Washington County Museum
Oral History Interview with Norm Winningstad
At C. Norman Winningstad's home
February 21, 1996

Informant: C. Norman Winningstad

Interviewer: Barbara Doyle

Transcriber: Jeff Millen

NW = C. Norman Winningstad

BD = Barbara Doyle

BD: . . . with C. Norman Winningstad at his home at 1517 SW 66th Avenue. This is his home in the Portland area—Sylvan area. Actually, he is just over the county line in Washington County, so it's very appropriate that Washington County Historical Society is collecting this information. I am Barbara Doyle, and today is the twenty-first of February 1996. Basically, this interview and any subsequent ones with Norm are basically concentrating on his participation in the development of the high-tech business in Washington County and northwest Oregon, but certainly we need some background information about you. So, Norm, if I may, tell me something about your earlier years. I've done a little reading to the fact that you had both a father and a grandfather that were interested in science and engineering, so how did they lead you into this, and give me some explanation.

NW: Well, that unfortunately is disappointment in the sense that my mother and father were divorced when I was quite young. So, I lived much of my early life either boarded or with my mother. And, so, I did not have the influence of my grandfathers of either side of the family inculcating me with engineering. I think maybe the propensity to be an engineer has a genetic factor, and that's what did it. It wasn't until I was a young adult that I learned that my maternal great-grandfather supervised the spinning of the cables for the Bay Bridge suspension section and engineered the first Hollywood camera boom. So, that was a big piece of news. He was an electrical engineer. My paternal grandfather was an engineer and surveyed the railroads in Washington and Oregon and some of California, and a governor—I think it was Sonora District—hired him to survey the railroads down there. So, I guess I come genetically by being an engineer as opposed to being nurtured into being an engineer.

BD: Sounds genetic rather than like an environmental impact here. Did you do anything that sort of represented a precocious interest in science and engineering?

NW: Oh, yes. Like many children I was interested in dinosaurs, and that led me into understanding about evolution. I was very interested in astronomy. That got me into cosmology. Then I built model airplanes. In those days, we built them out of very skinny pieces of balsa wood glued together and covered with tissue paper and powered by a rubber band. We didn't have gasoline engines then. But, I was going to be an aeronautical engineer because I played with model airplanes so much.

BD: So, when you started at the University of California, Berkeley you were going to go into aeronautics.

NW: Exactly. And, because the war was on, I was able to skip the high twelfth grade in high school because my grades were good enough to go directly to college without high twelfth, and they had an accelerated program of three terms per year instead of two terms per year. So, before they drafted me out of college, I finished my sophomore year, and I was going to be a mechanical engineer in order to become an aeronautical engineer. So, I probably would have ended up being an aeronautical engineer for Lockheed in California or Boeing in Washington if it hadn't been for the fact that I was going to be drafted. That led me to my advisor at the university, and I said, "What's the best way not to be killed?" [laughing] He said the Navy has a wonderful program called the Eddy Program, named after Admiral Eddy. And what it was, was to train young men such as myself to become expert in this modern thing called electronics because, when I was in school, power engineering was the closest to electronics you could get in those days. You learned about generators and motors and transmission lines, but very few people learned about vacuum tubes and electronics in those days. So, the Navy a was very short on electronicers. They called them radio technicians mates then. So, this Eddy Program would train you for a month in pre-radio to make sure it was worth their time and six months in secondary radio, and, then when you graduated an expert in radar and sonar, they would put you out in the fleet. So, my advisor told me that was the best program he knew of because once you graduated from that program the Navy didn't want you killed. [laughing]

BD: You were in the Pacific theater?

NW: Yes, but here's the funny part. I became an instructor, so I was stationed on Treasure Island teaching antennas, so my sea duty consisted of radar training and antennas on a converted garbage scow in San Francisco Bay.

BD: That's where Treasure Island is located?

NW: Yes.

BD: Ok. I didn't know. I thought maybe it was located out in the Pacific.

NW: Yes. Treasure Island is in the middle of San Francisco Bay. So, my sea duty was teaching radar antennas on a converted garbage scow, but I did have some dangerous duty. My most dangerous duty was being on shore patrol on Market Street in San Francisco on V-J Day. Our standing orders were, "Don't make trouble." [laughing]

BD: There's just one little thing we didn't get at the beginning of this, and that was, you know, like the vital statistics of when you were born and where you were born.

NW: Oh, yes. I was born on November 5, 1925 in Berkeley, California at Berkeley General Hospital.

BD: Okay, so you are a full-blooded native Californian.

NW: Yes, I am what's called a prune picker.

BD: That was the area?

NW: Yeah, a native Californian is a prune picker.

BD: We didn't know that.

NW: Yep. Yeah, that's a little obscure information because, of course, then California was largely an agricultural state, and the agricultural side was emphasized. That's why people don't know about it anymore because there aren't very many prune pickers around.

BD: Probably not too many prune eaters either. So, you worked in electronics—radar, sonar, and that kind of stuff—during the World War II, and, when the war was over, you went back to Berkeley as a Junior?

NW: Yes.

BD: What were you studying then?

NW: Well, I really, really loved learning electronics in the Navy, so I switched my major from mechanical engineer to electrical engineer, and, of course, I guided all my courses in the direction of electronics rather than power because there was a big struggle going on between the power boys and these young upstarts called electronicers. The faculty consisted mostly of old-timers who were drenched in power, and here were these new young upstarts who wanted to get into electronics. So, that was the interesting part, and the favorite joke that I like to tell people is that when I finally graduated in 1948, an expert in vacuum tubes, that was the year that Bell Labs announced the transistor. So, I graduated technically obsolete [laughing].

BD: Well, how long did you work in this electronics field before your knowledge of vacuum tubes became obsolete?

NW: Well, the first job I got, surprisingly enough, was in television. At the time, television was just becoming a big thing in the United States around 1948, and the T.V. channels were being allocated in the VHF band, that is two to thirteen channels, and not yet available commercially were the UHF channels. And a gentleman of great power wanted a television station in San Francisco, so he hired a bunch of guys, including me, to do experimental UHF propagation. That's the high channels—fourteen to forty-nine at the time. So, we did propagation there, and all the studio equipment, all the transmitter equipment was vacuum tube powered. So, my first two years, so to speak, were in vacuum tubes. I also taught television repair at Heald College, and at that time they were all vacuum tubes. However, in 1950, when I went to work for the Lawrence Berkeley Laboratories, the transistors were becoming commercially available.

BD: This is 1950 we're talking about.

NW: Yeah.

BD: That was pretty quick.

NW: Yes. It didn't take long for the commercial companies to understand what was going on. So, fortunately the commercial companies knew that there were a lot of people like myself who were nurtured in vacuum tubes but didn't know what the heck a transistor was. So, they deliberately put out some very good manuals that quickly transitioned you from thinking like a vacuum tube to thinking like a transistor. So, in 1950, I started to work for the Lawrence Labs, and I started designing some equipment for them that utilized transistors in low-power parts of the circuits.

BD: So, basically, you taught yourself what you needed to know about transistors.

NW: Oh, yes. But don't forget, they had very good manuals on this, and it was no big deal to make the transition. But, yes, you did have to learn some new and interesting things like a vacuum tube was very, very hard to hurt it a lot whereas a transistor was a very delicate device, and you had to have considerations of not accidentally over-voltaging it and being very careful not to over-temperature it. You had to be careful of a whole lot of things that you didn't have to be careful of with vacuum tubes. But, they had the big, big advantage of mechanical aspects. They were small, lightweight, and very rugged—you could drop them on the floor and nothing would happen, but try dropping a vacuum tube on the floor and see what happens.

BD: Well, a vacuum tube was a little bit like a light bulb.

NW: Oh, absolutely, absolutely.

BD: Okay, so the glass broke, and there was a little filament in there that conducted your current.

NW: Yes and that little filament could burn out just like a light bulb can burn out. But, the big advantage of transistors was, they were so-called solid-state device, and, in principle, they never wear out. They may degrade over time because moisture slowly gets into the plastic package and invades the chip, but they have good passivation methods nowadays, so transistors can last twenty years today, but vacuum tubes, if they're used continuously, will almost never last twenty years because the filaments break, uh, filaments quit.

BD: Now, this is a real layman's question. Were the tubes and the transistors used strictly to conduct electricity, or was this a passage of information that went through there?

NW: Both. In order to transmit information, you have to transmit something, and, in this case, it's electricity. So, the electrons going through the vacuum tube, or electrons or holes going through the transistor, represent a flow of current, and, if you're doing binary work as we do nowadays, no current is a zero and some current is a one. So, you can transmit binary code very nicely by turning a vacuum tube on and off or turning a transistor on and off. Now, there's another way to do it, and that's called analog. In the case of analog, the amount of current is proportional to how loud the sound is if you're transmitting sound. So, when I talk very quietly like this, the current variations are small, but when I talk loud like this, there's big variations in current. So, in the case of analog, you directly proportional to the signal . . . information you're trying to send, whereas digital is coded.

BD: I just learned something. That's good. Thanks.

NW: If you don't learn something new every day, it's a wasted day.

BD: Some days you have to learn too many things in one day. So, then after the T.V. work in California you moved to the Lawrence Labs. Is this what became Lawrence Livermore?

NW: No. Lawrence Labs is a Berkeley lab, and Livermore Labs were in, literally in, Livermore, California. Now, we guys in the Berkeley labs considered ourselves the guys with the white hats because we did peaceful type research, whereas the guys in Livermore, they wore the black hats because they were the guys who did weapons.

BD: Now, the work that you were doing at the Lawrence Lab, was that is some way preparation for the kinds of things you did when you came to Tektronix?

NW: As a matter of fact, it led directly to my Tektronix job. What we were doing is building what was popularly called atom smashers.

BD: This is at Lawrence.

NW: At Lawrence. Now, Doctor Lawrence made the first cyclotron, and the cyclotron had an inherent limit in it to a few tens-of-millions of electron volts, or maybe a hundred-million-electron volts of energy, and physicist wanted to go to higher and higher energies, so some guy invented a thing called a bevatron. Now, a bevatron is very much like a cyclotron except that it operates with a constant radius for the electrons. Instead of starting in the center and as they build up energy spiraling outward as they pick up energy, in the case of the bevatron, they need a great big radius, and it wasn't practical to have from zero to that big radius evacuated for the electrons to run around. So, instead, they built one great, big, donut-like gadget, and this great, big, donut-like gadget had the electrons start off slowly, and at a constant radius, they'd pick up speed. Well, the trick was to accelerate them, and my job was to build the basic gadget that detected where the electrons . . . how fast the electrons were going and then make them go a little faster next time. It was called the master oscillator, and what it did is supply the energy at the correct timing to keep the electrons at the same radius as they picked up energy and went faster and faster. So, I like to consider myself as one of the guys at the bottom of the pyramid that was supporting Doctor Emilio Segrè who made the first man-made positron, that is, a proton that is positive. I'm sorry. I stated that incorrectly. A positron is a positive electron. He made the first antiproton, which is a proton with a negative charge instead of a positive charge, and he got a Nobel Prize for that. As one of the guys at the bottom of the pyramid supporting a stack of people who were doing the real physics work, I felt very proud that a young kid, sort of fresh out of college, got to work with Nobel Prize laureates and do something that was right out at the forehead of science.

BD: So, in a way, you were somewhat responsible for that Nobel Prize.

NW: Yes, but in a very small way. A whole lot of other people, you know . . . somebody else could have done what I did, so I didn't do anything that was . . .

BD: But you did it.

NW: But I did it. I didn't screw it up. Let me put it that way. I probably wouldn't have been there very long if I wasn't doing it right. But anyhow, out of this came a broadening experience for me and my young family. The French government wanted to build a similar machine, and the French being a very proud group of people wanted to be sure that when they threw the switch that turned their equivalent bevatron on that it would work the first time because the bevatron at Berkeley took a couple of month for it to get up and running correctly because there are a lot of things to be debugged. This was the first one that had ever been built. So, of course, my equipment worked perfectly [laughing].

BD: Somebody else's had a little flaw in it.

NW: Anyhow, the net of it was the French wanted to be darn sure that when they turned on their bevatron it worked right. So, they hired me as a consultant to come over for three months and review the work that'd been done and give them a helping hand in making sure that when they threw the switch the thing would work right. So, in January, February, and March of 1956, my wife and two young children spent three months in Paris. I commuted out to the suburbs where the accelerator was in a little town called Saclay, uh, S A C L A Y. Anyhow, that experience was the first time I had been outside of the United States and, of course, my wife and children also, and she had a brother in Munich, so when we had weekends we'd go . . . sometimes we'd go . . . for instance, one of the trips was to visit her brother in Munich, and we also went to Switzerland because in Geneva they were talking about building an accelerator, and I got to go see that, so I took my family.

BD: If I can back up for a second, are you still working for the Lawrence Labs?

NW: Except I'm on leave of absence.

BD: Okay. So it's the French government or this French organization that's paying your salary at this point.

NW: Right. Exactly.

BD: That had to be a nice little sort of coup to realize a foreign government was willing to do this.

NW: Yes. They were very nice. They were going to fly me over first-class, but I said, "Hey I can't leave my family for three months. So, if you'll give us tourist-class tickets for the whole family, we'll fly tourist instead of first-class." It was on this trip that I learned a couple of practical things like, if you want to get through customs quickly, have one of your kids start crying [laughing].

BD: And so which one did?

NW: The youngest of course. And in Geneva . . . in fact of the whole trip to Europe, the only thing my youngest son remembers is he found a dead frog in the fountain in Geneva. Now he doesn't remember it was Geneva, but he sure remembers finding the dead frog in the fountain, so that's his cultural absorption.

BD: One question. Which one is your youngest son, Dennis or Dick?

NW: Dennis.

BD: Dennis is the youngest one.

NW: Yeah, Dick escapes that.

BD: Oh, is he the youngest child?

NW: Dennis is the youngest; Dick is the oldest.

BD: Okay, okay. So, we're in France, and we're doing this interesting stuff, and let's get back to the story now.

NW: Well, the French thing was just a side point in that it broadened my perspective on the world. For the first time, I found out that there were wines other than Uncle Gallo's drink.

BD: That's because you come from California.

NW: And I found out that there were cheeses other than Kraft. It was really a very, very broadening experience. I found out that people are quite different in other countries. For example, we were walking along on an icy sidewalk in downtown Paris on Rue de Rivoli, and Dennis runs ahead and slips on the ice. Before we could get there, a Frenchman had him picked up, dusted off, and comforted. Now, if this had been New York, [laughing]

BD: No, not New York.

NW: he would have been sitting there crying until I could catch up. But it was really a wonderful, wonderful experience for a young adult to find out that other people of the world exist and have different lifestyles.

BD: And how did the rest of your family like the stay in Europe?

NW: Very, very much. Yeah. And one other interesting incident . . . I don't know if you want these anecdotes or not.

BD: This is what fills out your life picture, so, yes.

NW: I'm driving with one of my French coworkers in Paris traffic. I have a Triumph TR3 which was at the time a pretty spiffy little sports car. The French called this a nervous car because it moves quickly and suddenly. It maneuvers nicely, so their term of the art it's a nervous car. So, I'm in the left lane (which in France is the fast lane. It's like in the U.S. in France.), and the signal is red and we're waiting first in line when all of a sudden along side me pulls up another car stopping at the red light, but he is in the oncoming-traffic lane facing them, and obviously in order for him to not cause a big problem, he's going to have to out-accelerate my car. Now, as an American and a young adult guy, nobody but nobody is going to out-accelerate my Triumph TR3. So, I'm all ready to dig out and really get this guy, and I said to my French friend, "What's that guy think he's doing?," and my French friend said, "Oh, he's in a hurry." Now, I was dumbfounded to hear that, and it suddenly dawned on me the Frenchman was right. Nobody would be that dumb as to get into the opposing traffic lane facing the other traffic and have to out-accelerate the car beside him in order not to cause a problem unless he was in a hurry. So, probably the poor guy was late for work or had something important to do and wanted to get there quickly, but my American attitude was just the opposite. "He can't get away with that." [laughing] So, again, it was a very interesting cultural experience to find out what other people did and how other people viewed life.

BD: And probably a very good thing that you had your French companion there, and he made a comment, or you might be dust on the road.

NW: Yeah. Absolutely. Well, I think what would of happened was I would have jumped ahead of everybody, and he would have pulled in behind me, but, needless to say, it was nevertheless like a very important point in my life because I suddenly realized there's another way to look at a situation.

BD; And now what about your working on this French bevatron? Did you get it up and going on the first switch?

NW: I left before they had a chance to throw the switch, and they got it up and going in a couple of days, so it wasn't bad at all.

BD: Okay, now that was in 1956.

NW: Right.

BD: And it was three months, so you were back in this country before the end of '56 or at least into '57.

NW: End of '56.

BD: And back at the Lawrence Labs.

NW: In Berkeley, right. So, what we did then was the bevatron was up and running, so the big trick now is the physicists need improved instrumentation because the old instrumentation for the cyclotrons were running at microsecond speed, that is one-millionth-of-a-second kind of speed. But the bevatron had much higher energy particles, so they happened quicker. And as a result of happening quicker, we needed devices that could measure shorter periods of time than a millionth of a second. The big, big, big deal at the time was the millimicrosecond—one thousandth of one millionth of a second. It's now called a nanosecond. I mean everything's up-to-date in Kansas City, so we progressed in the last many years, but at the time millimicroseconds were the big deal. So, my job was to build an oscilloscope device to look at how the electricity is varying at signal that would have a response time of under a millimicrosecond or ten-to-the-minus-nine [10^{-9}] seconds. So, the first trick was to find cathode ray tube that could handle those kinds of speeds, and the second trick was to develop the electronics that would allow you to view that. So, it turns out that there was a company called Dumont who was at the time was the world's greatest manufacturer of cathode ray tubes. They had a television network at one time, and they developed television cathode ray tubes, but they also had an oscilloscope business that at the time was the big rival of Tektronix. Dumont was in the business before World War II along with RCA and I think maybe GE. But Tektronix was an upstart after the war—I think 1946 or whatever is when they started. So, low and behold, Tektronix was buying their cathode ray tubes largely from Dumont for many years when they realized that in order to get ahead of Dumont in the business they'd have to make their own. So, Tektronix, sure enough, started developing their own cathode ray tubes. At any rate, here I am at Berkeley. The world's fastest cathode ray tube is available from Dumont. I buy the cathode ray tube from Dumont, develop the electronics to allow it to work, and we at the radiation lab in the Berkeley Lawrence Lab very much wanted a faster oscilloscope than Tektronix made, and that was why I was putting this thing together instead of simply buying it from Tektronix. So, when I got it all put together, my boss had me write a paper for *The Review of Scientific Instruments* as a dig to get Tektronix on the ball and make these things commercially because handmade they cost like heck, and, frankly, my design was not the most reliable and was not the best calibrated and all these sort of things because it was cobbled up in a very short period of time and without a lot of R&D effort—one guy, whereas Tektronix had put a team of five or six guys on a new oscilloscope. So I published this paper titled, *A Fractional-Millimicrosecond Oscilloscope Made From Commercially Available Components*. Now, that was supposed to get Tektronix's attention, and did it ever. It surely did.

BD: Now this was published in . . .

NW: This was 1958. Or maybe it was '57 when it was published. At any rate, Dick Ropiequet was the

Vice President of Engineering at Tektronix at the time, and Dick Ropiequet happened to be in the Navy Eddy program, and he happened to have been on Treasure Island when I was going through the Eddy program, and, so, Dick Ropiequet knew Norm Winningstad, and he wrote me a letter and invited me up to Tektronix to give a little talk on my oscilloscope and to see how Tektronix was doing. So, I bopped on up to Tektronix, and, about two or three weeks after I'd made the visit, I get this letter that offers me a job at Tektronix.

BD: Now, were you interested in leaving California at that time?

NW: I didn't particularly want to leave California. I applied for a job in Los Angeles with Hughes, who was big in electronics at the time. And I applied for a job with Hewlett-Packard, who was also in the Bay Area and was Tektronix big rival. So, I had those two in the mill because I was a little discouraged with the Lawrence Berkeley Lab in that they were federally funded and as a result, although they were a state university organization, nevertheless, they had to conform to certain federal rules, and the result was I could see guys making more money than I was who wasn't doing nearly the quality of work that I was doing—at least in my opinion. And, in order to get a raise, what you had to do was go in and pound on the table. So, for example, when I got a job offer from Hughes, I went in and pounded on the table and said, "Look. I'm going to have to leave. I got this big offer from Hughes." They said, "Norm, Norm, Norm. Don't do that. The work here is much more interesting. Da-da, da-da, da-da. And, besides, what we'll do, we'll give you that raise but not right a way. We have to give it to you incrementally over a period of a year in order to conform with our budget." So, you know, I went along with that, but then low and behold here comes this Tektronix offer which is like half again more than I was making at Berkeley Labs, and, so, just to check the thermometer, I went to Hewlett-Packard, and Hewlett-Packard allowed us how if they matched the Tektronix offer so I didn't have to leave California, they would disrupt their entire salary structure for engineers, so Barney Oliver, who was the head of their R&D work who later became very famous for his work in the search for extraterrestrial intelligence project SETI. Anyway, Barney Oliver told me he could match the Tek offer. So, I guess Dick Ropiequet have known me from Treasure Island felt he was getting a known entity whereas Barney Oliver was not, and also Dick Ropiequet wanted me immediately for work on very fast oscilloscopes whereas Hewlett-Packard did not have a project in very fast oscilloscopes. So, at the end of 1958, I came up, and, then in the beginning of 1959, my family joined-

[end]

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Terms:

University of California, Berkeley
Heald College

Lawrence Berkeley National Laboratory
Lawrence Livermore National Laboratory
Tektronix
Dumont
Hewlett-Packard

Admiral Eddy
Eddy Program
Doctor Emilio Segrè

Richard Ropiequet (Vice President of Engineering at Tektronix)

Treasure Island, California
Saclay, France