to whom he just couldn't get through, he just couldn't make them understand where he wanted to go or what was in his head. I always found him to be a very interesting guy. Of course he was my mentor. I wouldn't have had a career without him and Don Nielson. So they are people who are very special to me. But I found that if you went to Doug with an idea, he was pretty receptive. If you went to him with a demand, forget it, he just closed up like a turtle. He was a research guy. When the institute was leaning on him to shape the NLS system up and sell it, that didn't fit well with. His whole world was figuring out how people and machines interact with each other and contemplating the long term impact. And that was very much his research thing. The network, the software, and what not were somewhat incidental to what was happening with communities of communicators. It wasn't easy to communicate with Doug, because he was an idea guy. He definitely saw things the rest of us didn't at the time.

Weber: And it sounds like it was a nice, there was a lot of joking around, a friendly feeling in the lab.

Feinler: Oh yeah. But of course he had to manage all of this, and he had a lot of young people that had no idea how difficult it was to bring in enough funding to cover all their work. They just, they didn't deal with that. And so, sometimes there were people that thought Doug didn't do much because he wasn't out there in the middle of the floor where they were. They didn't know how hard it was for him to find support for them. And I had some of those problems myself, you know, if you're the one that's going off to Washington and doing all that paperwork and what not, sometimes people think you're not doing anything but it's a lot of work. Work had to be done exactly the way the client wanted it done. And what you want to do and what the client wants to do and what your group wants to do, it doesn't always mesh. So it's quite a juggling job to make that all flow together, in my opinion. And it was a big job for Doug and a lot of people were not aware of how big a job it was. He would be in his office and he would be working on this kind of thing and they weren't aware of how difficult it was. Some understood and some didn't.

Weber: And who were the main personalities in the lab?

Feinler: Well, they kind of prided themselves on not being structured.

Weber: Sure, but I mean who were, who stands out in your memory?

Feinler: However, they were the most structured group I ever worked with. And it was-- the lead people were the programmers because they controlled everything. NLS was a big system and there used to be-- seemed to be one programmer that kind of coordinated it all. I wasn't a programmer so I might have this wrong, but it seemed like when I first came there, Bill Paxton was kind of that coordinator, then Charles Irby, and Jon Postel to some extent. But Jon was always more oriented toward protocols and the network than he was towards the NLS system. However, he was a very good NLS programmer, or system person. Then when Charles left and they went to Tymshare, it was probably Don Andrews. So there was kind of this hand off, but it took a lot of knowledge to know everything that was in his system, it was very complex. I mean it had debuggers, it had...

Weber: Jeff Rulifson...

Feinler: ...it had a programming language, it had email, it had document tracking it had, and everything was under one umbrella and it was a very nice system to work on. I said I started out with the best and it's been downhill ever since <laughs>.

Weber: And Jeff Rulifson, though, was not in that kind of driver's seat <inaudible>.

Feinler: I don't know exactly.

Weber: Okay.

Feinler: Jeff was one of the very early people and he was certainly a key player; however, he left before I arrived, as did Bill English and Bill Duvall.

Weber: True, he was <inaudible>.

Feinler: I had left out Bill Duvall and Bill English. Those guys were the very early guys and I don't know who might have, been the lead designer. Elmer Shapiro also had an early role.

Weber: And Bill English was a hardware guy as well.

Feinler: Yeah, and Bill Duvall was very big into software as was I think Jeff Rulifson.

Weber: But were...

Feinler: Bill Paxton.

Weber: Did you interact much with these guys?

Feinler: They were there-- I did but not-- I wasn't a member of the group then. Bill Duvall and Bill English and Jeff Rulifson, had left by the time I joined the group.

Weber: So it was really...

Feinler: Bill Paxton was still there.

Weber: Bill Paxton. And was he-- you were asking for resource from him and stuff, right?

Feinler: I would talk to him if I needed something fixed.

Weber: Was he easy to work with? Yes, very nice guy – quiet and thoughtful.

Feinler: Duvall and English and later others went to Xerox Parc. The NIC gathered information from Xerox PARC for the Resource Handbook because they were on the Net. However, access to PARC was restricted as they were a commercial lab. —As for Rulifson, I don't know where he went after he left SRI but he eventually ended up at Sun.

Weber: Which I did want to ask, when you were there during the period, PARC was hiring away a lot of people, right?

Feinler: Yeah, there was some kind of a schism which I wasn't there for. And it was probably one of those things that somebody wanted to go this way and somebody wanted to go that way and there just weren't enough machine resources to do everything. And so that's when several people left to go to Xerox PARC. And also, PARC had, you know, endless money to spend on equipment and that was always a problem, because we were contractors and you only had as much equipment as the contract would purchase for you. So that was an issue. For instance, a graphics workstation cost \$50,000, \$60,000 bucks, so we had one. Bob Belleville worked on that when he was at SRI. And it was very difficult to do graphics on the network in those days because the network couldn't handle graphics and the machines couldn't handle graphics.

Weber: But Bob was there a-- Bob Taylor had originally funded the ARC lab, right?

Feinler: Which-- who was he?

Weber: Bob Taylor had initially.

Feinler: Oh, yes.

Weber: And then he went to PARC. Was there any feeling, did that hurt the relationship?

Feinler: Well I'm sure he knew all the ARC people and he probably sold them on the idea that they could do what they wanted and he could provide them the resources. But both groups always kept in really close touch and I don't know what happened at the time, I wasn't there. By the time I joined Engelbart's group, all those people were still friendly and interacting on things and so it was, I think it was a reasonably friendly split, although I don't know what happened at the time.

Weber: And do you remember visiting PARC <inaudible>?

Feinler: Well PARC was kind of proprietary, you couldn't just go there. But I was up at PARC several times and saw the work Alan Kay and Adele Goldberg-- were doing and various people that I knew moved to PARC. And of course they had the Altos machines, which were really nice machines and everybody was jealous <laughs>.

Weber: And Jon Postel, what was he like to work with?

Feinler: Oh he was a sweetheart. He had the office next to me and he was very considerate and he had a lot of feeling for getting the right information to people and working on keeping everybody informed. So he and I had a lot of common interests-- we used to kid around and I said why don't you come up with a protocol called the MIN protocol. And he said, what's that? And I said, Make It Nice <laughs>, just so everything worked, because half the stuff didn't work when you wanted it to work. Jon was the editor of the RFCs. So we worked really closely with him even when he went to ISI because they were developing the DNS system -- the programming for it at ISI and we were doing the implementation at SRI so there was a lot of, interaction. And then Dan Lynch had run all the machines at SRI, then he went to ISI and the people in his group there, were developing TCP/IP implementations for the DEC-20s and 10s. So, you know, we worked back and forth a lot with other sites particularly in our case, BBN and ISI. Those were maybe the closest ones but, you know, the MIT sites, Carnegie Melon. There was lots of back and forth both with designs of things, particularly when we started to go to the TCP/IP protocols and everything had to get converted over. So everybody was swapping back and forth implementations and programming that they had done and little things that would help and so forth. There was always a lot of back and forth.

Weber: Who were the main people you dealt with at BBN?

Feinler: Well, again, that was different over time. At first we dealt mostly with the NOC, the Network Operations Center, because they were one big service and we were the other big service on the network. And then as time went on we...

Weber: But who were the main people involved in that?

Feinler: Alex McKenzie. I remember in the early days dealing with Bob Thomas and, gosh I-- there were a lot of names, I'm blanking on them now. But most of the people that ran the NOC, we were in contact with them all the time. When any host came on the network, first they had to get an IMP port from BBN and then BBN would tell us that they were coming on and who the contacts were. And we'd follow up and get pertinent information from them. This interaction is like a day-to-day thing almost. And then as we got into naming and addressing, well more in the audit trail on billing we were working really closely with BBN. And it, was it Ed Cain who ran the Protocol Standard Technical Panel at DCEC-- oh gosh, anyway.

Weber: That's okay.

Feinler: But there were, you know, it was different people at different times.

Weber: And then was Ted Nelson, did you meet him in those years?

Feinler: I knew who he was. He ran the little, I forgot what it was, a little computer center, it was on the corner of Manalto [ph?] and a lot of the people in the ARC group were helping or we were over there. And so I went over there a couple of times. But I didn't know Ted that well. However, I've met him since, and gotten to know him.

Weber: And Andy van Dam had came out some?

Feinler: I didn't know him at all. Some of the other people knew him.

Weber: And who were-- how did your users change over time, the users of the Net?

Feinler: I'm sorry I didn't get the question.

Weber: How did your users change over time?

Feinler: Well originally, the users were the developers of the system and they were not using the Net so much as they were using their own host and trying things out and then they'd exchange ideas of things that worked host to host. Then-- that worked out. Then, the idea for TCP/IP came along and that took the focus off of resource sharing-- originally the network was supposed to be a resource sharing network, primarily to share the big computers that were at the time, located at atomic energy sites. They had big computers and people had to go there to use the computers. The idea was that you could get access to these computers across a network, I think that was sort of the original idea... plus development of communications that were faster and more robust. But once email hit, that kind of changed the whole direction. People then used the network in a different way and still later the focus changed again from

using resources to developing the TCP/IP protocols. I mean, the emphasis of the research was on protocols and getting everything to work with everything else. Not that protocol research hadn't been ongoing, but it became more of an emphasis. Then once we cut over to TCP/IP, the network became an operational military network called the DDN. The DDN adopted TCP/IP, and they became a very large DoD operational network made up of five subnets, one of which was the ARPANET. The DDN was "operational" which mean that everybody was using it for regular business; other government agencies were using also using TCP/IP. NASA had its NASA Science Internet-- you know, everybody was using the same suite of protocols so they were all interactive. And so then there was a lot more emphasis on what the users needed versus what the underlying system was all about. This internet was growing exponentially, so that was what was driving the protocol research... whether they were robust enough and there was gateway research and security issues, a lot of things that the emphasis hadn't been on in the very early days.

Weber: So the people that were calling you were very different kind of person.

Feinler: Yes, in the early days we just had a phone. But by the time I left we had a bank of six phones and they were ringing all the time, you know, first one would ring and then the system would roll over to the next phone, and so forth.

Weber: And what would people ask?

Feinler: Just about anything. A lot of times where something was or who was the person to contact or how did they come onto the Net? How did they use certain things? How did they get a copy of this, that, or the other? It could be anything. And then we had a lot of liaisons between the various subnets. CSNET had come on, there was BITNET. CSNET had been superseded by NSFNET but both were still there. UUCP folks called us to find out how to get stuff from one side to the other? It could be anybody, you know. And so the group that we had answering phones, we tried to get them to somewhat specialize. if it was TAC access it went to the people that were doing that, how do we get on a TAC, how do we get a TAC access card? If it was security stuff. We had a security expert, Peter Neuman who was working with our group, and there were other security people at SRI that we could call on. So we just never knew what we were going to get. And that's why I kept so much paper, because we would get transferred from one machine to another machine and-- or something was old and they'd say, "Oh we don't want to carry that across or we don't want to bother with that, it's old." But that didn't stop people from asking questions about it. And also in the early days, it was very hard to jump on a machine and get to something while you were talking to somebody on the phone, the machines just didn't work that fast, so we kept a lot of paper around to be able to answer questions in a hurry. And we had sample questions and answers [now known as FAQs] for the kinds of questions we got all the time

Weber: Do you still have those, yeah.

Feinler: I don't think I do anymore. We kept them for a long time. The Reference people used them and that's also how we would train new people that came in. They could learn about the questions that you got the most. And then, if you got something that was more complex, we passed it on to either a local or network expert.

Weber: What was the most common that you remember?

Feinler: Mostly where was something or who was the right contact? Or how do I do X, you know, how to-- when we handled the TAC cards, we got a lot of people calling to get a TAC card. But that was fairly late in the '80s. Also, lots of questions about naming and naming domains.

Weber: And would you try-- was there any screening? Anybody who called, you would answer the question?

Feinler: We would try unless they were trying to be silly or something like that.

Weber: But not trying to restrict it to legitimate users in any way.

Feinler: Well, like I said, we were kind of a hub. We didn't always try to answer questions so much as get the person to the right person that could answer the question. I mean, we did not try to be experts on everything that was going on, but just try to know who was the expert and pass that person on. Especially in the working groups, I mean we were more familiar with the working groups and who were the heads of them, but we wouldn't try to answer the question on what was going on in working groups, we'd just pass it on.

Weber: And how many people did you have answering phones?

Feinler: Probably off and on about 20. We had a bank of six phones and we always had two or three people manning those-- we had the NIC room, which was where most of the resources were ... books and things for quick look up. But then as more and more stuff was online ref staff could stay in their office and the phone would just transfer to their office. If somebody was on reference desk that's the way it worked. We always had at least two people in the NIC room because we also had walk in visitors too that would come to the NIC.

Weber: Oh you did, I didn't realize.

Feinler: SRI would have clients or visitors, and they would walk them through the NIC, and introduce them to some of the network resources and stuff.

Weber: And your total staff at its peak was how many?

Feinler: When I left in '89 it was around 40 people.

Weber: Wow, so that was a combination of, what were the main roles?

Feinler: Programmers and reference people and database people, we kept a lot of databases. But people would rotate tasks, they didn't always do the same thing. The programmers never worked on the Ref Desk, unless there was a technical question, then we'd pass it on to them. But we used the operators to answer phones so that we could come on at five in the morning because we had an operation staff that started at five and went until midnight I think. That way we could answer East Coast phones at eight their time and then by the time we went off at five or six, it was 8 pm on the East Coast. This gave us pretty good coverage.

Weber: And as time went on, more and more requests came in by email as well, right.

Feinler: Yeah, oh we'd get hundreds of email questions a day.

Weber: Was that a big, like the breakdown, what percentage was phone, versus email, versus letters say?

Feinler: Oh toward the end no, almost no letters except they were usually from foreigners. And I would say 75 percent was email and maybe 25 percent was phone calls.

Weber: And the early days mostly phone.

Feinler: In the early days it was almost all sending out hard copy documents.

Weber: But the requests coming in were mostly by phone in the early days?

Feinler: Phone or letter, excuse me.

Weber: And how did people find out that you existed?

Feinler: The people on the network knew we existed. And then we would go to meetings and send out flyers and that kind of thing. Every host that came on had to contact us because we were the naming authority. We automatically gave them the manuals we produced. So they pretty much knew who we were, and then the word would spread out, you know, somebody would just say call the NIC.

Weber: But you were actively trying to get more visibility then or no?

Feinler: Well we didn't go out looking for people, but when any host came on the network they had to deal with us. And then we would give them a package that said here's what we can do for you and here's what we have available. And then for instance when Dan Lynch held the big Interop meetings the NIC had booth there that would hand out information. And some of the big-- we went to the COG meetings, which was an engineering working groups for the Defense Communications Agency. And we went to the

sponsors' meetings, and we went to the Internet Engineering Taskforce (IETF) and we went to Protocol Standards Technical Panel, which was the DOD standards versus IETF which was the Internet standards group, and we were always trying to keep those two in sync too. So we ended up being observers in a lot of instances where sites would call and invite us, they'd say, "We're having a big meeting of our user constituency, would you come and give a little briefing?" So we did a lot of that.

Weber: So you went to many meetings a year.

Feinler: Yeah.

Weber: And then you went to NASA, when was that?

Feinler: I left SRI in '89 as I was slightly burned out on all of this. I had planned on taking a year off, is what I had in mind. And I had been invited to go down to Brazil as a visiting scholar in Prof. Leani Taruco's group. As it turned out my stepfather died almost the day I left SRI. I was in Washington for a final briefing when he had a heart attack. My mother was functionally blind. She had macular degeneration and couldn't see. So that created a lot of problems for me. I had to move her out to California and so forth. So I didn't do what I thought I was going to do that year. Finally I decided I needed to go back to work and had gone to an IETF meeting, and ran into some people from NASA and they said, "What are you doing?" And I said, "Nothing." And they said, "Why don't you come and work for us?" So I did. And that was interesting too because NASA -- the amounts of data that NASA handles is incredible. I mean, I don't think I'd ever heard the word terabyte until I went to NASA. And that was like what they got daily. Their information problems were very different, and the way they did business was very different. Everything at NASA is out in the open, I mean they do their work in a fishbowl, which is very different from the Department of Defense that only reveals as much out as they thought was reasonable. So they were very different communities in which to work. And I worked with the people that working on the big land based telescopes. My job at the NASA Science Internet was to provide networking for NASA scientists. We were network requirements managers. But anyway, our job was to provide networking. And we had both people that looked at the administrative side of it and people that looked at the technical side of it. When you're putting in networking in places like Cerra Tolola up on a mountain in the middle of Chile, you couldn't just call a phone company and have them install some lines. There were lots of things that went into providing service. The group I worked with put in networking to Antarctica... the group, not myself personally.

And then I switched to a different group where I brought the NASA Science Internet, NIC, which was then at Goddard and on DECNET, to Ames and we put it on the Internet. And then I worked on another big project called the, I think it was the Globe project. But anyway, we worked with kids, and teachers, and scientists. The teachers would learn the program from the NASA scientists and teach the kids. The kids, in turn, would gather data and they would-- it was real data and they could look online and see it and they could talk directly to the scientists, and these kids were just so turned on by this project. It was really a kick. Our job was to put together turnkey machines that had all the software on them, and they were ready to go with this program and we'd ship them out. That was a lot of fun because one time we had a little kid call in and say, "I'm sorry, but I'm not going to be able to collect my data over Christmas because my mom says I have to go see my grandmother." <laughs> And they were just so turned on by this project. Another time we had a teacher call us and say, "I need a lot of help." And we said, "What's the

problem? And she said, "Well all these computers arrived and I don't know anything about computers." And she said, "The superintendant told somebody in the legislature that they should come and see a demo." And we said, "When?" And she said, "Next week." She didn't even know how to turn the computer on. So we had a programmer online with her going, "Turn this. Do that. Did you see a light? Did you see this?" <laughs> She was a grade school teacher, and she had a third or fourth grader that was pretty sharp. So we got the kid involved and we got the whole thing running. She called us afterward and said the demo was a big success. <makes noise>. It was a great, great project that way because the kids were so excited about it and so were the teachers and it was an interesting mix of people. And then another thing we did... as I say I didn't do it, but the group I was in did it. We put the Web into the White House. And it was a little like Bambi meets Godzilla, you know, because I think they thought they were going to knock on the door and say, "We're here to install the Web." They had no idea what White House security was going to be like. But they finally-- this was in the Clinton administration... got the first Web up in the Clinton administration. One of the things I did was start a working group to look at how to administer a Web because everybody was putting anything on the Web. And, you know, it looked like this was all NASA stuff. If someone took something from somebody else they didn't necessarily acknowledge the source. There was nobody saying, "Yes, it's okay to put this on, no it isn't." So we came up with a structure of how to administer a Web. And that was kind of interesting, so those are the things I did at NASA.

Weber: And the White House site they faced a lot of bureaucratic obstacles?

Feinler: Well you can imagine what the security was like -- there was one side that wanted the security to go away, and the other side that said, "No way are you coming in the door without us approving everything, you know, somebody going over everything you're even thinking of doing." So it was kind of a kick.

END OF TAPE 4 / BEGINNING OF TAPE 5

Weber: So you mentioned the Web but when the Web arrived you were still at SRI at the very beginning of it?

Feinler: Yes.

Weber: So do you remember how did people feel about it or react to it?

Feinler: Well it was just getting started. It was WAIS and Gopher and I loved the kid that came up with Gopher, he said he designed it so his mom could use it. These versions worked on the Internet, but not across the whole Internet, it wasn't until, who's the guy at CERN...

Weber: Tim Berners-Lee.

Feinler: Right, Tim Berners-Lee came up with the protocol that made it work internationally that it was another killer app. I mean it spread like wildfire and everybody could see what a good thing it was going to be. And I don't think anybody imagined that the Net was going to grow the way it did. The fact that the military just didn't want to pay for all of it anymore. It was hard for them to know who their customers were. I mean we knew who they were, but nobody could budget for the expansion, and there were so many users on that weren't contractors or, weren't specific users of the Internet and they were coming in from hosts all over the place. So it made sense for DoD to decided that non-government portions of the Internet could become commercial, and once that happened then, just all hell broke loose. But it was very interesting to watch the Web, the change it made, and the realization of what people could do with information. There still weren't a lot of websites, mostly they were hosts that had been on the Net for a while, they weren't commercial but then very soon there was all this commercial stuff out there, a lot of which didn't work very well and then it kinda settled into what we have today.

I worry about the Network... There are a couple of things that bother me about it, and one is that it's very easy to spread the Big Lie. Information goes so fast that somebody can start a rumor as if it's perfectly factual, and before very long it's all over the place and if there isn't a counter balance to correct the rumor, it can get set in concrete,,, so that's a worry about the way people use the net. I also think a lot of people are kind of addicted to it and that'll probably wear off after a little bit... maybe, maybe not, I don't know. But two things that I haven't liked about the Net are porn and spam, I think they could, you know, they could bring the Net down in many ways. Spam is harder because it's hard to know exactly what is spam. I mean one person's spam is another person's information, and it's just hard to know which is which, but I personally find it very hard to deal with my email now because of all the stuff that's coming in. It's not that I'm not interested in some of it, but I don't want to read it right now, I don't want it to be mixed in with other mail. Now and on a Mac you can deal with this, but then you've got more than one mail program to look at, so too much email is a problem for me personally because a lot of it isn't email that I want. I don't know what one can do about that, but on the other hand it's just fascinating that the whole world can have information that only a few could have many years ago. Nowadays anybody can get educated if they can get access to a terminal and the Network. Libraries can make information available that they never even dreamed of before. So it's pretty fascinating and whoever knew.

Weber: When, let's say in 1975 if you were thinking about the future of networking what were you thinking about, where did you think that would?

Feinler: Well I thought it would expand through the government, I guess I wasn't thinking of, you know, just the man on the street, my mother using the Internet, I mean this is fascinating. My little nephew who is three years old can use the net, can use a computer, I mean this was unheard of. Then a computer was something that cost a fortune. So you didn't think of having one in your living room that was for certain, even all the time that I was working in the NIC, work stations were still thousands of dollars, and it wasn't something that anybody could have in their pocket. And also the miniaturization is fascinating... everybody doing work on something this small is really fascinating.

Weber: So when you're running the NIC you were not thinking that this is something, the kind of thing that might be a public service of the future?

Feinler: Oh yes particularly email because that was already everywhere, also, all the Nets were all — becoming interconnected, and I thought it was fascinating that students,,, NSFnet was coming along then,,, were all trying to talk to each other. So that opened up another whole world that hadn't been there to start with, and I think that was the beginning ,,,just opening up the flood gates, so to speak.

Weber: So you've been using email almost 40 years now.

Feinler: Yes.

Weber: How has the way people used it changed if at all?

Feinler: Well the number of people who are using it.

Weber: Sure but are the conversations similar, are they different?

Feinler: Actually the parts of email are pretty much the same since John Vittal's program MSG...although many things have been added along the way. My understanding was that when John left BBN to work at ISI, he went on one condition that he never had to work on MSG again because everybody always had another little feature, another little thing they wanted to have added to the email program. It's just that there's so many more users. Another thing that drives me nuts on the Network, it's what I call chain letters, you know, send this to a hundred people you love.

Weber: You didn't have that in the '70s?

Feinler: Mostly the only thing that you sent stuff like that out to were to the working groups.

<Crew Talk>

Feinler: It would have been prohibited officially to send that kind of message out, you wouldn't have been allowed to send it out for just nonsense kinda stuff. I mean I'm sure it happened, but it was kind of frowned upon because the resources were pretty limited and people would say don't mess up the net with this kind of stuff.

Weber: And you've always lived right around Menlo Park, Palo Alto?

Feinler: Originally I was from Wheeling, West Virginia and then I went to Columbus, Ohio and Purdue for a while where I went to graduate school. Since then I've been out here in California. We used to have a lot of foreign visitors at SRI and particularly the Japanese visitors would come with a map and say "Would you point out Silicon Valley?" and I'd say it's a joke, it doesn't really exist except it's a slang term, you

know, a kind of blanket term to describe the area. They had a hard time with that, they wanted there to be a way to Silicon Valley.

Weber: To see the silicon, yeah. Anything else you would like to add?

Feinler: Well I'm very pleased that the collection of papers and documents and so forth that the NIC collected over all these years to which many of the sites on the network contributed, will be here at the Museum. We've managed to hang onto much of it, and we're trying to get it into shape and make it available to researchers at the Computer History Museum. That's what I've been doing for gosh almost ten years now, very slowly with a lot of setbacks, but I think we're finally almost there. I hope to have a finding aid up on the web, so that people can actually see what is here, and access it for research. It breaks down into a number of things: The original bunch of documents that Englebart had and many of the early papers that the different sites sent to us, we called xdoc at one time, meaning that it wasn't online, it was a hardcopy collection, and is a huge collection of early documents. We've got a set of Englebart's journal that was some of the first hypertext information that was in his system, <inaudible> and which we saved also in hardcopy.

Weber: And was that from before you went there or?

Feinler: Well it was gathered until he left SRI in 1977, it journaled what everybody was doing there but sometimes it was what people sent from outside, so it's a mixture of things, but mostly how his group was run and his system NLS, was designed, a lot of this detail is in the journal. We have 40 some boxes of his work.

Weber: And for instance the journal is how big, how many linear feet? When you say the journal, how big is that?

Feinler: Oh that was at one time a set of notebooks that was probably about I'm guessing maybe 25 feet or more.

Weber: And that's downstairs?

Feinler: Now we've got that in the collection, we also have source code from the original NLS system, three sets of source code, we've got a lot of the user manuals, we've got a lot of the reports and reprints from the Engelbart group over time. In the Englebart collection alone we've got about 50 boxes or more of his material and then the xdoc collection is probably 25 or 30 boxes of these very early papers. Nowadays a lot of it would be considered cruff but if you look at the overall collection it's just a composite of what went on in computers at the time, what was important, what has since gotten lost. Also there are things such as the interaction between the early developers and DARPA so it's a dukes mixture but there's some very interesting things in xdoc. Then we've got.

Weber: And what period does that cover?

Feinler: That would cover oh boy from well we have Doug Englebart's copy of "As we may think" by Vanamar, Bush that goes back to 1945... that was his inspiration... but mostly it's late '60s through the '80s, ..something like that ...and then in the early days a lot of sites sent us their technical reports, so we have many, many early technical reports from the various sites which were on the Arpanet.

Weber: And how big, give just an approximate idea of the size of each of these will you?

Feinler: That's probably one of the biggest collections and I don't know of, you know, how many boxes it took up.

Weber: More than 40?

Feinler: Yes, quite a few, well the whole collection is over 350 boxes of material, so it is a lot of material. We have a bibliographic reprint collection on email in the early days; we have a large collection on that we put together an information center for the Defense Communications Agency that had all of the documents that they needed to monitor their contracts and manage the network, so there were many items on protocols, on various cog meetings, sponsors meetings, minutes, all kinds of things that were happening in the military and I think that's an important collection because a lot of that material has been lost or was not circulated very well to start with. What else do we have.... we have quite a number of things. So it's a very interesting collection and I hope that some of you will have a chance to come to the Museum and use it at some point.

Weber: If somebody were totally unfamiliar with the collection what would their starting point be to find out what's in it? Finding aids and.

Feinler: Probably depends on whether they're technical or not.

Weber: No but you showed me for instance some of the documents which are basically indices to the other things or you have some documents that are like tables of contents for other documents. You showed me a couple of books that are like a guide to what's in the other parts.

Feinler: Yes.

Weber: Could you explain how to use those?

Feinler: We have an index to the xdoc collection, and we have an index to the DCA collection, what I call the military collection, and we'll be trying to get all of this collection into our own database over time... that's going to take a while. But that's the next phase of work, and then finally to scan items that are scanable. There are always a lot of copyright problems with scanning, but with the military documents that shouldn't be true because they're government documents, so they should be in the public domain. It would be nice to get the reports scanned but again that depends on whether the issuing agency is amenable to that or not. So it's a lot of work, it'll take a while but I think we've got a good start and at

least I think with the finding aid and the material now boxed in useful ways to get to it, we at least have a start for people to be able to use the collection.

Weber: Sorry to ask again but if you walked up, what would be the first document you would look at to find out what's in the collection? The finding aid that you're producing.

Feinler: Well the finding aid would be a start because it would tell you what types of things are in the collection and hopefully why they were significant at the time. Maybe xdoc would be interesting because it's such a duke's mixture of what went on in the very early days of '60s and '70s and '80s. If one were interested in more technical issues, they probably would want to start with the RFCs. We have the first 1500 RFCs but those are also online other places. If you're interested in the social aspects of the Internet, I don't think we covered a lot of that, but we did have some information along the lines of what people thought would be the impact or where they thought it was going, and that I think is a very exciting area now to see, and that was one of the things Doug was very interested in. We have his bootstrap seminar documents...we have all of his bootstrap seminars where he was trying to work with collective communities of different types, mostly industrial and academic, and trying to see how you could augment the way people worked with machines that was his big interest. So we have all that, so it's.....

Weber: That's part of the 50 boxes of his material?

Feinler: Yes.

Weber: Right.

Feinler: I think some of the things we have are probably the only ones still in existence, so that's nice that some of this has gotten preserved. My friends always told me I never saw a piece of paper I didn't like, so I'm glad I saved it for the museum and posterity.

Weber: I am too. Good well thank you very much, really appreciate it.

Feinler: Well this has been fun.

Weber: Yeah it's been a pleasure.

END OF INTERVIEW