

A Conversation with James Aagaard, Spring 2000

By Vincent McCoy

In the spring of 2000 I conducted an interview with Jim Aagaard for a library staff profile. I made an audio tape of that conversation and transcribed the tape fully. Our conversation centered on Jim's career at Northwestern and contains a lot of information about the history of computing at Northwestern, and of course, NOTIS, the library management system developed by Jim and Velma Veneziano that was later marketed to libraries world-wide by NOTIS Systems, Inc. Upon Jim's retirement from Northwestern University we present the complete transcript of that interview for the very first time.

Begin transcript of interview with Professor Emeritus James S. Aagaard interviewed by Vincent McCoy, Spring 2000

Vince: What year did you graduate from NU?

Jim: BS in 1953, Masters in 1955, Ph.D. in 1957.

Vince. So you went straight through then?

Jim: Yes. I was lucky in that I had a fellowship so that I didn't have to support myself with a teaching assistantship.

Vince: Did you work as an undergrad?

Jim: No, but I was a co-op student so it took me five years to get my BS.

Vince: What does co-op mean?

Jim: Co-op meant at that time, that sometime during the sophomore year the class was divided into two parts and we alternated spending one quarter in industry and one quarter in school. It ended up being 6 quarters in industry including summers. The division of the class in half didn't work that well because students didn't want to be in school during the summers. But I went during the summer.

Vince: Was this like an internship?

Jim: Sort of.

Vince: Where did you go?

Jim: I went to Shure Bros., Inc. They made microphones and phonograph pickups. At that time they were located on Chicago Avenue downtown by the L tracks. I commuted on the L.

Vince: How did that relate to what you were studying in school?

Jim: I started out in what they called the test department that was kind of quality control. One of the projects I remember was building a little jig to test the magnetic characteristics of the laminations that go into transformers. They had little transformers inside of microphones. I think I maybe spent three quarters there and the last three quarters in the development department.

Vince; This was really electronic kind of work.

Jim: Yes. There weren't any computers back then.

Vince: So that's what electrical engineers were doing back then.

Jim: Yes. Or you could be in the power business. I had good friends who co-oped at Motorola and worked on two-way radios and things like that. I know some people who spent time at the Tennessee Valley Authority. Prior to electronics there was power. I was more interested in electronics.

Vince: Was the department just called EE at that time?

Jim: Yes.

Vince: Did you get a Ph.D. because you intended to teach?

Jim: No. I didn't really intend to. I had a fellowship so I didn't have to teach to pay my way through graduate school. But I wasn't quite finished by the fall of 1957 so they assigned me a course or two to teach. I kind of enjoyed it and when I had the opportunity to join the faculty I did. There was and probably still is a sort of a prejudice against keeping your own graduates on as faculty members.

Vince: What were you teaching when you first started?

Jim: Electronic courses, basic electronics, eventually graduate level electronics. I taught for quite a few years the basic electronics courses.

Vince: When did you start getting into programming and learning computer languages?

Jim: My interest was electronics and communications in particular. I spent a summer in 1962 with the Motorola military electronics division in Chicago. I spent a summer in 1958 in the state area engineering department of Illinois Bell. An opportunity came along; the Air Force was soliciting bids on a contract which was called telemetry. Telemetry is the way that data measurements are transmitted between airplanes and the ground. That seemed very appropriate to my interests. There was a research group in the EE department called Aerial Measurements Laboratory which was an outgrowth of the Second World War. They were very much involved in analog computers. They wanted to bid on this contract and they asked me if I'd like to join in, and I did. It turned out that what the Air Force really wanted was not technical developments in telemetry; they wanted someone to provide a quick reaction capability. If they had a technical question they wanted someone who would quickly look up the answer or tell them where to find it. Well this was information retrieval and we decided here was a place we could use computers. By that time the University was on its second computer, the first one was an IBM 650 which was in the basement of Dearborn Observatory. The next step up was an IBM 709, which was really the last of the vacuum tube computers. It had been superseded by something called the 7090 that was the first IBM transistorized computer. And I think the University probably got a 709 that was bumped out of Boeing or something like that for one of the newer models. That was installed in the basement of Tech in the electrical engineering area in what was called the high voltage laboratory. So anyway we did have a computer and we figured out how to use it. We located some information retrieval software, basically punched bibliographic information onto cards and feed it into the machine and sorted it and produced lists in various orders. I modified the software because it wouldn't run under the operating system we had on the IBM 709. So that was how I got into software.

Vince: Was this one of those computers that filled the whole room?

Jim: Yes, 40 tons of air conditioning; there were four or five air conditioning units sitting out in the moat up at Tech. It was all vacuum tubes and towards the end of its lifetime it was sometimes hard to keep it running for more than an hour. One of the tubes would go out.

Vince: You had to keep a supply of tubes around that you could replace yourself?

Jim: No, there was a full-time IBM engineer there just to keep it running. And towards the end of that project was when Vogelback was built, Jim Van Ness, a professor of EE, was acting as director of the computing center. He was responsible for building Vogelback and getting a new machine installed. They were not going to move the 709 to the new building. He thought I might be interested as serving as supervisor of systems for Vogelback.

Vince: Was he right?

Jim: Yes, of course I was still teaching. These things were just part time; the Air Force contract was just research. I spent January 1965 to June 1968 at Vogelback. The machine we got was a Control Data machine. Argonne Lab had a lot of good experience with a CDC 3600 machine which was produced as a direct competitor to the IBM 7090 machine and there were a number of our faculty who were working at Argonne and liked the machine so there was a lot of push for NU to go in that direction, but we couldn't afford that machine. Control Data offered us a 3400 which was newer and just developed and kind of a cut down version of the 3600. We made the mistaken assumption it would be able to run all of the 3600 software but it turned out it was a completely different architecture. We got serial number 3. The operating system wasn't really finished yet. So I had a lot of work to do. We kept the 709 going for much longer than we intended because the new machine was not doing everything we needed it to do. I left Vogelback when they started looking for a replacement for the 3400. I'd had my fill with Control Data and when they decided to stay with CDC for a new machine I thought I'd go back to doing something else.

Vince: You had an office in Vogelback and an office in Tech?

Jim: Yes.

Vince: So it was similar to what happened when you came to the Library.

Jim: Yes, by that time Ben Mittman was the director at Vogelback. He had been approached by John McGowan who was under a direction to try to do something about automation in the new library building, which opened in two years. He asked me if I might be interested in working on that. At about the same time he had received an employment inquiry from Velma Veneziano who was working at the Chicago Board of Education. Both of us got referred to John McGowan and that is how things got started.

Vince: What kind of language were you writing in on these early machines?

Jim: On the 709 and 3400 most of the work was done in FORTRAN. The information retrieval program was written in Assembler.

Vince: So FORTRAN was your first language?

Jim: Yeah I guess so. Actually I did a little FORTRAN one summer at Motorola. They had a small IBM 1620 that was promoted for scientific work but very small. The input was punched paper tape. That was great fun because once in a while the machine would chew up the tape and you had to start all over again. You couldn't really repair the stuff; you had to make a new tape.

Vince: That was incredibly primitive but you were probably excited that you could do anything at all.

Jim: Uh huh. I can't remember what I used the machine at Motorola for; it was mostly that the staff was being encouraged to get used to it.

Vince: I remember going on a tour of IBM in high school and they talked about a computer where you had to code programs in by wiring it into the computer.

Jim: The Administrative Data Processing Department at NU started with punched card tabulating equipment and had machines that used plug boards with wires in them. Basically if you wanted to print a report, the printer was a tabulating machine that read the cards and transferred them to paper. But to get information from this place on the card to that place on the print line you had to put in a wire; it was the only way you could rearrange things. Otherwise you'd just get a stupid looking listing of the cards.

Vince: The output came out on cards?

Jim: There were no programs. The 650 produced its output on punched cards and then you had to put the cards in a tabulating machine to get something you could read.

Vince: The things you were doing were for academic use. The administrative people were not using that machine?

Jim: No. I got a little involved in the administrative data processing because of my involvement with the *Northwestern Engineer*. One of our big problems was producing mailing labels. I had the idea that we could make use of the University registration records which by that time had been converted into this punched card system. In fact, I wrote an article about it for the *Engineer*. So I did some negotiating with the head of the tabulating department about how we could do this and they ended up doing our address labels for years and years after that, until about 1982 when they shut it down. One other sidelight is that is how I met my wife (Mary Lou) who was the supervisor.

Vince: How many programming languages do you know now?

Jim: FORTRAN. COBOL; I taught COBOL for a while. IBM Assembler, CDC 3400 Assembler, IBM 360 Assembler.

Vince: You probably did some PL/1?

Jim: Yeah, we started using PL/1 a little bit for NOTIS. A lot of the early customers of NOTIS griped about NOTIS being written in Assembler and so we decided we should do something about that. The new circulation system batch programs were written in PL/1. I never did a lot of PL/1 programming myself.

Vince: How do the machines today compare with those early machines you worked with?

Jim: Memory is the obvious difference. The IBM 709, which represented the top of the line in scientific computers, had 32K words of memory. The tape drives were like molasses.

Vince: Was there any kind of disk storage?

Jim: Not on the 709. Although I think IBM had just introduced some, certainly not anything we could have afforded. We were supposed to get a disk drive with the CDC 3400 but they hadn't finished development of their drive yet so they gave us an IBM drive that had a capacity of about a half a megabyte at the most. The disks were 14 inches in diameter, a little bigger than LP's. There were about five of them stacked up.

Vince: Were they permanently sealed?

Jim: No, you could remove them. The stack of discs was removable as a stack, and you could replace them. One of the things I did at Vogelback is figure out a way we could put our program libraries onto a disk

so that the professors who were using canned programs for statistical analysis and such could retrieve them from the disk rather than the computer having to wind through reels of tape trying to find them on tape. That speeded up the whole operation very much. We eventually had two disk drives. It was several years after we got the machine before we got any of that working.

Vince: Did you communicate with the computer on a teletype machine?

Jim: No, everything had to be keypunched. We had a console you could use to communicate with the operating system which was basically a typewriter. Generally the output from a FORTRAN job would go onto tape and we would put the tape on another machine that did the printing. In the opposite direction the punched cards you submitted as a student went onto tape and were read into the machine.

Vince: So you had a lot of operations experience before NUL?

Jim: Oh yeah.

Vince: What advantages did you see for the library having a computer in-house?

Jim: By the time the library system started in 1970 most of the punched card equipment in the basement at 619 Clark had been replaced by an IBM 360 computer. Until November 1979 we were using the 360 computer at 619 Clark. The reason we had to move was the machine got overloaded and an upgrade would have been very expensive. Just about that time IBM came out with the 4300 series of machines that were more compact and much less expensive. We convinced the University it was much less expensive to buy one of these new machines.

Vince: When you were writing NOTIS what was the greatest challenge, hardware or software or both?

Jim: I don't think it was the hardware. The greatest problem initially was there was no really good software for remote communications. We knew that we wanted this to be an on-line system and there wasn't any packaged software to provide the remote communication between the remote workstations and the computer. We pretty much had to write it into the operating system ourselves. From a hardware standpoint there weren't any good terminal devices; we had to start with electric typewriters that had been adapted to work with computers. There were no suitable visual display devices. IBM eventually came out with the CICS system which I think was developed by one of their customers. Speaking of hardware I should go back to the days when we were using the computer at 619 Clark. Our mass storage device was something called a data cell. It was a huge device, about two feet in diameter that had a big drum that was segmented into ten compartments; each compartments held a cell that was a foot and a half long. Hanging in the cell were strips of large magnetic tape maybe 2 inches wide. The way the device worked was that this drum would rotate under command from the program to a particular place. Fingers would reach down into the cell and grab one of strips. There were notches on the strip so that it could tell which one it was getting. Pull the strip out and wrap it around a smaller drum and some magnetic heads would read it. When it was through the strip was returned to the cell. The problem with that was that sometimes it would crumple the strip up and you'd lose your data. You could watch the data cell and see when someone charged out a book in the library. Obviously response time was not terribly good. At the time we got our own computer in the Library we got disc drives. The data cell was originally built for insurance companies for storing policy records. They wanted large capacity and weren't too concerned about speed of access.

When Velma and I started working on the system we logically thought we should begin with the acquisitions system. But John McGowan was concerned about having something visible when the building opened in

1970. So we dropped work on acquisitions and concentrated on the circulation system. It was probably just as well because it was before the MARC format was developed. We started with a format that was close to MARC but we ended having to do a major conversion.

We eventually had to pay extra to get a display terminal that could display lower case characters. The first thing we did with a terminal was the circulation system. Someone had the idea that a self-service inquiry system for circulation might work. You had to type in the call number. We did not have a link between the circulation system and the cataloging system at the time. The first circulation terminal was in Fall 1975.

NOTIS wasn't really totally integrated until we rewrote the circulation system. The first LUIS terminals (public access catalog) were in May 1980. The new circulation system came in March 1985 and that was the first time that we really had things integrated.

Vince: What did you know about libraries when you first started working on NOTIS?

Jim: Not much beyond what anyone would learn as a student using the library. Most of my time was spent at the Tech library.

Vince: How'd you learn about cataloging?

Jim: Most of that I picked up as we were developing NOTIS. Most of that was Velma's concern. When Velma first started she spent hours visiting with all the Library departments and staff members.

Vince: How did you build the first part of the database?

Jim: We just started entering records. In the case of the circulation system we had this huge project to punch the book cards from the shelf list. Eventually for new books the NOTIS acquisitions system punched the circulation cards for us.

Vince: You've never been tempted to work for business at all?

Jim: No, well certainly before I started teaching I thought that was the way I would go. For a while I was changing positions every 10 years.

Vince: How long did you think this project was going to last when you started working on NOTIS?

Jim: I don't know that I ever thought about that. Obviously as a system we assumed it would last forever, but not necessarily that it would last as long as it has. There were always new things happening with the system.

Vince: When did you stop teaching?

Jim: I'm not really sure. Most of my teaching was programming by then rather than electrical circuits and stuff. For one thing running the student jobs got to be difficult. I was teaching a class that was fairly heavily in demand that was IBM computing rather than CDC computing. Students were going out to work in industry where 90% of the computers they would run into would be IBMs. No one was running COBOL on the CDC. I was teaching a combined Assembler/COBOL class, which was a lot for one quarter.

Vince: Do you miss teaching?

Jim: Yeah somewhat. But it would be real hard for me to go back to it now. Some of the last electronics courses I was teaching were just getting into transistors and I was busy learning about them as fast as I could, trying to relate them to vacuum tubes.

Vince: You've worn a lot of hats over the years. What did you enjoy the most?

Jim: I think the development of NOTIS was probably the most enjoyable and the feeling of the greatest accomplishment. I suspect at that time there weren't very many libraries even interested in such a thing. The wiring stuff is kind of a return to my roots, going back to communications.

Vince: You've learned the networking stuff on your own?

Jim: Yes, all that stuff didn't exist when I was in school.

Vince: How many hours a week do you work now?

Jim: I try to keep it to 40 or less. When I was AUL I was probably putting in 60 hours a week. What I'm doing now is working a little less than 37.5 on Monday through Friday and coming in on Saturday and sometimes Sunday. Most of the Library is caught up on cat 5 wiring so there aren't that many projects to do. I don't know what the next step is, fiber? Wireless? I think it's a ways off before we start replacing anything else.

Vince: Do you ever think about retirement?

Jim: Yes, I've been thinking about it quite a bit lately.

Vince: What do you have in mind to do?

Jim: I don't know. That's a problem. I might follow Adele Comb's lead and volunteer to do some work. I guess it depends if there is something that the Library wants me to do.

END OF TRANSCRIPT