An Interview with

JOHN McCARTHY

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Conducted by William Aspray

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John McCarthy Interview
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Abstract

McCarthy begins this interview with a discussion of the initial establishment and development of time-sharing at the Massachusetts Institute of Technology and the role he played in it. He then describes his subsequent move to Stanford in 1962 and the beginnings of his work in artificial intelligence (AI) funded by the Advanced Research Projects Agency. This work developed in two general directions: logic-based AI (LISP) and robotics.

In the main section of the interview McCarthy discusses his view of the Defense Advanced Research Projects Agency's (DARPA) role in the support of AI research in the U.S. in general and at Stanford in particular. He specifically addresses the following issues: the relative importance of DARPA funding in comparison to other public and private sources, requirements and procedures undertaken to obtain DARPA funds, and changes over time in levels of support and requirements from DARPA. McCarthy concludes this interview with a brief description of the AI Laboratory at Stanford and his continued work on AI (funded by DARPA) with the Formal Reasoning Group.

JOHN McCARTHY INTERVIEW

DATE: 2 March 1989 INTERVIEWER: William Aspray

LOCATION: Palo Alto, CA

MCCARTHY: You know the history about Licklider having convinced the Air Force Scientific Board that they needed to do some research related to command and control. Then when DARPA was formed he advocated that it do it, and eventually they said, "Well, it will do it if you lead it." He had gotten from me some ideas about timesharing and maybe AI. I'm not sure, he may have had sources about AI independent of me when we were at BBN. When he wanted to set up a time-sharing project at MIT he wanted me to be the head of it, and was disappointed when I left MIT and went off to Stanford. At least somebody told me; I forget whether it was Licklider himself. He sort of forced the project on MIT. Now that doesn't correspond to what I heard at this 25th anniversary reunion of Project MAC. So it's possible that it was different from the way it was told to me. Basically, the way it was told to me is that Licklider virtually forced the project on MIT, whereas the way Fano told the story it was considerably more symmetrical. It's certainly true that Fano was not involved in timesharing before I left MIT, or even in computing for that matter.

ASPRAY: He will admit that; that's quite clear.

MCCARTHY: Now, the other fact relating to MIT and timesharing is the two-level committee. Do you know about the two-level committee?

ASPRAY: No, I don't.

MCCARTHY: Well, around 1960 MIT decided to do a study of its future computing requirements.

ASPRAY: Yes. I've seen some of the records of that.

MCCARTHY: Okay, and so they formed a two-level committee. The top level of the committee consisted of three full

professors -- Morse, Hill, and maybe Fano. Morse and Hill were not on speaking terms. So the top level committee may never have met. Then there was a lower level committee which was initially headed by Teager -- Herbert Teager. Then there was a sort of revolution in that committee and it became headed by me.

ASPRAY: If I remember correctly, didn't some report that came out of that committee get written by Doug Ross later on?

MCCARTHY: I don't think so. Maybe after I left, but there was a so-called majority report, which was only Teager. Then there was a minority report that was everybody else. Now, the way Teager got into it is that I had sent this memo to Morse about timesharing and he looked at that favorably. But he said, "Well, do you want to do timesharing or do you want to do artificial intelligence? There is this new assistant professor, Teager, who would be useful in that direction." So I said, "All right, let Teager do the timesharing. I'll do the artificial intelligence." Teager and I wrote a joint abstract, but then he [went on to do] engineering work. He connected the Flexowriters to the IBM 709. We'd already connected one to the 704, I think. He had a hard time separating grand plans from what was practical given the equipment that was available, so that he didn't [ever] get started on a timesharing system even though he was in charge of the project. Corbato did an interim timesharing system which became CTSS. Corbato did a demo of that before the Licklider era. The demo was done, of course, on the MIT Computation Center computer; and there was just no prospect of converting that computer to timesharing. So it wasn't until DARPA supplied a separate computer that they were really able to do it. Now I've come to the conclusion that there was one issue -- the major issue between Teager and the committee -- that if we had taken Teager's advice we would have done better than we did. But at the time I couldn't have predicted the squabble between MIT and IBM. Teager said we should get a STRETCH, and in my view that would have been a good idea considering what actually happened. My idea, and the rest of the committee's, was that we should send out a request for proposals for a computer that was suitable for the project. That got hung up in the MIT administration. IBM went to Stratton, the president of MIT, and said, "Why don't you hold up with this RFP? We might be able to meet your needs at little or no cost." Then time just went on, and IBM didn't do anything. Then they reacted back on me and said, "Why don't you do a new study about the demand for timesharing?" This was essentially a stall, and my reaction to it was that it was like doing a study among ditchdiggers to find out if there's a demand for steamshovels. So I left. I went to Stanford.

ASPRAY: Did you describe in that material you've given me the genesis of your ideas on timesharing at BBN?

MCCARTHY: Yes, I think so. Well, I'm not sure. I don't remember. I was promoting timesharing in general, and in particular was promoting the idea of an even larger computer for timesharing. The person who said that timesharing could be done on a small computer, namely a PDP1, was Ed Fredkin. I kept arguing with him. I said, "Well, you'd have to do that -- get an interrupt system." And he said, "We can do that. You'd have to get some kind of swapper." I said, "We can do that." He persuaded Ben Gurley, who was the chief engineer at Digital Equipment Corporation to do all of those things -- that is, to do what was necessary. Then Fredkin left BBN because he had some idea about World War III starting, and he was going to move off to the southern hemisphere -- he, and Roland Silver, and Victor Vyssotsky from Bell Labs were going to go. [The only one who] actually went to Brazil [was] Vyssotsky, who went for awhile. Then there was a sort of a coup in Brazil, and a left winger became president -- this guy Quadros. He was against foreign companies. So Fredkin founded Information International instead. In fact, Information International was the company that was supposed to move to Brazil. Well, the company still exists [and] is prosperous. I'm still on its Board of Directors, although Fredkin isn't connected with it anymore. So Fredkin got this idea and then he left. I was a one-day-a-week consultant. He had convinced me that it was indeed feasible. There was very little additional hardware design to do. I did a piece of architecture as to how it should address a memory larger than its normal 4k. But basically, Fredkin had done the work and then I supervised Sheldon Boilen in actually implementing that timesharing system. He was hired as a programmer and consultant, then left. So it was done. But BBN didn't use it after it was implemented basically [because] they had a small enough number of people, so the system of signing up for the whole machine was satisfactory. There was this sort of other timesharing system project done at MIT that essentially used the same hardware that Fredkin had designed. It used a slightly smaller configuration. That was the one that was done by Jack Dennis and a bunch of students. I don't know what the relative role of Dennis and the students was. But they had some more advanced ideas about the interaction with users, because they had software from TX-0. Now the TX-0, TX-2 ideology was opposed to timesharing. That is, it was: get a supercomputer for each individual. So TX-2 was designed to be run by one person. However, they did eventually have timesharing, I think. But there was quite a lot of opposition to timesharing in the MIT AI lab when they got their PDP 6. The people who were used to being able to sign up for the computer and have the whole thing at their fingertips were even threatening to destroy the machine if it were done. And they eventually did, designing what they called ITS, standing for "incompatible timesharing system" in contrast to CTSS, the "compatible time sharing system" done by

Corbato for the IBM 7090. So I went to Stanford in the fall of 1962 and DEC essentially gave me a PDP 1 -- a minimal configuration PDP 1. Then I applied to Licklider for a contract to do AI.

ASPRAY: This must have been soon after he arrived.

MCCARTHY: Probably fairly soon after he arrived. It was also probably fairly soon after I arrived at Stanford. At first, he was sort of mad at me and didn't want to do it. He said, "You know, we had been too close at BBN." I said, "Well, why don't you send the proposal out for outside review?" He didn't do that. He eventually gave me a small contract. Now, it rapidly became clear that that the PDP 1 computer was too small. I wanted a big computer.

ASPRAY: Yes. What was the money you got from Licklider to be used for?

MCCARTHY: People, I suppose.

ASPRAY: Yes. Did you hire graduate students?

MCCARTHY: Yes. We didn't have anyone, but graduate students and undergraduates at the time, I think. We may have possibly hired a programmer, I don't know. The most interesting AI thing that was done on that was probably Raj Reddy's original work on speech recognition. This was something that I proposed to him for his thesis topic. My only innovation was to say, "Look, all you need is a microphone, and an analog-to-digital computer, and a converter on the computer. You don't need any banks of filters and so forth." Unfortunately, after he went to CMU, he only went into banks of filter. He did a thesis quite rapidly. You can say that it was amazingly rapid for a hardware-based thesis at that time, or even for this time. Now, my ideas in AI were mainly theoretical. I always was expecting that they would immediately reach the level of where I would want a computer to implement them. But I'm a theorist to this very day.

ASPRAY: You have time yet.

MCCARTHY: Yes, right. Now, as far as the PDP-1 was concerned, Pat Suppes wanted to use it for computer-aided

instruction. He and I got a big grant from NSF, I think it was, to beef up that PDP-1 and put a timesharing system on it.

ASPRAY: This must have been at the very beginning of support from NSF in the computing area. It seemed to me they were pretty late in getting going in any major way.

MCCARTHY: No, that's not right. By the way, I have to say about my own understanding of these matters early that I was always lucky and was not ever required until much more recently, to become anything like an expert on funding. For example when I was a high school student I applied only to Cal Tech for admission. (laugh) And I only asked ARPA for money for the AI. But, I believe that NSF did support some of Teager's work on timesharing at MIT. I wrote a draft of a proposal, which would have been sent to NSF in Morse's name, and it would be very much worthwhile trying to get a hold of a copy of that proposal.

ASPRAY: I think I have seen a proposal in the MIT Archives, but I thought it was a request for hardware only, without description of a particular research program.

MCCARTHY: Well, it's conceivable that it eventually took that form. I believe I didn't apply for the large increase to get a PDP 6 computer until after Licklider was replaced by Ivan Sutherland.

ASPRAY: Was that intentional on your part?

MCCARTHY: I doubt it. As soon as the PDP 6 had been announced, I wanted one. I wanted a large memory. So I applied. But part of the reason for setting up a large project was to get a large computer. I felt that if one was going to do the things that I had hoped I would soon be ready to do, namely logic-based AI, then I would need a big memory for a big LISP system. My calculation is that the cost of the computer was approximately the cost of 30 man-years. Now, the other motivation for the project was to able to do robotics. Wanting to do robotics was partly a reaction to the 1950s notion of pattern recognition, which to tell you the truth is also a big hunk of the 1980s notion of pattern recognition; namely, regarding a pattern as being defined as some Boolean combination of elementary characteristics. So, my slogan was "Description, not mere discrimination." The example that I gave was, "Well, if

you want a robot to pick something up, it can't get by with just a yes-or-no answer as to what it is. To pick something up you needed a description of it in terms of how it was laid out, or how it was constructed, what its parts were, and so forth. That led me to thinking about robotics as a subject to do. One only recognizes the difficulties that one can immediately see, so my first proposal proposed that we would be assembling a Heathkit in a couple of years. At that time the Heathkit was something that involved point-to-point wiring and soldering, which of course is something that nobody's even done today. But I thought we would be able to buy suitable arms and use these remote-controlled arms for manipulating radioactive material. But I didn't realize that while enormously rapid progress in remote arms had been made during World War II, after the end of the war there was no further progress. So I would say your conjecture that there was no other source is probably correct, although, since I only asked one source I can't really testify to that. I always went to Washington as rarely as possible. It would have been to send away for the money, and get the money by mail order.

ASPRAY: Well, let's look at it a slightly different way. The community of researchers of related questions related to artificial intelligence was very small at that time -- you undoubtedly, personally knew all or most of these people.

MCCARTHY: Yes.

ASPRAY: Can you remember what their funding sources were? Can you think of anyone who had funding other than ARPA funding with the exception of this one case that you told me about with NSF?

MCCARTHY: Wait a minute. That NSF support wasn't for AI. Let me say another remark about NSF. NSF's idea about funding computers was that computers were for physicists and other physical scientists. So it had a program for funding computers really very early. But the basic idea was that you bought a computer and the physicists and the chemists and so forth used it. The idea of computer science was late and in its early days subordinate to the program that bought computers. So people that you ought to talk to about what NSF did are people like Perlis. The people in the east who were closer to the source from which all blessings flow would know more than I did. Are you talking to Newell and Simon yet?

ASPRAY: Not yet, but they're on the agenda.

MCCARTHY: They were certainly early ARPA contractors. Well, I can't think of anybody. The earliest outfit to be interested in AI that never got any ARPA funding was, I think, the University of Texas at Austin. The person that you should ask about that is Woody Bledsoe.

ASPRAY: Okay, and when would that have been would you guess?

MCCARTHY: Late 1960s. When Bledsoe moved to Texas. He had been running a small company out here, [and] he was already interested in automated theorem proving then. He can tell you... Oh yes, there was another source. It wasn't extemal support, but at Argonne automated theorem proving was done without ARPA money.

ASPRAY: Who were the principal investigators?

MCCARTHY: The sponsor was Bill Miller, who is now the president of SRI. He was head of the applied mathematics group at Argonne. The people he supported to work in AI included his summer visitors and [people] like that including J. Allen Robinson and Larry Wos. Now that I have to think about it, IBM was early in doing AI research. Of course that was out of their own money.

ASPRAY: Can you give me some idea of who this would be?

MCCARTHY: Okay. In the summer of 1955 I had a summer job at IBM (I was at Dartmouth at the time). I was hired by Nathaniel Rochester. Rochester hired me because IBM had given, or was about to [and] had committed itself to [give] this 704, do so to MIT and the New England universities on the basis that it would be located at MIT. MIT would get one shift. The New England universities would get a shift. And IBM would reserve a shift for itself. They went on a kind of "scouting trip" to the New England universities. I was who they found [for] a summer job. I guess I was the only one. So I worked in his information research department and turned Rochester on to AI. Then we had the Dartmouth summer research conference on artificial intelligence in 1956, which was supported by the Rockefeller Foundation. Maybe there is a memo there that says what they thought about why they gave us the money they did. I was the main organizer, but there were four or five official organizers. There was Rochester, Shannon, Minsky, and

me, and possibly Oliver Selfridge, though I think so... he didn't get involved until later. Selfridge was another supporter of AI at MIT Lincoln Lab, which would have had Air Force money. Now, neither IBM, nor Lincoln Lab, nor Argonne -- none of those gave any money outside of their own organizations. But they did conduct research. They did hire people both temporarily and permanently and did provide computer resources for this kind of thing.

ASPRAY: Was their support for their internal projects in any sense equivalent in size to the projects that ARPA started half a dozen years later? Are these really comparable?

MCCARTHY: No, I wouldn't say they're comparable in size. They tended to be two or three people projects, and without dedicated computers. IBM started off very well after the Dartmouth summer conference. At the Dartmouth summer conference Minsky made the proposal to do geometry as a domain, because there you could test your theorem proving with diagrams. I undertook to make that happen as a consultant. In September of 1956, IBM had hired a new Ph.D. in physics, Herb Gelernter, and he undertook to carry out this idea of Minsky's with me as a consultant. I proposed to them this FORTRAN list-processing language, that is, the idea that they make a list processing language. I'd learned about list processing from Newell and Simon. So they did it. They made major contributions of their own to the FORTRAN list processing language. This program was done in 1959. In 1959 there was a purge of artificial intelligence at IBM; everything was wiped out. Now, maybe you should talk to Rochester, and Samuel, and maybe even talk to one of the villains [to find out] exactly what happened. There's a Canadian at UBC, who is one of the major villains -- a philosopher. If I remember his name, I'll tell you.

TAPE 1/SIDE 2

MCCARTHY: He was a villain in that he thought AI could never work. But then there was something else. There was allegedly some PR aspect to turning it off. Namely, IBM thought that artificial intelligence was bad for IBM's image -- that machines that were as smart as people and so forth were bad for their image. This may have been associated with one of their other image slogans, which was "data processing, not computing". That is, they were trying to get computing into business, so they wanted it to look as familiar and unfrightening as possible. But anyway, IBM didn't officially do any AI between 1959 and 1983. That's when they revived it. So DARPA was the main supporter, all right. DARPA handled different things in different ways. They separated the MIT AI Lab and the

Laboratory for Computer Science (that is Project MAC).

ASPRAY: Yes, though for several years the grants were block grants for the two while there wasn't a separate AI lab. There was AI research going on that was still under the umbrella of the MAC grant.

MCCARTHY: Yes, that's true, but those two outfits didn't get along very well, because the MIT AI lab was full of hackers. There was also Minsky, who was not by any means a ? . And then, Project MAC was always run by executives, as it were, whose connection with the science was sometimes tenuous. I guess they got themselves to officially separate at some later point. Now, they handled CMU differently. They called CMU "a center of excellence in computer science".

ASPRAY: CMU.

MCCARTHY: Yes, right. So their AI work, or "complex information processing", as they called it at first, wasn't separated financially from their general computer science work. We were strictly AI -- that is, Stanford had no charter to do any research in timesharing, although we did have to build ourselves a timesharing system. We didn't have to write papers about it, which was too bad, because some of our innovations were lost.

ASPRAY: Yes. How widely was this money to be applied? For example, was programming language development associated with AI, covered under this work?

MCCARTHY: Basically, once we got the money they never criticized or attempted to influence what we did with it. The way they worked is that you submitted this rather detailed proposal. Then the statement of work was always a very short thing. It was actually associated with the contract. They never gave all the money asked for, of course. But they never said, "Well then, what shouldn't you do? What should you leave out?" So basically, I would say that we were not closely supervised. We did what we thought best. But I did very little of that. I don't think I did anything or supported anything that was not contained in our proposals. Of course, some things that weren't mentioned were auxiliary to the things, but I didn't consider it as a kind of general computer science thing.

ASPRAY: Do you still have your proposal?

MCCARTHY: Old proposals?

ASPRAY: Yes.

MCCARTHY: Yes. They still exist, although it would be a fairly substantial undertaking to find them. No, I guess the person to ask would be Betty Scott downstairs. She's been associated with the department for quite a long time. She might know where to find [them]. But DARPA also has their own proposals.

ASPRAY: They have some of them. They're not very good record keepers.

MCCARTHY: Oh, you mean they actually threw them in the wastebasket?

ASPRAY: Yes. They have a total of 56 cartons of records for 25 years of operation.

MCCARTHY: I see. Yes, I'm pretty sure Stanford has all those.

ASPRAY: I would assume that your office of research administration, or whatever it is called here, would also have copies of them.

MCCARTHY: Yes, in the sponsored projects office.

ASPRAY: Well, what can you then tell me about the continuing history of funding for your work? And were there changes? For example, it seems to me that in the early 1970s with the Mansfield Amendment and various attitudes about what kinds of scientific research that should be sponsored by the Defense Department there were changing relationships between ARPA and its contractors. Did you experience any of this?

MCCARTHY: Oh yes. About 1970 they got increasingly short range. "What are you going to do for us now? In

the next two years?" Furthermore, they abolished robotics, or at least they claimed to abolish robotics on the grounds that, "That's production and we want things that go bang." ARPA has gone through several cycles in terms of its willingness to support non-weapon activities of the Defense Department. If you were to look at the successive doctrines, what you would discover is that the actual work that they supported fluctuated much less than the doctrines fluctuated. The people who were supported were on the whole a pretty stable group, much more stable than the people who were supporting them, for example. So we certainly had a lot of trouble with that. But we had less trouble than outfits like SRI. In my opinion, the Shakey work and Strips and those things were a good start -- and then were clobbered. The person you should talk to about that is the person who experienced it, namely Nils Nilsson.

ASPRAY: We chatted briefly about it yesterday.

MCCARTHY: I think that he would confirm that they suffered more violent fluctuations than we did.

ASPRAY: Can you tell me in a bit more detail, though, about your own personal experience of this sort?

MCCARTHY: Not really. My memory of that kind of thing, of proposals and... was that I ignored it as much as possible. Every now and then they would chop something out of the proposal and give us less money. But then, what we actually did was within the limits of the money they gave us was more or less independent. We didn't even drop robotics actually. I don't know whether we got some other support for it, or... well, we got this multiple vehicle support. I've forgotten how it was rationalized. The person that you should talk to about that is Lester Ernest, because he was really in charge of putting together the proposals.

ASPRAY: Okay. I've been told by Bob Fano that he noticed a change in the early 1970s in the attitudes of the IPTO office regarding graduate education -- that in the early years there was a strong sense that one of the most important missions of IPTO was to train a new set of young people in the field and get them out there to produce. So, there was rather generous support for education. But that by the mid-1970s that had been lost, that there was a sense that these grants were supposed to support particular product development or research programs, and that if you incidentally train some graduate students that was fine. But there weren't going to be guarantees on long-term

support for graduate students. They weren't quite so generous in the number of people they were willing to support, and so on. Did you experience this at all?

MCCARTHY: I would say that I always hired graduate students for specific projects, and never really supported graduate students in general.

ASPRAY: Would it be a common pattern for someone after their first year or so here to go to work on one of these projects and have some expectation of working on it as a research assistant for the rest of the time that he or she was a graduate student?

MCCARTHY: Yes, provided what he did his thesis on was relevant to the project. I took a fairly broad view of that, but I never considered this as general support to the department in any sense. Now, the tradition at MIT was different. I remember in 1958 when Minsky and I proposed the MIT artificial intelligence project, we met Jerry Wiesner in the hall, and we said, "We want an artificial intelligence laboratory." He said, "Well, what do you want?" I said, "We want a room, and a keypunch, and two programmers." He said, "How about six graduate students? The Research Laboratory of Electronics has undertaken to support six mathematics graduate students, and we don't know what to do with them." Now, the Research Laboratory of Electronics was supported by a joint services contract, so this was before DARPA. It was very open ended, so they could do something like that. So they were going to support six graduate students. When DARPA came along I think both MIT and CMU pushed that kind of thing. But there was a difference between [that and] what happened at Stanford, namely, I was not much in contact with any higher levels at Stanford; or even very much in contact with the chairman of our own department. I just sort of announced the artificial intelligence laboratory, appointed myself director, and did it without much cooperation with the department. The one thing that I did is that when Don Knuth and Bob Floyd came, I supported them for the first year. Forsythe had evidentally thought that I would be able to give them continuing support. I made it clear that that wasn't something I thought I could do. I think that at that time, if somebody had thought to do so, the center of excellence idea for Stanford could also have been pushed. Maybe they would have gone for it. Or maybe they did try later. I think Feigenbaum tried at some point and didn't win; DARPA didn't do it.

ASPRAY: When you use the phrase "Center of Excellence" what features do you have in mind?

MCCARTHY: Well, I'm copying the phrase from CMU -- that is, that's what they called themselves. I think I heard the phrase, not from them, but from Feigenbaum, who had come to Stanford, who got his Ph.D. at CMU. Feigenbaum was always much more interested in administrative and financial matters than I, so he would remember that history a lot better than I.

ASPRAY: Because it's a phrase that Licklider used from the very early days at IPTO.

MCCARTHY: Oh, probably he initiated it. Or maybe the CMU people did.

ASPRAY: So when you went to establish your artificial intelligence laboratory, presumably you needed some laboratory space, some office space, and such. Did that money come from your DARPA contracts?

MCCARTHY: No, Stanford had a laboratory that they didn't know what to do with. It was five miles from here. What had happened was that General Telephone and Electronics wanted to have a West Coast lab. They bought this land, almost finished the lab when there was some kind of coup in the company, and it was decided that it would be better to have the lab in New Jersey. So they sold the land and gave the building, or vice versa, to Stanford. Stanford first put classified projects out there. But then, when we wanted space on campus they looked around and said, "Well, how about this?" because it was more space than we could possibly have gotten on campus. Stanford supports space, almost always, out of overhead. If it absolutely has to, it rents space and then charges it to the contract, but normally they have enough space. So there wasn't any financial allocation from Stanford for it. They scarcely maintained the building; the building eventually deteriorated to the point where it had to be torn down.

ASPRAY: Then what happened when you needed new space? They allocated space to you again?

MCCARTHY: What happened was that in 1979 this building [Margaret Jacks Hall] was renovated. That is, Stanford has to renovate all these old buildings because they are not safe in earthquakes. So the renovation of this building, which had been the physiology lab, was comp leted in 1979, and the idea was that the Computer Science Department was to move in and all of its activities were to move in from this other building. So we did move here in 1979. We got

gypped out of an amount of space, but we did move anyway. Then that building continued to be occupied by the Computer Music people until just about two years ago, when they finally got new space on campus. Then the building was torn down.

ASPRAY: Have there been any major new funders over the years for the AI laboratory?

MCCARTHY: Well, the AI laboratory, as an organization, I dropped in 1980, because I didn't want to be responsible for getting money for other people. I dropped its overhead structure. I laid off Earnest and the business manager. The sub-group people, who had headed sub-groups in it, all had stature where they could get their own financing, so they could be principal investigators and so forth.

ASPRAY: Those people went to a multiplicity of organizations for funding?

MCCARTHY: Well, Zohar Manna is a professor of computer science and has a variety of sources of funds. David Luckhan got research professor (research) in the EE department. Tom Binford has this robotics laboratory. Those are the main ones.

ASPRAY: And for your own private research?

MCCARTHY: Well, I have a group -- the so-called Formal Reasoning Group -- which has two or three research associates and a number of graduate students.

ASPRAY: Where are the funds from that...?

MCCARTHY: DARPA almost entirely; some NSF.

ASPRAY: Okay.

MCCARTHY: They've arrived, so they've always had their problems in deciding what proposals to fund, and then

severe problems in shoveling the money out the door once they decided to fund something. And every now and then they say, "Gee, you guys haven't submitted reports recently," and get after us. We submit the reports, but there's no evidence that they ever read them. They use these contracting agencies. We were best off when they used Defense Supply Services Washington, that normally buys things like pencils, I suppose, because they never asked us a question at all. When they started using SPAWAR, which is some Navy acronym for something... It doesn't stand for space war, but whatever it does stand for, I don't remember. It's something having to do with electronics. Once in awhile some new admiral would appear and they would say, "Well, what are these people doing, and is it a good idea?" But since the money wasn't coming from them anyway that never amounted to much. But boy, can they make bureaucratic difficulties. If you want a trip approved, they'll want to know all about that. The last two directors of IPTO have been the most troublesome.

ASPRAY: That is Amarel and Schwartz?

MCCARTHY: Yes.

END OF INTERVIEW