in gallium arsenide and they were specifically aiming their company at digital circuits. The other thing I liked about it was, since they didn't know quite what they were doing starting a new company, they were quite willing to let me do the design. They would give me the rules of their process and I could do the integrated circuit design which I thought was just lovely. I love to start with blank paper and do things from scratch. Here was an opportunity for the first time in my life to do integrated circuit design. I never participated in silicon integrated circuit design because there were so many rules that had been developed over decades that it just seemed like unless you spend a lifetime studying the book, you could never do anything. Since there was no book here, I thought it was wonderful and we got started off and did just great. Within a year of the starting of the Gigabit Logic company and my involvement with them, we were making circuits which were 3 times as fast as the silicon circuits that I could get at that time. To be sure the gallium arsenide circuits were very crude, but if a crude circuit will work 3 times as fast as the current sophisticated ones in silicon, there ought to be some potential here. I was pleased with that arrangement and we have gone on to several more years of production build-up at Gigabit Logic to the point where I feel that the circuits are not pacing our work on the CRAY-3.

I'd like to go back in time just a little to give you some perspective on this. I assume many of you aren't at all familiar with the hardware scenario of silicon in its early days, but I'm old enough to have been there. In the late 1950's when Control Data was starting, I began very primitive silicon circuits. The fascinating thing is the circuits that we're using in the CRAY-3 are the same circuits that we were using in 1958 at Control Data. The reasons are the same. The process is so primitive you have to adopt circuit technologies that allow for all the tolerance variations that are current in the process. Therefore the answer today was the same as the answer 30 years ago. I find that fascinating because, among other things, if one looks at the evolution that occurred during the 1960's in silicon, it was very dramatic. The circuit I'm talking about is called diode transistor logic. That was the very early circuits that performed when things really weren't all that accurate. But about 3 or 4 years after the successful completion of a computer of this type, which was the 1604 computer at Control Data, there was the development of an emitter-coupled logic which was much faster so there was a 3 or 4 fold improvement in speeds serially. Over the