Schooling
Interviewer: Jeff Elsey (grandson), 5/5/24

Jeff
Okay, so your, so tell me about your major, or what did you major in for your bachelor's degree?

John C. Elsey
Electrical engineering.

Jeff
Okay. And what made you want to go into electrical engineering?

John C. Elsey
That's a good question. It was always hard to know what to do... what you want to do with your life or how you're going to do it. My dad was an electrical engineer and he had an interesting story which I told. He said, "Don't become an engineer because I'm one, but do what you want to do, what you're most interested in." I couldn't think of anything better.

John C. Elsey
I wanted to do something where I thought I could get a job and provide, so that seemed like a good field, electrical engineering.

Jeff
And you liked math, right?

John C. Elsey
Yeah

Jeff
Did you like math when you first started or was it something that you learned to love?

John C. Elsey
I think I just always kind of liked math and numbers and whatnot. Yeah, it was interesting to solve problems, to find solutions to things.

Jeff
So it was a nice challenge. Do you think, do you think if, um, I mean, you haven't had a lot of exposure to it, but if programming would have been around, do you think he would have tried that out?

John C. Elsey
Yeah, I do. Kind of interesting. I didn't go my senior year of high school. I remember walking at the high school and they said something about, today is the last day to apply for the Ford Scholarship or something like that.

I knew a little bit about it. It was the second year, I think, in the program. Ford gave about 40 high school students scholarships to a university and they would go there instead of their senior year.

They'd take some special classes at the university. So I did that and I got a scholarship. I went four years with that. I made some good friends on that program. I didn't really like school. I was not really.

I knew I wanted to get good grades. I knew it was important to do well. And I did get good grades, but I don't

know if I was a good student because that was after the grades and not necessarily to learn the material.

School was kind of a chore until my senior year when we got introduced to digital logic. It was the start of computers and binary number systems. We had to do a thesis as a senior at the University of Utah.

They wanted me to do- well at least on of the faculty suggested- said that I look at a multiplier, an analog electronic multiplier. I had just fallen in love with digital logic and I said, what if I build a simple relay digital computer?

So I did. It was a simple thing. It had a lot of relays there. So I could use those for the logic devices. This little computer would add, subtract, multiply. I even got to divide using a stepper relay.

It was very rudimentary, but I entered it in the engineering contest they had that year. They did it every year. Students could submit a project or something. I think I was the only one that submitted anything.

I won that and we went to Seattle with it in a regional competition. I didn't do very well there.

Jeff
Do you remember any of the other projects that were at the Seattle one?

John C. Elsey
No, I don't. There were six of them, I think. I think I came in fourth, something like that. But anyway, that was what I liked. When I was at MIT,..... that's an interesting story, too. Claude Shannon is a very famous person.

I don't know if you've heard of Claude Shannon. He's the father of Boolean algebra and information theory.

Jeff
I'm sure in one of my classes in college, they probably mentioned his name, but I can't remember it. Maybe in my, cause I did take an intro to computer engineering class where we, where we had the program in assembly.

So we actually, I actually did something kind of similar to a calculator. Like where one of our assignments was you had to create a calculator, but in assembly. So you had to worry about like gates and like moving, like jumping around in the register and things in the code.

So it was like a lot more like you had to drill down a lot more than I was used to because the programming languages are a lot higher level now, but that was I think as close as I got to. just binary.

John C. Elsey
Yeah. Machine language coding. Yeah.

Jeff
Yeah. But going back to Claude.

John C. Elsey
Well he was very famous. A movie was made about him. Books had been written about him. Really down-to-earth guy though. I ended up with him as my thesis advisor at MIT.

It was kind of funny because I just.... they had an organization at MIT that published a list of topics that the professors there were interested in working in. We had to have a thesis for the master's degree. I looked through the list and the logic stuff was with Shannon.

I like that. So I'll just go talk to him. I just went over and knocked on his door and he happened to be in and we got talking. He suggested this digital device to recognize handwritten script letters. This is in 1958, so digital computers were kind of coming on the scene, but they weren't really that prevalent.

So it was all hardwired relay logic that I used. And I built a machine, a box, to recognize those letters. But again, the people who were familiar with Shannon, they said, what? One of the books that was written about him talked about how he didn't have too many graduate students that he supervised because it said you had to have an awfully big ego to go to see Claude Shannon for your advisor.

I don't think I had necessarily a big ego.

Jeff
You just happened to see him and you're like...

John C. Elsey
Oh, what the heck, I might as well go try. And he caught you in and was so down to earth. Such a nice guy, yeah. He was a... I think a lot of that one too, but...

Jeff
So someone just caught him on a bad day, whoever wrote that book?

John C. Elsey
I don't know. He was pretty famous.

Jeff
Going back to the U, so the scholar, the Ford scholarship that was so it... so did you have to go into electrical engineering?

John C. Elsey
No, you could do whatever you wanted to do at the university. In fact, it was more liberal arts, and you had to take a lot of liberal arts classes.

Jeff
So you had to do that when you were there?

John C. Elsey
Yeah, the program had some courses that you had to take, but you were free to choose beyond that, whatever field you wanted to.

But there were some classes I did took because of the Ford Scholarship that I would not have taken had I just been an engineering student. And kind of a funny story there. I don't know if I told this to anybody or not on this recordings, but.

Jeff
Hopefully we're not asking you repeat questions.

John C. Elsey
I don't know, but you guys can edit it if you want. But I was intent on getting through in four years and I poured over the books that gave the requirements catalog and figured out and mapped out my course.

...to get through it in four years, but I felt that because I had to take some of these extra liberal arts classes, I wouldn't be able to finish in four years. And so I went to see the dean of the college.

(I don't know how I got in to see him). But I said that, you know, I didn't think I could finish in four years and I'd like to not have to take some of these classes. And I'd give back the money and just relinquished the scholarship.

And I said, would that be okay? And he said, no, it wouldn't be. He said, these classes that you're taking, you'll find to be some of the best classes that you ever took. And I said, no, I won't. And he said, yes, you will.

I said, no, I won't. And he said, yes, you will. And I said, well, what if I just don't take the classes? Just drop out. And he said, we just won't let you register at the university. And I said, oh, since you put it that way...

So I took the classes and they were very good. He said, we'll work you, you can schedule them when you need them and take them out of sequence or whatever. And they did. And I got through it in four years.

And some of those classes I took were the best ones they took too. Looking back, I enjoyed those more and they've been more valuable than some of the other classes that I took. But there's this, know-it-all 17 year old going to talk to the Dean.

Jeff
Like "I'm not going to get anything out of this", but he knew different.

John C. Elsey
But they said, well, we won't let you register at the university. Well, since you put it that way, it was interesting.

Jeff
That's how one of my classes was. I had to take, for the computer science program, they made you take an interpersonal communications class because they didn't want you to just take coding classes, they wanted you to know how to interact with people, too, since programmers are known to just be introverts and not talk to anybody.

And that class was probably one of my favorite classes that I took and it wasn't even a programming class. I thought it was good. I'm noticing a trend with our family, though. I mean, Steve kind of broke it because he went into accounting, but said your dad went into electrical engineering, and then you went into electrical engineering, and then my dad went into electrical engineering, but then he kind of swapped over to a more computer science or programming, and I ended up following in his footsteps and doing software engineering.

John C. Elsey
I think had computer science been around I would have followed that. Yeah. We didn't really program in the 60s. It was hardwired, hardwired logic a lot of time. So even into the 70s when I was working at Rockwell we were building fingerprint matchers and they were, because of the speed, the computers were somewhat slow if you programmed it.

But if you hardwired logic that was a lot faster. But it was a lot more rigid too. You didn't change it. And so we built some hardwired matchers and they wished they hadn't because we changed the algorithm so much that they didn't want to keep changing the hardware.

Jeff
That's probably expensive too, right?

John C. Elsey
Yeah. You can change the code so easily and now the computers are so fast that you can do it really fast and cheaply.

Jeff
So you skipped your senior year of high school, and then you got your scholarship. So did you get your, you graduated before you went on your mission, right?

John C. Elsey
I did. I graduated. Then I went on my mission right after I graduated.

Jeff
You were 21 when you graduated?

John C. Elsey
[yes]

Jeff
And then you met Omi, got married, and then they changed the rules so you couldn't go if you were married. Was that what it was? And then you complained, and then they let you go on your mission.

John C. Elsey
Well we got married my senior year, halfway through, and then we went on the mission, so I'd been married five or six months, when we applied for the mission. I was on of the last ones to go.

Jeff
That's just so it's it's so different from how it is now because you have because now it's just every kid who's just graduated high school is just go straight on his mission but then you or someone who had been at college for four years got your degree and then you then you decided to go on your mission.

John C. Elsey
Yeah. Well you had to be... I'm not sure if you had to be 20 then or 19, but the draft was on, which is not there now. The draft was taking all the 19, 20 -year -olds, and you couldn't go on missions. They only let, I think, one per ward per year go.

Jeff
Does that have to be the Korean War?

John C. Elsey
Well, the Korean War was just over, but I think... I don't know that Vietnam cranked up yet.

Jeff
But there was still a draft?

John C. Elsey
Yeah, there was a draft. A draft went until the mid -70s, 1975 or so. But yeah, so I was liable to be drafted.

Jeff
but you're only able to go so could you have been drafted while you were on your mission?

John C. Elsey
No. When you're on your mission, they deferred you, but I almost got drafted when they got home.

Jeff
How did you know you almost got drafted?

John C. Elsey
Well, I finished at MIT in June, and I... let's see... I finished my mission at the end of June, July. I got home the first part of July. I had been in the Naval Reserve before my mission, the last couple of years of college, two or three.

And at that time, being in the Naval Reserve did not exempt you from the draft, but if you got your draft notice, you could then join the Navy instead of the Army, and you maintained whatever status or rank you had as a sailor.

So that's why I was in the Naval Reserve, so that if I did get drafted, I'd be in the Navy rather than the Army, which I thought would be better because I thought the Navy would have more technical stuff than the Army did.

So anyway, I was in the Naval Reserve before I went on my missions, came back, the commander of our Naval Unit was really a good guy, Lieutenant Maw. His father had been the governor of the state, but he was Lieutenant Herbert Maw.

He was really a good guy, and I came back, and I had to report to the draft board after my mission. I said that I was going to MIT in the fall, and once you get into graduate school, I'd be deferred.

I was married, too, but the draft board told me, he said, "We'll get you before you get to MIT". I said, "Oh, great". So I contacted Lieutenant Maud, and he said, Well, we'll pick you up. And if you were in the Naval Reserve at that time, they changed the rules.

You were not eligible for the draft, but you had to go on active duty within six months. But if you'd been in it before, you didn't have to go six months. So anyway, he picked me up, gets me through all the paperwork, uniforms, a whole bunch of stuff for about three weeks, and let the draft board know that I was now active in that unit so I wouldn't be drafted and I got to MIT and I had draft deferrment status. Anyway, I lucked out. Not that the military is bad, I don't think, but I didn't want to do it.

Jeff
So you got back. So what made, why did you want to go to MIT? And how hard is it to get into MIT? Or was it?

John C. Elsey
Good question.

John C. Elsey
Like, did you have to, because usually you have to fill out, like, you have to make an application for it and send it in.

I get some of the alumni stuff, and now, I think the last year or two, there were 20 ,000 applicants for admission to MIT as an undergraduate, and they accepted 1 ,400, which means less than one in 15 or so got in.

But when I was off my mission in 1958, it was a great time to be in technical field. The Soviets had just put up Sputnik in 1957, so everybody was saying, oh, we're way behind, we need more engineers, we need more technical blood, we're technically behind, which wasn't really true, but that was the feeling, so it was easy to get scholarships or fellowships and stuff.

So I applied to four graduate schools, MIT, Caltech, the University of Illinois and Purdue, and got an acceptance in all of them, in fact, scholarships and fellowships, from them, so I got a teaching assistantship at MIT, which provided all the tuition and the salary, but I was teaching full-time at labs, basically, while I was teaching.

Jeff
Then you'd also have to go to your classes and do your homework?

John C. Elsey
We could only take two classes each semester, so it took two years instead of one year to do that. But that was good...

Jeff
I thought masters degrees normally take two years.

John C. Elsey
You could do it in one year if it all falls into place, your thesis and all the classes. I think at that point we didn't have to... You needed eight units, and you could take four at a time. But we only take two at a time because of the teaching assistantship.

But that was good too because I learned a lot from the faculty and other stuff there. That was really good. So anyway, it was a good time to be an engineer.

I had graduated from the University of Utah first in my class, kind of a fluke as well. It was based on your GPA, and I didn't know that it was that high. Well, it was 3 .78, but there was another guy who was ahead of me- he had a 3.94 I think. But he went on his mission after his junior year, so he dropped out and I picked it up.

So I was first in the engineering class of 1956. So I got in to all these universities and got those fellowships.

Jeff
Was were you already planning on going on to graduate school or was the driving factor to not get drafted?

John C. Elsey
Good question. If you had asked me what I expected to do as a profession, I would have said, I expect to teach electrical engineering at the University of Utah. So I'd alwaysâ€”and they said.... my dad was on the faculty there, and he was a good friend with several of the faculty members.

And a lot of them had started at the University with a master's degree, but needed a PhD, so they went back to Purdue, it was one of the big schools they went to, when they were 40, married with three or four kids.

So they said, if you're going to get a PhD, go get it. Don't mess around. Just go get it. So I said, okay. So I plan on going straight through.

Jeff
Okay. So that's why you went straight from off your mission to master's. What was, uh, what was like the campus like, um, what were some of the differences between MIT and the U of U?

John C. Elsey
Well, in some ways, university schools, are all the same - classrooms, and that kind of stuff... a difference-, the University of Utah was lots of different buildings. MIT is pretty much one big connected building.

It just sprawls all over the place and they talk about the infinite corridor because it was the long corridor that ran forever through all the buildings. Well, MIT was pretty much one place. The University, U of U was another..

Jeff
MIT kind of sounds like UVU because, like I don't think you ever have to go outside to get to another building. You can just go from one building and they're all connected. You can get where you need to go by staying inside.

There's lots of different buildings, but they all have hallways connecting all of them.

John C. Elsey
It was pretty much a building, I mean it wasn't hallways between buildings too much, it was almost as I remember, just one great big building, it just went, added on to it.

Jeff
Was there a big jump in class difficulty, like in curriculum difficulty between the bachelor's degree and the master's degree?

John C. Elsey
I don't think so.
MIT was interesting. I had probably some of the best teachers there, some of the worst teachers there, and it was really interesting. There were some good ones, and there were some that were not so good.

Jeff
Well, it sounds like did you work while you were at the U of U or was, were you only doing school?

John C. Elsey
Yeah, I did. Well, I had a paper out the first couple of years, and then I worked in the lab there the last year or so when I was there, and I worked summers.

Jeff
So were you a lot busier at MIT because you had your full-time teaching plus the classes? Was my dad born while you were at MIT?

John C. Elsey
Yeah- he was. It was our first year there.

Jeff
Then when you moved on to go to your PhD at University of Illinois, did you apply to other schools or did you want to go there specifically?

John C. Elsey
I kind of had a friend, and Mac Van Valkenberg was a professor. I think he was at the University of Utah one time and knew my dad. Then he became, at the University of Illinois, became the dean of the engineering school.

He was head of the department, so I kind of knew him. When I had these four offers for a master's degree, I wrote to him and I said, you know, I got acceptance at Caltech, MIT, U of I, University of Illinois, and Indiana, and Purdue.

Where would you go to school for a master's? He said, I'd go to MIT. I said, okay. So I went to MIT, and that's what he did. He got a master's from MIT. I don't know where he got his Ph .D., but then I wrote to him.

When I was finishing up at MIT, I was thinking of the PhD., but MIT was a tough school in a way. It was a good school, but I wasn't sure if I could handle the PhD program and do the kind of research they wanted, because they're very research-oriented.

You had to come up with something that was kind of original to really make it. And there were guys that were spending a lot of years there working on a PhD. So Illinois said, we were a little more relaxed, we want to help you along a little bit. .

And they offered me a good fellowship and an instructorship to teach halftime. So I really had money. We were really pretty well off, things considered, and it worked out better in Illinois.

I got through in three years there.

Jeff
It does sound like a good blessing because today people will just go into more and more debt for their student loans to go through all these programs, but you're able to go through on scholarships and you're even able to make money while you're getting your degree.

John C. Elsey
Yeah, at MIT we were poor as church mice. When we went there, after my mission, we drove up, I was married to Liana, and we drove to MIT. We talked to the people in the EE department, and they offered her a job as a typist, so she was going to get, I think, two hundred and twenty dollars a month, and I was going to get two hundred and eighty dollars a month, about five hundred dollars or so we that's ok. We found this neat apartment, it was the basement of a house, it was on the lake, it was really a neat place, and we really liked it.

It was thirty dollars a week, so I was about a hundred and fifty to a hundred and twenty, a hundred and thirty a month. We handled that in five hundred. Well, she got pregnant, and so sick that she couldn't work, so were missing and two hundred and eighty a month, and we were spending up to a hundred and fifty on rent, and it was tight, but we were okay.

We had some money in the bank, and when your dad was born, the total bill was like a thousand dollars or twelve hundred- a doctor, the hospital and everything- and we had a thousand dollars in the bank, so we were okay.

I remember thinking sometimes, it's getting towards the end of the month, but we got food in the house, and the gas tank is full in the car, so we're ok for the month. We didn't have much money.

Jeff

What, so did you, when you're nearing the end of your degree, or your PhD, what, were you still wanting to teach or were you realizing that you wanted to go work at a company?

John C. Elsey
I decided I wanted to try industry for a while, so I was going to go to industry for five years, and then I wouldn't think about going to the university. But I had an interesting interview. I had my PhD, but I talked to Dale Harris, who was a friend of the family and my dad, and I talked to him.

And he was the head of the EE Department at the University of Utah. And he said, you know, if you'd come here three years ago or two years ago, one year ago, with a PhD, he wouldn't snap you up- a young PhD, he would snap you up in a minute.

But now we want somebody to come with a PhD, and they can bring a million dollars of research money each year. And so, oh, well, I'll think about that. So anyway, I went off to industry. I'm really glad I stayed in industry, because from what I understand, the university is so political in a lot of ways.

And they're so interested in research. And what we were doing at Rockwell, which I think was really kind of high-tech and much better than the universities, that their research there was in some ways somewhat shallow.

I mean, I've thought about that. At the university you're teaching, you're teaching graduate students who are there for a year or two, and you're somewhat limited in your facilities and your resources, but you take a company like Rockwell that's building the space shuttle, that's building the B2 bomber.

You know, they've got thousands of people and lots of money and big space and lots of facilities. And we had a contract one time at Rockwell for an automatic target recognizer, and some universities were involved in that as well.

But we had access to all the Air Force, the latest data, the video tapes that they would take. They flew over targets to give us the imagery that we would work with. And we were, there were several of us that we had years that we worked on that thing.

And the universities would crank out a lot of papers- on automatic target recognition, but they didn't really say anything.

Jeff
Would you read them as they came out?

John C. Elsey
Yeah, when it started on that project, the guy that would have already had in the whole stack like this, six inches, and here's some papers, so I'd read through them, and if it said University I just kind of set it aside. I had read enough of them to know that they just weren't very deep.

Jeff
I mean it's all theory too, it's nothing that could actually be proven, right?

John C. Elsey
In a way that's true. They had some simulations. But that was a problem we couldn't solve- what the Air Force wanted to do. We just could not do it. We gave up after a few years. There were three companies that were working on it, the same thing. Nothing came of it, I don't think, not like the Air Force wanted.

Jeff
Was there, uh, was there like, uh, what was your, what was your dissertation on for your PhD?

John C. Elsey
"An algorithm for the synthesis of large sequential switching circuits". The sequential switching circuits are basically a computer circuit. They're basically the switching circuits that you use.

Jeff
How many, how many hours or how many, how long did it take you to come up with your dissertation? Like how many hours did you work on it?

John C. Elsey
Well, Illinois was great because when I got there, I had to take some classes and I was teaching half time. So I did that in a year and a half, had to take two language exams and show some proficiency in that, which was a joke, and then after a year and a half, I became a research assistant instead of a teaching, and basically the assignment was to do your thesis.

So I had a year and a half to work on my thesis, which was essentially my full-time job. It was the government contract to work with that. My thesis advisors described it as "using a computer to design the computer".

But that was 1963, and transistors were separate little electronic devices. You see printed circuit boards with little individual transistors on them, and we were trying to save transistors so you could get the job done with fewer components.

But now, transistors are thousands on the wafer. They don't worry about saving a transistor.

Jeff
I think there's like, I think there's like millions.

John C. Elsey
Yeah, probably, yeah, there's like five millions that are down in the CPU

Jeff
Because back then were you like, were they being put on by like hand? Like transistors?

John C. Elsey
Yeah, I think so.
Yeah, yeah individual little transistors. But it changed so fast

Jeff
Yeah, I mean like they're they're progressing so fast now like I feel like they're able to like double the the speed of all these CPUs and Group G and like graphics processing units like every couple of years Just crazy how fast it is.

John C. Elsey
It is how fast they go on how much memory they cram on that space. It's amazing.

Jeff
Did you have a favorite out of the three schools that you attended? Did you have a favorite? Like where did you

have the best experience at?

John C. Elsey
Probably MIT... probably... yeah

Jeff
Was that as prestigious of a school back then as it is now?

John C. Elsey
Yeah

Jeff
Because I feel like if you're going into any sort of technical field, it's like if you go to MIT, then that's the best.

John C. Elsey
Yeah. It was interesting. When I got there, it did have a good reputation. It still does. The people were just down to earth. The faculty and the other students, they were just nice. Nobody was snooty or stuck up or just that I remember anyway.

They were very congenial down to earth. But the thing I remember about MIT was they kept saying, figure out what basically is going on. What is this thing really like? Get down to the real fundamentals of the thing.

Then they were saying, we want to teach you how to look at problems. Well the University of Utah said that too- when you were graduating, Dale Harris would say, you know, you may think you don't know anything. What we've tried to teach you here is really how to solve problems instead of the actual problems that you'll solve because the technology will change, which it certainly has.

But we'd like to teach you how to search, how to look at a problem, how to solve it, and what useful techniques you need to break the play. MIT did that. It was evident in working. We learned about probability theory, statistics, probability density functions.

I remember one briefing. I was involved in it and it was at Rockwell. We were in a meeting and talking about the probability distribution of a spot in a pixel. Another guy, who was a doctorate supposedly, he was called doctor so-and-so...

He said, what's the Gaussian equivalent of that? We said, Gaussian equivalent? There is no Gaussian equivalent. This is the distribution. He went off and apparently got shot down pretty badly and made some comment later about it.

He wasn't going down there with those guys from Rockwell again. Another guy and I were both in that briefing and we looked at each other "Gaussian. What are you talking about? There's no Gaussian". So MIT, I think, just really stressed the fundamentals and getting to really peel back all the layers and find out what's really going on.

I think that philosophy was the thing I remember.

Jeff
I think that's why, like, today there's, with coding, there's so many of these boot camps that you can go to where it's like a six or 12 -week program where they'll just kind of rush you through this program of learning a specific programming language so you can get a job.

Usually it's in web development, so it's like a programming language called JavaScript, and it's, I don't know, it's interesting because when you go to the university where you get your degree in computer science, they do something similar where they're, like, they're more teaching you how to solve problems and teaching you fundamentals of how the programming languages work or, like, good design principles for it, and so that you can, so that it's programming language agnostic so you can really jump between anything and still be able to figure out how to build something, and I think that's, like, that's still really important for people to go to universities, especially in engineering degrees like electrical engineering because of that, whereas with these boot camps, they come out with just, like, a really in-depth knowledge on, like, one specific thing, but they can't really branch out to do anything else.

John C. Elsey
It's certainly been the case that technology has changed and what they were teaching. Well, at the University of Utah, it took a year studying vacuum tubes. Nobody uses vacuum tubes anymore.

Jeff
Vaccum tubes were for TVs, right?

John C. Elsey
Yeah, yeah, but now they don't,

Jeff
I mean, well, now these are just...

John C. Elsey
Yeah, flat screen. The computer is somewhere in there. Hardly takes up any room.

Jeff
Oh, is that a computer too?

John C. Elsey
No, it's just a monitor.

Jeff
Oh, okay. No, I was wondering if it was the computer.

John C. Elsey
The vacuum tubes, you know, were that big and they were getting hot and it took 200 volts to operate.

John C. Elsey
Now you've got your iPad there, you can't even find the chip in that one almost.

Jeff
Yeah. So how did... like CRTVs, how would images get displayed on that? How do images get displayed on those old TVs like this here?

John C. Elsey
Well they were CRTVs. So, yeah, like the Cathode Ray Tube?

Jeff

Yeah, like the ones you had in the basement for a long time. Like that one for we had down there?

John C. Elsey
a cathode ray tube, yeah, and a cathode ray tube in it.

Jeff
But now these, you can get TVs that are like this thin, I don't know how they have that now.

John C. Elsey
If you get them 60 inches or bigger, yeah, that's amazing.

Jeff
So was like the one thing, the most important thing you learned in all of your schooling was that is what you learned at MIT, would you say? Just like those principles of...

John C. Elsey
There were other things as well, other schools, but you kind of learned how to solve problems basically. And, well, there are some fundamentals. I mean the math is there- differential equations, integral equations, the statistics, the probability functions- the math, you need to have that.

Jeff
Was there a class you took that you did not like? Like for me, for some reason statistics was really hard for me, but like I, I enjoyed calculus, but I didn't like statistics or like I didn't like trigonometry as much.

John C. Elsey
I don't know if there's any one that stands out. Well, algebra was... probably the easiest, the easiest to manipulate

Jeff
Are you, are you glad you went all the way through and got your, your PhD? Like, do you think you would have still been able to get a job at Rockwell if you had just stopped at your master's?

John C. Elsey
That's a good question, and I'm not sure. I'm not sure it did a lot of good for me at Rockwell, although I was with the groups where a lot of the guys had PhDs. I became a supervisor there after a while, and I had five guys in my group, and four of us had PhDs, and the other one was working on his, but... so I don't know, it may have opened a lot of doors that wouldn't have been available otherwise.

Jeff
Like the relationships that you made at Illinois?

John C. Elsey
Yeah, and the assignments that I got, I mean, I just worked on my own stuff for most of my career. Nobody was really over me saying, you know, what, how did you do today or do this today or that kind of stuff.

Jeff
When did you retire? Like what company did you, where you was Rockwell, your entire career?

John C. Elsey
Yeah, well, it was the same place, doing the same kind of stuff, but the company name changed five times.

Jeff
But you stayed there your whole career?

John C. Elsey
Yeah, it was initially North American Rockwell, then North American Aviation, then North American Rockwell, then Rockwell International, then Boeing bought it, so I'm a Boeing retiree, but they were just the last two or three years.

Jeff
Why did I think you worked at Hughes Aircraft? Who worked at Hughes Aircraft?

John C. Elsey
I didn't, your dad did.

Jeff
Oh, my dad did, okay. For some reason I thought you worked at Hughes Aircraft. All right, I think that's all the questions I have on your education.

John C. Elsey
You're asking good questions, Jeff, it was insightful.