

An Interview with

JOHN HERRIOT

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Conducted by Pamela McCorduck

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Abstract

This interview is concerned principally with the early years of computing at Stanford University. Herriot begins by discussing his postgraduate education at Brown University in the 1940s and his work experiences prior to joining Stanford in 1946. In 1952 Herriot was appointed the first director of the Stanford Computation Center, using a Card Programmed Calculator and later an IBM 650. He discusses the formation and funding of the Computation Center and its integration with the rest of Stanford. Herriot also discusses the formation and development of the Stanford Computer Science Department, centering on the role of George Forsythe. Affiliations between Stanford and private industry are also mentioned.

JOHN HERRIOT INTERVIEW

DATE: 22 May 1979

INTERVIEWER: Pamela McCorduck

LOCATION: Stanford, California

McCORDUCK: This is a conversation with Professor John Herriot on 22 May 1979 at Stanford University.

I'd like to go way back to your graduate days at Brown University. What were you studying there?

HERRIOT: Mathematics, pure mathematics. That's what we did at Brown. Brown was a very pure Mathematics Department in those days.

McCORDUCK: And you were classmates with Sandra Forsythe and George Forsythe?

HERRIOT: Yes, George and I came to Brown in the same year and we left in the same year and Sandra came two years after that; she was there for the last two years that we were there.

McCORDUCK: And you were all students in mathematics together. And after Brown, what did you do?

HERRIOT: I spent one year at Yale University; I was an Instructor in Mathematics while one of the faculty was on leave. Then I came to Stanford in 1942. Except for a couple of years with Ames Research Center which at that time was called Ames Aeronautical Laboratory, the NACA in those days, now NASA, I worked on aeronautical research during the war for two years, then I came back to Stanford again in '46 and I've been here ever since.

McCORDUCK: Did you come here to the Mathematics Department?

HERRIOT: Yes, the Mathematics Department.

McCORDUCK: Were you doing pure mathematics when you came here?

HERRIOT: Yes. Of course, during the war, I was doing sort of applied research in theoretical aerodynamics then I came back to Stanford and continued in pure mathematical research. It wasn't until about 1952 or so that I got interested in computers and got more into the applied mathematics numerical analysis area which was just sort of getting started in interest with the advent of the high speed computers.

McCORDUCK: What piqued your interest?

HERRIOT: Well, I've always been interested in sort of practical problems, more or less practical, and more or less numerical problems and so it seemed a natural changes to move over from less practical to more practical problems.

McCORDUCK: But the computer was pretty exotic around 1952.

HERRIOT: Yes, I didn't know anything about computers in 1952 and then Professor Bowker who was head of the Applied Mathematics and Statistics Laboratory and Fred Terman who was Dean of Engineering at that time, decided that it was time Stanford got into the computer age and that we should have a computer which was to be jointly funded by these two organizations, and they asked me would I be interested in heading it up. I said OK, and then I started to learn about computers.

McCORDUCK: What was the computer that was first purchased?

HERRIOT: It was a computer that wasn't very well known to many people; it was called the Card Programmed Calculator or CPC. I guess you've heard about that by now, probably from other people.

McCORDUCK: Joe (Traub) worked on the CPC.

HERRIOT: Did Joe work on the CPC also? Where was that, Columbia?

McCORDUCK: Yes, it must have been.

HERRIOT: That was a real old machine. It was a strange machine; it was sort of built out of parts of things that weren't computing machines. It was built out of an accounting machine, the so-called 407 and in addition to that they had an electronic calculator which was a 605, I think they called that one. And then it had also a memory, an electro-mechanical memory which would store all of 16 words. There was one other part to it -- it had four parts and they were all hooked together by cables. There was the memory, the accounting machine which I guess that was used, there must also have been a card reader. I can't remember exactly whether or not. I think the cards were read by the accounting machine and printing was done by the accounting machine. And then there was the calculator, the 605, and then there was the memory. That was essentially it.

McCORDUCK: It really sounds primitive.

HERRIOT: Oh yes, but we did a lot of things. They were doing already that time one of the fellows in engineering was writing a thesis on some electronics aspects, I don't have any idea what the problems were, which were of interest to him. After he got his thesis he went to work for Hewlett Packard almost immediately or maybe he was already working for Hewlett Packard on some electrical engineering research which used up a lot of time on the CPC. I don't know what kind of problems they were. But then, of course, the first thing we had to do to be sure that we got some kind of a general purpose system so that we could have the calculations done and so that the elementary functions could be available like sines and cosines and so on and so forth. This was done instead of writing a program like we do

nowadays. This was done by wiring up a control panel. The computer had about 60 steps, I think it was, for each operation that you have, and so you could in one operation accomplish 60 individual electronic operations and these were controlled by a plugboard control panel. We always were wiring up these boards and putting them in the machine.

McCORDUCK: You actually did the wiring yourself?

HERRIOT: Oh, sure. Well, you know, it was very easy to do. You just had to plug wires into holes. It's not like getting out your solder gun or anything like that, it's just easy. They still use those control panels I think on some accounting machines. You've probably seen those, but maybe not. So that's the sort of thing that we did. And so we had that from '53 to '56 and in 1956 we got our next machine which was the IBM 650. That, of course, was a real computer. It had its drum memory of 2000 words and the electronic operations in it and it could read the cards and did it give output cards or was it printed? I forget how the output was handled. This was probably by card output and then the cards were printed on an accounting machine. I can't remember for sure. Do you remember?

McCORDUCK: I would guess it's as you describe.

HERRIOT: Anyway, that was our next machine.

McCORDUCK: Now, what were your responsibilities with CPC and the 650?

HERRIOT: Well, I was Director of the Computation Center at that time. When we started in 1953, we had a staff of three. There was myself and Alan Peterson who were co-directors and we had a secretary. That was it. Within a year or so we got in another couple of people such as graduate students to help us, and we gradually expanded the staff.

McCORDUCK: What kind of issues brought about conflict in those days?

HERRIOT: I don't know that there were any special issues of conflict. Everybody was trying to learn how to use these things and not everybody realized that they needed to learn yet and that was the first thing we had to do was sort of educate the faculty to convince them that people ought to be learning about computing. We gave various courses and lectures and invited the faculty to come and listen. Of course, as you might expect, the students took to the computers much faster than the faculty. We also gave lectures over at SLAC to, well I guess it wasn't SLAC in those days, they had a small linear accelerator in the high energy physics and they didn't really know that they needed a lot of computing in those days, and so we sort of did a little missionary work to try to indicate to them the sort of things that they ought to be using computers for an to indicate to them what computers could do and sort of direct their attention to the fact that they ought to be getting into computing. It wasn't too long before they became customers of the computing facility and then not too many years after that they got their own computing and of course by now, they have more computing power at SLAC than at any other one place in the University. However, of course, the University has so many places now where there are computers and computing, the Computer Science Department, The AI Lab, SUMEX, and many other places. But, SLAC, I think, still has the biggest thing in that they've got their triplex computer, so I guess our missionary work bore some fruit. They finally became convinced that they needed their computer.

McCORDUCK: I would think it's just very gratifying to see what you've accomplished as far as the missionary work is concerned.

HERRIOT: It took a while to bear fruit, but it kept on growing.

McCORDUCK: I'd like to get back to those early days, then come back to later times. One of the themes that one sees in the early papers is the constant problem of funding and where is the money going to come from. these machines were terribly expensive compared to what people were used to spending on paper and pencil. How did you go about convincing whatever funding sources there were that they ought to put money into computing?

HERRIOT: Well, the first decision was made by Bowker and Terman and they each said, "Our laboratories need some computing power. Ok, we'll guarantee \$25,000 a year for the expenses of each computer." So that was \$50,000 each as a budget right there for the computer power and then they would use this computing power and I suppose this charge, that is they were charged for the time against various research grants and contracts and since they guaranteed \$25,000, if their charges didn't come up to that, they'd pay the remainder, but that was the guaranteed funding. And then, I guess about 1955 or '56 we were applying to the National Science Foundation and we were successful in getting a small grant from them to assist us in financing the operation of the computing center.

McCORDUCK: Now apparently there was also some commercial sales of computer time to a bank in San Jose.

HERRIOT: Oh, that was arranged somewhat later. That was when we decided to get the Burroughs machine. That was the Burroughs 220 that we got and that came along, I don't remember if it was 1958 or '59, but somewhere in that neighborhood, and there was a deal made there whereby we would sell about half of our time to the, I guess it was the First National Bank of San Jose, now called something else, Bank of the West or something like that. Anyway, they were just getting their feet wet for their first time in computing for their banking business and so they bought a certain amount of the time of this computer which was at that time housed over in Encina Hall which was removed from the Electronics Laboratory over there in Encina Hall and as you say, we arranged to sell about half the time to them. They used to use it at night a good deal and we used it at daytime. So yes, that was a good way that we were able to stretch our meager dollars.

McCORDUCK: Well, as Chancellor Bowker pointed out yesterday, that just simply couldn't be done today because everyone would jump on you for taxes and such things.

HERRIOT: I daresay that is true and I'm sure Al Bowker says that, he knows all too well that it stems from his

experiences from CCNY and the University of California at Berkeley. Al has always been very close to this sort of thing, very knowledgeable and very shrewd about how to deal with things. I guess he was -- was he still here when we did this? I suppose he was.

McCORDUCK: Oh, he was here until 1963.

HERRIOT: Is that when he went to CCNY? I couldn't have given you the date. It was just about the time when we moved into Polya Hall, and about that time, I guess we moved from the Burroughs 220 to the IBM 7094. By this time I had given up the directorship of the computation center and Forsythe was the Director of the Computation Center from 1961. I was Director for the first eight years and he was Director for a few years and then Feigenbaum was Director. You've probably got all these dates figured out from various people you've talked to.

McCORDUCK: Well, as a matter of fact, I really should sit down and do myself a little chronology because I haven't done that and I have a very vague notion of when characters come on stage.

HERRIOT: Well, that was my period, '53 to '61, and then Forsythe took over and I was still associated with it and I wasn't directly in charge, then I can't remember the year, Feigenbaum took over.

McCORDUCK: It was probably about '64.

HERRIOT: No, it couldn't have been that year because Feigenbaum came to the University, was it January 1st, 1965 or was it September '64?

McCORDUCK: He came in September '64 and in '65 the department was formally formed.

HERRIOT: Yes, and that's also when Bill Miller came, was in 1965. On January 1st, 1965 he actually came on board at exactly the same time as the department. As you may know, Bill came partly in the department and partly to run the computation at SLAC. You're talking to Bill this afternoon? Oh, he also talking at the colloquium this afternoon at 4:15 so provided you see him earlier you'll be alright. I'm glad you've got Bill lined up too because he's been here since 1965 when he came from Argonne to join us.

McCORDUCK: Well, again, let's go back a little way. In about 1957 the University administration in the persons of Terman and Bowker commissioned a study from Louis Fein. Do you remember the Fein study? What was your reaction to this? You were a Professor of Mathematics then.

HERRIOT: I don't think that most of us in the University received Fein's recommendations very favorably. I think we were a little bit negative with what he came up with. I don't know if you got this impression from Bowker or not. Did he have any opinion?

McCORDUCK: He said that he took it into consideration. He was consulting lots of people and Fein's study was just one study. but in any case, it is the only piece of writing that exists on the topic.

HERRIOT: Well, I don't think it was a very good report actually.

McCORDUCK: Do you remember what your objections were at the time?

HERRIOT: No, I have no recollection. I just simply do not remember any details as to what it was he suggested that we didn't think were very good.

McCORDUCK: If I can give you a summary, it really is a summary, he was suggesting a grand plan where there would

be a graduate school of computer sciences and under that there would be several departments, systems of information, and so on and that kind of thing. He really was thinking in big terms by '57. I was rather surprised and I continue to be surprised that as many people as there were willing to say yes, this is a legitimate discipline, it isn't just a service that this machine performs for other people in the course of their academic work, but that in fact it is both. To me that seems like a rather big leap.. Can you remember when the idea of computer science as a discipline began forming in your mind?

HERRIOT: Well, it wasn't that soon. It hadn't yet formed in our minds. In fact, George Forsythe came to Stanford only in 1957, so this report must have come out very close to the time when we brought Forsythe here. Of course, he was one of the big pushers to get computing more and more into the curriculum and to recognize that it was in fact a discipline. I think that the fact that nationally as well as at this University, computer science came to be recognized as an area of study that was of importance in itself, was due to the efforts and the vision of George Forsythe more than any other person, more than any other single person and I mean that nationally as well as here at Stanford. I think that George was one of the big pushers, one of the big influences in the fact that computer science came of age, that it came to be recognized as a discipline.

McCORDUCK: What were the kinds of things that he did?

HERRIOT: Well, he gave talks. He talked to the administration and he convinced them about things that should be going on. But I suppose that more than anything, giving talks at various meetings and just talking to people, making the ideas become familiar to everybody. I suppose, I just don't really remember. It's not the sort of thing that I would have been good at. George was very good at his mission, explaining things to people and he had a lot of energy. We owe a lot to George.

McCORDUCK: Yes, I certainly get that impression. Were you one of the people who needed to be convinced? You said that this wasn't quite formed in your mind, say in the late '50s that this should be a discipline.

HERRIOT: No, I didn't have to be convinced. I guess it hadn't occurred to me yet. I was already teaching courses in the area, I think as early as 1955 I gave the first course in computing at the University in the Mathematics Department of course. It was concerned with teaching them how to use the CPC, I think we already were giving a course with the CPC. We had some kind of a system of programming which was like assembly language programming in those days. We hadn't yet the language of Fortran or any of the high level languages and so it had to be similar to an assembly language. We may have had a three address system instead of a single address system as most assembly languages are. We had a three address system and so one could have operand A, operation, operand B gives a result C. So that we had a little bit more sophisticated setup. That was a kind of system we had on the CPC. So I gave the first course in about 1955 using this system so that people could get the idea of how to use the computer. In the next year or two as Al Perlis from Carnegie-Mellon came up with his system -- he had a language which made it possible to put Fortran, essentially, on the 650. Fortran had been devised about 1956 and was available on the large IBM machines, but not on the small IBM machines. And so there was a sort of a miniature version of Fortran called Fortranit which was put forth by Al Perlis which made it possible to transform Fortran programs into something he called "It" programs which could then be run on the 650, and we were using this in about 1957. Just as soon as it became available from Al and we had our 650 going in 1956. So we were moved immediately into this area of using a higher level language such as it was in those days.

McCORDUCK: But that was very early.

HERRIOT: Yes, quite early. Of course we were also teaching numerical analysis in the Mathematics Department. When I started in 1953, numerical analysis was something that was given maybe one quarter every other year, or something like that. Gradually we worked it up to two quarters every year so that the interest in numerical analysis grew with the advent of the computers, naturally. So we got that going and then the focus in computers was at the Masters level quite a bit too because in those days everybody in the Mathematics Department who wanted a Masters Degree had to write their Masters Thesis which was usually an expository paper, study an area, and write a paper on it. The first

thing we did, we saw that in the computing area it wasn't appropriate to have an expository paper. What you needed to do in the computing area was to solve a problem on the computer, write a program, and describe it, so it became an expository paper to a certain extent but it wasn't quite the same as for the Masters Thesis. We got it set up in such a way that people who wanted to take a Masters Degree in Mathematics specializing in scientific computations as we called it, instead of writing the ordinary kind of Masters Thesis that was written by other Masters people, they did a computer laboratory problem; they solved a problem and wrote a report. that, of course, is where Computer Laboratory, which we still have on our curriculum, evolved. That was one of the requirements for the Masters Degree in Mathematics with the sub-designation of Mathematical Computation.

Along about 1958 we had quite a lot of Masters Degrees in Mathematics coming up with that kind of requirement satisfied, who took all the courses in Mathematics with as many as possible in the numerical area and then they did a laboratory problem on the computer.

McCORDUCK: Now you've spoken of numerical analysis quite a bit here. It sounds as if the first time there was any real parting of the ways between the computer science division of mathematics and the rest of mathematics was when George Forsythe wanted to hire somebody who perhaps was not known for his mathematics, but was known for his computer science. Do you remember the occasion?

HERRIOT: Yes, that was the idea of getting -- it was about 1961 when the computer science division of the Mathematics Department became autonomous in the sense that it had the power to hire its own people instead of having to pass them through the Mathematics Department's approval system and therefore evaluate the people based on their mathematics, pure mathematicians, or whatever it was that Mathematics was looking for. They had the right to make appointments based on their expertise in the computing area.

McCORDUCK: Who engineered this, if I can use such a word?

HERRIOT: Forsythe did. He was able to convince the Mathematics people that this was the way it should be done and we got this power. So, in about '61 we became an autonomous division.

McCORDUCK: That's very unusual. I can't think of many divisions, or any divisions, that have that kind of autonomy. Usually it's the Department is all powerful.

HERRIOT: Well, we managed it anyway. And you know, of course, who the first person we hired was. John McCarthy. John had been a member of the Mathematics Department at Stanford prior to that, did you know that? So it was sort of a homecoming for John in some sense. He came back with an entirely different emphasis in his work and of course he's still going very strong. he is a very innovative person, but he was more in the numerical area. You've already talked to him so you know where he came on board as an acting Assistant Professor then became an Assistant Professor.

McCORDUCK: So that means there were four of you in the division.

HERRIOT: Well then, we also had Niklaus Wirth pretty soon after that; about 1963, I guess, Wirth must have joined us. There were some other people. Joyce Friedman -- I can't remember exactly what year she came. Joe visited us in about 1967.

Well, especially in the numerical analysis area, we always have a lot of visitors, especially in the summer time. That's one of the things we worry about in this building -- that we don't have enough room for visitors. But, nevertheless, we'll find room somehow. People like to come here and we like to have them; it has always been beneficial. So that's essentially, I guess, how we developed, as I said, developing the Masters area with the scientific computation Masters Degree and more and more courses in numerical analysis.

Forsythe and I were both able to give courses in advanced numerical analysis and this was sort of the beginning of courses in computer science. I mean we had, of course, the courses in introduction to computing and programming languages which were going on the fortransit, the higher level language right away there. Then we got into Algol 58 which you remember was devised by a committee in 1958 and then it became Algol 60. And we had Burroughs Algol, you see, on the Burroughs machine. so we were immediately teaching Burroughs Algol; we were already teaching that language. Then there was a Stanford University Algol, sub-Algol or something. As thing evolved over the years, we would change our programming languages to fit the current thing, always moving in the direction of having a higher level language. It was Burroughs Algol and then of course we got the Burroughs B5500, so it was definitely the Burroughs Algol that we were teaching for some time before we moved into Algol-W by Professor Wirth and then briefly SAIL, and now Pascal.

McCORDUCK: Also by Professor Wirth?

HERRIOT: Yes. so Wirth was her for, I forget whether it was three years or six years, but anyway, he was here for several years before he went back to Zurich.

McCORDUCK: Do you remember the actual formation of the Department? what precipitated the move from Division to Department status?

HERRIOT: Well, we'd been working on this for some time to try to get the authorization to have the Ph.D. program. We already had guided the Ph.D. theses of several people for the Mathematics Department. They had written their theses in the numerical analysis area but they were Mathematics Ph.D.s which meant they took the Mathematics qualifying exams and all that sort of thing, and we wanted to have more courses in the other areas of computing. We were building these up, of course, even as a division of Mathematics Department. We had a certain number of courses

with McCarthy's courses coming in and Wirth's courses that were going on. We were already giving courses in assembly language even as early as 1958 or '59 in the Mathematics Department. We had visitors such as Van Zoren was here and he was giving a course in numerical compilers already in the early '60s. And this was, of course, in the Mathematics Department. so, we were building up a body of courses in the computer science area outside of the mathematics and outside of the numerical analysis and we were seeing, of course, that as people were going to specialized in these areas, they had to get a broader background and so of course then we had to start devising comprehensive qualifying examinations to get these people sufficiently broad that they should be considered as computer science Ph.D.'s. We didn't have the right to give Ph.D.'s in computer science until the department became actually formed in 1965. Prior to that they got degrees in Mathematics.

McCORDUCK: Yes, I was surprised at the number of people I know that I associate with in the Computer Science Department who actually got their degrees in Mathematics. Cleve Moler comes immediately to mind.

HERRIOT: Yes, well he was very much mathematics in those days. I can't think who else there was, but there was Eldon Hansen, but he was and still is much in numerical analysis and not very much computing. Cleve Moler has definitely gone over into other areas of computing beyond just numerical analysis. He's quite bright and quite broad in his knowledge. So, that's the way it went all right.

McCORDUCK: Now by this time George Forsythe was both head of the division, about to be head of the department and head of the computation center. What do you suppose made him decide to give up one of those hats, the computation center?

HERRIOT: Oh, I think that aside from the fact that it was probably too much work for him, I think he felt that the service computing as represented by the computation center should be definitely separated from the academic program and it would be best if the academic program which was run by the Computer Science Department if it would be better

not to have the service computing under the thumb of just the computing department. It should be more widely used and more widely controlled.

McCORDUCK: You've just touched on a very interesting theme that runs through George Forsythe's papers and that is, what the proper relationship of the computation center is to a Computer Science Department.

HERRIOT: Yes, I guess he wrote some papers about that but I couldn't quote him.

McCORDUCK: It was an evolving thing, I think, that at first nobody saw that there was really any difference. Computer science people were the only people who knew how to use this beast, so...

HERRIOT: So naturally, it was under their thumb. But I think he saw and I guess that's what you're saying, that more and more people came to rely on the computer and it should be outside of the Computer Science Department, and it should be a separate organization that provides the services for these people.

McCORDUCK: To your knowledge, was there pressure elsewhere in the University for this separation?

HERRIOT: Not that I know of. There might have been, but I didn't know about it.

McCORDUCK: I was just wondering if there were departments that felt that computer science was essentially building the computation center for its own fun delectation.

HERRIOT: Oh, it's possible that there were, but I don't know the politics behind that. I don't know whether Sandra was able to throw any light on that. Did you say you have seen Sandra?

McCORDUCK: I did, yes.

HERRIOT: I don't know if Sandra was able to throw any light on it or not, or did you ask her?

McCORDUCK: No, as a matter of fact, she was not able to and most of our conversation was about George personally.

HERRIOT: Bowker probably didn't mention that either, did he?

McCORDUCK: In a very limited way.

HERRIOT: He was gone, of course, by then.

McCORDUCK: He was gone and I think so many things have happened to him since he'd left that his recollections of what went on at Stanford have been altered.

HERRIOT: Did you have any chance to talk to Professor Fred Terman?

McCORDUCK: No, as a matter of fact, I haven't. Do you think I should?

HERRIOT: Oh yes, I think it would be worthwhile because he was Provost during that period, of course, too, as well as...after he was Dean of Engineering. I think Al Bowker took more major roles than Terman did in the computation center and the development of it, but Terman was always there and Terman understood these things; Terman always understands everything. He's such a wonderful person, such a clever person in knowing how to operate things and how to do things.

McCORDUCK: He's still around Stanford?

HERRIOT: Yes, he's still around. He's Provost Emeritus; he's about 78 or 79, I think now.

McCORDUCK: I think he had retire by the time I was here.

HERRIOT: Yes, I can't remember when he ceased being Provost, but about '65, I think. Lyman was Provost for a while and he became President, then Miller was Provost. Terman was certainly...he would be a good person to talk to. I wouldn't imagine that you'd have a very long conversation, but he would fill in maybe a few details that neither I nor Bowker remember.

McCORDUCK: Thank you, I will get in touch with him. I have one sort of metaquesiton and it's very hard to answer so I will understand if you throw up your hands, but the question is this: at what point was it clear to you that Stanford would have not just a good Computer Science Department, but a great one?

HERRIOT: I don't really know when that realization came. I mean we just simply were doing the best we knew how and the fact that it evolved that way, I guess, was attributed to George Forsythe and his insistence on always choosing very good people, possibly the best people available. That, of course, is what happened when he got people like Knuth and Floyd and other people. Feigenbaum came along and McCarthy, of course, was a top-notch person and still is. All of these people were very good people, not all the same, but contributed different strengths to the Department and I suppose it was simply the sum of all these people interacting together that made the Department become what people seem to think is a great Department. We are sitting here; I can only be a little modest, I think.

McCORDUCK: Yes, I think it is universally acknowledged.

HERRIOT: Well, anyway, the reason then, of course, is our students have a good deal to do with it too. We've been trying to select our students carefully and they're the ones who've gone out and provided us with the reputation, I suppose, as much as anything.

McCORDUCK: But certainly your faculty is stellar.

HERRIOT: But that's because of our insistence on getting the best people we could. I think that's probably the most important thing. That's something that Terman always emphasized as Provost, that one should get the best people; what he called steeples of excellence. You've probably heard this term. That one person who is up here is better than two people that are down here. Always get the best, and I guess that is what we did.

McCORDUCK: But you also did it not only depth, but breadth. It seems to me that you were able as a lot of departments aren't able to do (I'm talking about the collective "you" there), you were able to agree that it is worthwhile to cover a spectrum of fields and you didn't just build in one department and have, say, a marvelous group of theoreticians, but nobody else, or a marvelous group of hardware engineers but nobody else. You really did pick and fill out.

HERRIOT: Yes, but we still didn't fill out every area. We felt that we couldn't cover every area. For example, we practically have nothing in information retrieval.

McCORDUCK: What made you decide for one area and against another?

HERRIOT: I don't think we did that consciously. I think that it was more a question of who we saw in the way of a strong person in a particular area that we thought we might like to have and we didn't go out and say, "Look, we've got to cover information retrieval and find the best person we can even though he isn't up to the standard of the other people." We didn't do that. We didn't say that we had to cover every area. We're still a little weak in systems. We'd like to be

able to cover systems a little bit better. We always are looking for people in systems and every time we find somebody, somebody else hires them, or something like that. We end up feeling that we're somewhat weaker in systems. So, we cover a lot of the areas fairly well. I wouldn't say that we are able to be uniformly good in every area, nor did we consciously decide to either go always up in one area and forget about the other areas. I don't think we did that, but whatever area we wanted to be in, we wanted to be strong in that area.

McCORDUCK: Do you think this was the influence of Terman?

HERRIOT: I suppose to a certain extent, although I'm not sure that he had too much influence on power decisions, because I don't think we asked him or he didn't tell us what we could have or anything like that. It wasn't that. I suppose his example and direction would influence us in thinking this way.

McCORDUCK: Was it also a function of George Forsythe's predilections?

HERRIOT: Yes, his feeling for the need for excellence is there and as everybody has probably told you too, he's a very human person too, so it was very good to have a man who thought about people. I suppose you've probably read those articles that were published about him. Feigenbaum gave some words at his memorial service. Feigenbaum had a very good...

McCORDUCK: What I have seen is...

HERRIOT: I remember that still. Then there was an article in the ACM Communications -- have you got that? -- which I wrote and Knuth wrote something too. You've got those?

HERRIOT: So, I don't know whether I've answered your question.

McCORDUCK: Yes, and I realize what difficult question it is to answer without sounding either bombastic or ridiculously immodest.

HERRIOT: Well, I hope I came in there somewhere in between.

McCORDUCK: Yes, and thank you. One final question and that is: Looking back on the building of the Stanford Computer Science Department, if you had anything to do differently, would you have done it? If you had the chance to do things differently, is there anything you would have done?

HERRIOT: Well, I suppose the only thing we would have done differently would be if we had had more money, we would have been able to hire people as full time teachers and let their research go along as it would, rather than having to always be looking for research support for these people. It would have made life a lot easier if we had had more money, but perhaps even if we had had more money available we would have simply stretched it further and had an even better department. Perhaps we would still have worked on the basis of "get the most you can for your money and use all your resources such as research support to build the best department you can and don't rely on the University; use just their money for academic teaching." So, I suppose I would have liked to see stronger funding from the University, but that's not something we could have done differently. Forsythe worked as hard as he could to get as much as he could and to convince them that it was in their interests to help us, but aside from that, I can't second-guess Forsythe or second-guess the rest of us and say that we should have done something else different or better. I don't know of any opportunities that we possibly missed. Of course, we obviously didn't always get the people we had hoped to get because they would go to some other place or something like that, but we were pretty successful in getting people we really wanted. So, it sounds a little too smug to say we did everything right and therefore there is nothing I would have wished we could do better. that I don't really want to say, but I do say that it is difficult for me to suggest what we could have done better. Perhaps someone else could; someone from outside might have been able to look at it and say what

we should have done, but it's hard for me to do so.

McCORDUCK: Does the Computer Science Department have much of an active relationship with Silicon Valley?

HERRIOT: Not too much with Silicon Valley. We refer more to the hardware and the building of computers around here. No, I wouldn't say we do. Well, I guess the Electrical Engineering Department, the people in the hardware area, the systems area perhaps, have more acquaintance with those people. People like McCluskey and Hennessey and those people over there. The people in our area have quite a close connection with the people at Xerox-PARC (Palo Alto Research Center, Xerox). There are quite a lot of people there and some of our people consult over there. So if you call that part of Silicon Valley, yes we do have a very close association with those people. But beyond that I don't know how much there is.

McCORDUCK: OK, fine. Is there any question I neglected to ask you that I should have asked you that you can think of?

HERRIOT: No, I guess not. I think we've covered things pretty well. With what you have from other people you must have a pretty good idea of how things evolved here.

McCORDUCK: By now I'm just beginning to see a fairly complete mosaic. There are a couple of things that are not quite clear yet. It's something I began our talk with, it just isn't clear to me how people managed to go out and convince so many other people that they should spend huge amounts of money to get a new discipline underway.

HERRIOT: Well, they didn't really spend huge amounts of money, they did it on a shoestring. That's exactly what I said a few minutes ago, namely, that we got half-time support for faculty and had to find the other half from some other source such as grants, contracts, also some money from the Computation Center have supported my salary for a long

time as we were giving part of our time to the Computation Center. So that of course came from grants and contracts from all over the University since they were customers of the Computation Center. So the University put a very minimum amount of money into the Computer Science Department to build us up. I think when we had 15 people, we had about 6 full time equivalent positions, or something like that. So, convincing the Dean at all times that we needed more money was one of Forsythe's big things. It was a hard job.

McCORDUCK: Apparently very discouraging. At one time he actually wrote a little note to himself saying he thought he ought to resign as head of the Computation Center -- he'd had enough, enough opposition, enough...

HERRIOT: Head of the Computation Center, or Computer Science Department?

McCORDUCK: No, head of the Computation Center. This was when he was trying to raise money for more computing.

HERRIOT: So, that's the only answer I know to that question.

McCORDUCK: Well, Al Bowker said he thought it couldn't be done today, that with the shortages of funds and the stringencies that Universities are going through, there simply would not be enough surplus to start up an enterprise like a computation center or computer science department assuming another such thing came along.

HERRIOT: You mean we're the last new department in the University?

McCORDUCK: In a sense, that's what he was saying, and he was saying it regretfully.

HERRIOT: Well, of course, you have to realize that the '60s were a heady time in the universities. Universities all over

the country expanded very much. There was a big demand. There were a lot of students. There was a big demand in research; money was plentiful. Perhaps it's just as plentiful today but costs are so much higher so it doesn't go as far. But in the '50s when Wally Sterling came here and started building up the University, it was a good time and the '60s was a good time for everybody. It seemed like universities as a whole grew very much in those times and then in the '70s things became more stringent and now things are quite stringent. With our tax philosophy that people seem to be espousing and cutting their taxes and never mind if their services are cut, they don't care, this is a discouraging time. As Al can see it as Chancellor of Berkeley, very heavily dependent upon state money, I can see his discouragement. It must be real. One can see that he just couldn't start a new enterprise, a new discipline, even if something new and important came on the scene.

McCORDUCK: That's a kind of melancholy, isn't it. Well, fine. Thank you very much.

HERRIOT: It was a pleasure to talk to you.

McCORDUCK: This has been a conversation with Professor John Herriot on 22 May 1979 at Stanford University.

END OF INTERVIEW