

History of the JOHNNIAC

by J. F. Gruenberger

Pages 25 -27

Memorandum [excerpt] dated 12 June 1953 from John Williams (then head of the mathematics division of RCAD) to vice-president J. R. Goldstein

...The Princeton machine was conceived about the notions of reliability and speed. The original intent was to couple the present type of arithmetic unit with a high speed Selectron memory of 1024 words. However, RCA became interested in television and never put in the development time needed to debug the tube, so the builders of Princeton-type machines were put in an unhappy position: they could choose between Williams tubes and mercury delay lines. Both were messy technologically and neither was satisfactory logically; they chose Williams tubes as the lesser evil and wore a silly grin so people would judge them to be happy. How happy they really were may be inferred from the advantages they had had to forego: In the Selectron a particular slot in the memory is selected by digital {rather than analog} means, and the output signals are a thousand times larger than those in Williams tubes and delay lines— facts intimately related to sensitivity to noise and therefore to reliability. Immediately after we decided to build JOHNNIAC, RCA showed signs of life in Selectrons; they began a small production of 256-spot tubes for the Air Force. This looked like our boat, for we could get 512 words by running a double bank of these—and we much preferred this to 1024 words on Williams tubes—which proves that (a) we are not hogs and (b) we practice what we preach on reliability. Further, since all Princeton-types were going to Williams tubes, in the interest of getting finished, it looked as though we could contribute to the field and thus pay our passage, by exploring something different; Aiken of Harvard recently complimented us on this aspect of our choice.

So we abandoned plans for Williams tubes and placed a sizeable order for Selectrons in the expectation that, thus encouraged, RCA would lean into the harness, push development and production, and prepare to welcome all the frustrated computer people who had been living (reluctantly) on Williams tubes and delay lines. There was a high level confab at this juncture between RCA and IBM regarding Selectrons, which made it look as though they made it look as

though they might hit a really big market. So RCA took its engineers off black-and-white television and put them on color television, and hired the mothers-in-law of two deserving employees (the Chairman of the Board and the President) to make Selectrons for us. Besides wanting to sell us the rejects, the price of the tubes was remarkably arranged so that the more we bought the higher the unit cost became. There is even some question that the tubes really meet RCA specifications (and they are not bound because it is a development contract).

Like my late lamented gall bladder, the above somewhat unsatisfactory situation existed for some time before we became fully aware of it. We have enough Selectrons for the JOHNNIAC, but we are completely unhappy about the replacement problem. Very little is known about their life expectancy under dynamic conditions—JOHNNIAC JR. is just beginning a test program, so we will know something soon.

Actually we never worried about this, partly because RCA initially indicated that the tubes would have life expectancies of at least several thousand hours — later tests (after we had received a good many tubes) shook our confidence—and partly because we expected the price to fall and the quality to improve so that eventually it would be OK whatever the initial conditions might be. In passing: those of us responsible for the initial decision to go to Selectrons still feel that we used what brains God gave us in a pretty sensible way—though we deplore the result. The only remorse is that (for economy:) we decided not to keep the Williams tube as an insurance policy; i.e. , as a parallel development.

We may be incurable optimists, but we think we see our way out of this mess; covered with diamonds, moreover. We considered, briefly, returning to Williams tubes. For emotional reasons (and a couple of engineering ones!), we would just about as soon see JOHNNIAC chopped into those little pieces and put down the drain as to see it hooked up to this degrading companion at this late date. Our immediate plan is to go ahead with the Selectrons (we will soon own 100) , as an interim measure. We may put JOHNNIAC on a reduced diet—256 words (40 tubes) instead of 512 words (80 tubes)—if the life tests on JOHNNIAC JR. make this appear advisable. (We can do a lot of computing with 256 words. In fact, if really pressed, we can drop to 20 tubes and 128 words.) Our aim is to get at least a year of work out of the Selectron memory....