

An Interview with
WILLIS H. WARE -- OH 37
Conducted by Nancy Stern on
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RAND Corporation (Santa Monica, CA)

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[excerpts]

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WARE: Now, as to date. The RAND -- I mean, the IAS project started in the summer of '46. Right?

STERN: Well, it actually started, I think, in January '46.

WARE: But the engineering team assembled in the summer of '46. And I'll bet -- I think it was probably not more than a year or a year and a half later -- maybe two at the outside -- when the other groups started to do their thing.

STERN: So we're talking late '47 ?

WARE: So I would guess it's '47 - '48 is when the action got started. Now there's probably documentation here that I can dredge that up to pin that down, if it's useful.

STERN: That would definitely be useful. It's an adjunct to what I'm studying, but I'd be interested in it. I was under the impression that the copies came later than that, so it's very interesting that -- really, just during the development stage this was going on.

WARE: Well, the copies -- they were building stuff as fast as we got done. They were really right -- all of the groups were right behind Princeton, in a matter of a couple

months or so. As fast as we did something, they did it too. In fact, some of the copies, I think, went operational before Princeton....

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STERN: And when you got down there, besides Jim and Julian, who else was working on the project? Do you recall?

WARE: Ralph Slutz was there almost right away. And then I think soon thereafter Dick Snyder came. He fooled around -- and he had come -- I don't remember whether Snyder came from RCA, or whether he was a consultant for RCA. But I think he came from RCA. But I'm not sure whether it was RCA-Princeton, or RCA-Camden.

STERN: I think it was RCA-Princeton because he worked with Rajchman.

WARE: Okay. But Dick Snyder didn't stay very long. And then Rosenberg came later. I would guess that there was Pete Panagos who was the draftsman for the group and I think he must have come -- I would guess that he probably came in the fall of '46. I think that's right. Then somehow we got some shop people and I really don't know when they came or where they came from.

STERN: What were your first impressions of the Institute?

WARE: I really don't have any vivid recollections or impressions, although it became clear that we were sort of fifth class citizens around there.

STERN: In what way did it become clear?

WARE: Well, they stuck us in the second basement. And when you go to the social events -- let's see, at that time, the Institute was run by the Quaker -- Aydelotte. So there

would be social gatherings from time to time, and you would go to the social gatherings, and they say "Well, I'm in mathematics" or "I'm in physics" or "I'm in -- " -- "What are you in?" And then when one answered, it became clear that you were a social outcast.

STERN: In a sense though, you know, here there is a whole series of young engineers who were getting -- at least being invited to social gatherings with some of the most eminent mathematicians in the world.

WARE: Well, that's true, except that the people you often had such conversations with were not the permanent faculty, but the visitors that would come and they wouldn't always be so old, and they wouldn't always be yet so prominent.

STERN: I see, I see.

WARE: So I think most of us thought at the time that it was professional snobbery. That's an impression.

STERN: And it really did not seem to you from the permanent members as well as the visitors, that there was much of a commitment on the part of the administration towards this thing?

WARE: Oh, I've always felt very strongly that the only reason the Institute got involved in this whole deal was because of John von Neumann.

STERN: That their heart was not in it.

WARE: No. It was completely tangential to everything they ever did and it was not an intellectual exercise particularly. We were doing things with our hands and building dirty old equipment. That wasn't the Institute....

STERN: ... Were you involved with Rajchman at all in the Selectron work?

WARE: Peripherally. We knew of course -- all of us knew what was supposed to be the memory over there, and we would go over and talk to Jan Rajchman and Milt Rosenberg at the time. And we would see the demonstration, and we would see demonstrations of color TV while we were over there testing. But I had no direct involvement. Nobody really had intimate involvement with Rajchman except Julian. The project interface was really Julian to Rajchman.

STERN: When did you sense that there was some dissatisfaction with the progress on the Selectron?

WARE: It was just plain schedule -- purely and simply schedule. And I don't know when that was. If you can find out when Julian made the trip to England to see F. C. Williams and back-date it about six months or nine months or something like that -- that's the period in which that growing awareness would have been developing, that the Selectron might not make it.

STERN: But from your vantage point, working on the circuit design, it was not the major problem at that point?

WARE: No. No. We hadn't started the memory at all. And as far as -- I would say that as far as Pom and I were concerned, one day we were kind of told, "No. We're going to use the Williams tube memory in this thing, and here's what it's all about, and let's get some action." Now, Pom started that. And I don't know -- Pom did not go to England with Julian. I think Julian went alone. I do not believe that F. C. Williams visited the project. But remember, there was also electrostatic storage tube development going on at Whirlwind.

STERN: Was there any contact with the Whirlwind people?

WARE: There might have been, but if so, it would have been predominantly through Julian, or maybe Herman. But certainly not me. And I suspect not Pom either. But according to my memory, Pom did the initial exploratory experiments with the Williams tube stuff. And then we got around to doing the big design, and I sort of tuned in with him.

STERN: You weren't involved then with the Rand decision to use the Selectron, then, later on?

WARE: No. I think that decision had already been made by the time I got here.

STERN: Would you have thought of the Selectron as a failure because it was not used in a mass production way?

WARE: No more so than I think the dinosaur is a failure!

STERN: Because some people have classified it -- that's why I ask.

WARE: In evolution, not everything succeeds. And it was one evolutionary vector that -- if the magnetic core hadn't come along, the Selectron might be the thing we'd have today.

STERN: But it did succeed. I mean -- it was used in a machine.

WARE: Oh, sure! Oh -- we got tremendous performance out of it....

WARE: I don't remember what Jan Rajchman did before he got mixed up in the Selectron business, so I really don't know why he even got fooling around with the Selection. Oh! I'll bet I do. RCA had a contract. There were three contracts, all named after storms, and RCA had one and it was called "Typhoon." Raytheon had one called "Hurricane," as I remember. And somebody else had one --

STERN: Zephyr.

WARE: And they were all supposed to do 6 degree of freedom simulation of flight for the Navy. And the Raytheon thing was digital. The RCA thing was kind of a blend. It was kind of partly digital and partly analogue. And I suppose that maybe as a result of that, Rajchman got interested in computers or computing kinds of things.

STERN: There was also a contract for the NDRC on electronic counters, that Rajchman had worked on. It never materialized, but he had done some work on electronic digital counters. And a function table was something that the ENIAC used from RCA's work. So I think he had demonstrated an interest in computing even before this point.

WARE: Either I never knew or I've forgotten how Jan Rajchman got into that action.

STERN: Well, I think calling them visionaries is just what they seem to have been.

WARE: Well, they had a little vector started that turned out subsequently to be very important vectors.

STERN: Terrific. Anything else?

WARE: I'll tell you one final story. Jan Rajchman's sidekick in the Selectron was a fellow named Milt Rosenberg, who came out here and went to work for International Telemeter and built the first 4,096 x 40 bit magnetic core store for us here at Rand. But Milt tells the story of all the trouble they had with the glass blowers back at RCA while building the Selectron. And one day the glass blower in a fit of pique said to Milt - he said, "I can blow any tube that you can design." And Milt said "How 'bout a Fallopian tube?"

STERN: No answer to that, huh? Terrific. Thank you very much.

WARE: You're welcome.

END OF INTERVIEW

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