

CHEMICAL HERITAGE FOUNDATION

WILLIS HUMPHREYS

BECKMAN HERITAGE PROJECT

Transcript of an Interview
Conducted by

David C. Brock and Gerald Gallwas

at

Fullerton, California

on

7 March 2002

(With Subsequent Corrections and Additions)

ACKNOWLEDGEMENT

This oral history is one in a series initiated by the Chemical Heritage Foundation on behalf of The Arnold and Mabel Beckman Foundation. The series documents the personal perspectives of the individuals related to the history of Arnold O. Beckman and Beckman Instruments, Inc., and records the human dimensions of the growth of the chemical sciences and chemical process industries during the twentieth century.

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(Signature) William A. Humphreys
William Humphreys

(Date) October 31, 2002

WILLIS A. HUMPHREYS

1918 Born in St. Louis, Missouri on 15 November

Education

High School and Night School Graduate

Professional Experience

1938 Police Transmitter Manufacturer
Assembler/Tester

1938-1941 National Technical Laboratories
Production Assistant, Electronic Department

1941-1981 Beckman Instruments, Incorporated
Production Supervisor and Assistant Production Manager

ABSTRACT

Willis Humphreys begins the interview by describing how he came to work at National Technical Laboratories [NTL] on 31 March 1938. Before joining NTL, Humphreys worked for a small company in Pasadena, California, but was laid off due to lack of work. He was referred to the position at NTL and began there lacing cables. The company was still quite small at the time; Humphreys could recall only about 15 employees working there. Humphreys had little day-to-day contact with the management of NTL, including Arnold O. Beckman and Howard Cary, but what contact he had was positive. Humphreys worked on the electronics for many of the company's instruments including the Helipot, Model R pH meter, and others and remained with the company during its moves to new facilities in South Pasadena, and then Irvine, California. The need for instruments during World War II led to an increase in production and the development of new instruments. Although Humphreys was eligible for the draft, company executives helped him to get a deferment by arguing that he was doing work essential to the war effort. Humphreys remained with the company throughout his career. Although he did rise to supervisory positions, he surmises that he may have risen further if his interest in working hands-on with electronics had not distracted him from office politics. Humphreys concludes the interview by reflecting back on his career and the changes in electronics technology.

INTERVIEWERS

David C. Brock is Program Manager for Educational and Historical Services at the Chemical Heritage Foundation in Philadelphia. He is currently a Ph.D. candidate in the History Department, Program in the History of Science at Princeton University. In 1995, Mr. Brock received his M.A. in the History of Science from Princeton University and in 1992, he earned a M.Sc. in the Sociology of Scientific Knowledge from the University of Edinburgh.

Gerald E. Gallwas was a member of the original team in the mid 1960s that founded and managed the growth of what became the clinical diagnostic business of Beckman Instruments. As the business grew, he served in many roles from new product development to directing clinical field trials in the US, Europe, and Japan. This led to an extensive involvement with professional and trade organizations as well as regulatory agencies. He retired after thirty years of service as director of program management overseeing new product development programs.

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INTERVIEWEE: Willis Humphreys
INTERVIEWER: David C. Brock and Gerald Gallwas
LOCATION: Fullerton, California
DATE: 7 March 2002

BROCK: What I'd like to do is pretty simple. I'd like to talk about your experiences, so it's not a quiz—there are no right or wrong answers. I thought we could just move chronologically and I'll ask questions as we go along.

HUMPHREYS: I didn't have many experiences! [laughter]

BROCK: When did you join National Technical Laboratories [NTL]? I think the firm was called that at that time.

HUMPHREYS: National Tech, yes. I joined 31 March 1938. Are you interested in what I was doing?

BROCK: Yes, let's talk a little bit about what you were doing before that.

HUMPHREYS: Before that? I worked for a small company up in Pasadena, building police transmitters, and that went on for a while. Finally, I was laid off because of lack of work there. A few months later, the boss of the place called me and said, "Go out to 3330 East Colorado Street and see a mason." I imagined that I was going to be building masonry walls! [laughter] Anyway, I went out there and they needed somebody to lace cables. I took the job lacing cables, which I did for quite a while. I got pretty good at it. Dr. [Arnold O.] Beckman used to bring people around some of the people from Caltech [California Institute of Technology]. They used to come down there and they'd stand around and watch me lace cables. Now, that was kind of exciting. It used to really make me nervous! [laughter] Anyway, then I went into wiring instruments and making resistors. I did the layout for a new cable for new instruments as they came up, made cable boards, and got into it pretty good there. I got into some of the testing of it. I did do some of the design work, the laying out of the instruments. Of course we started to make the Helipot [helical potentiometer] back in about 1939, I think? Yes, I guess it was about 1939 when we started to make the Helipot. I know that the fellow wound the cores on the lathe and I helped put them together in little containers. So that was a pretty good experience there.

BROCK: Perhaps you could say some more about what National Technical Labs was like when you joined it in 1938. What was the facility like? How many people were working there?

HUMPHREYS: Yes. I think there were about fifteen of us, I guess, when I started. It was just a little building with a flat roof and of course, in the summertime it got pretty darned warm. It was not super big, but it had a front area for the offices and then towards the back was the machine shop and it had the glass shop, of course, in there. The back end of it was the assembly area that I worked in and behind that was shipping. The whole thing wasn't really too big, but I know the glass shop was probably one of the bigger sections of the group. I remember Dr. [Warren] Baxter was, I think, the head of the glass shop, and Johnny Simpson ran that. Who else? Let me think. I can't remember the other fellow's name there. One other fellow worked there with Johnny Simpson in the glass shop—Sid Parker. Of course, they blew all the electrodes and made standard cells. They made all the standard cells for the Model G. They weren't making hydrogen lamps at that time because we hadn't made the spectro [spectrophotometer] yet. Probably they were making something else in there, but I can't recall now.

BROCK: Who were some of the other employees at that time?

HUMPHREYS: Oh, boy! You're stretching my memory. Well, in the office was—I can't remember the girl's name. They had an office girl and Clair Mason. Clair Mason was the one that hired me. He was the production manager, or plant manager, I guess you'd say. Clair died last year. Then Jimmy [James] Salzer was the accountant. He did all the money stuff. Then, of course, Dr. Beckman was there. I guess when I started there, Dr. Beckman was the Vice President. He wasn't even president at the time.

GALLWAS: Who was president?

HUMPHREYS: What was his name? Golly, I don't know. Green? That doesn't sound right. I can't remember who he was. [laughter] My memory is not all that good. Anyway, Dr. Beckman finally quit Caltech. He was teaching a course out at Caltech at the time, so he quit there and then he took over full time there as president of the company. At that time, we were making the inks for the ink company. There was a fellow there—oh boy! What was his name? Arno Savage—he made the ink for that.

BROCK: Those were in small batches?

HUMPHREYS: Yes, because we were a pretty small company at the time. [laughter] I do remember him making the ink, and of course, then there was Russell Vanaman. Russell Vanaman was kind of in the wood shop. Russell Vanaman is the one that went in with Howard [H.] Cary there as far as making the applied physics. They went together and started that. Then of course, Howard Cary was the chief engineer. There was a fellow in engineering by the name of Test, but I don't remember his name. [laughter] That's what he went by, "Test." That's the only name I ever heard for him. Who else was there? Frank Traphagen ran the machine shop. He was the only machinist. Frank did everything. Let's see, Frank Traphagen. Frank Camarda. The other ones—there was one that kind of helped me. I can't remember his name. I'll think of it. Carter?

GALLWAS: Will that help?

HUMPHREYS: It might. Yes, Johnny Simpson. Charlie Donaldson. Thank you. Yes, Charlie Donaldson. He's the one that was there doing the cable lacing before I started. He taught me how to do it. Let's see. There was Traphagen, and my boss was Dick Fisher.

BROCK: In addition to the production of the ink and production of the pH meters, was NTL doing any contract research or one-off research projects?

HUMPHREYS: No, not that I know of. When I started, we were making the Model G pH meter and the Model M pH meter. Then a little later on they came up with the Model R pH meter, which was an industrial pH meter. I did all the layout work on the cabling and the wiring and all that kind of stuff. That was pretty much all of it over there in Pasadena.

GALLWAS: What pH meter was it that you used to build the micro-microammeter?

HUMPHREYS: We used the Model R and redid that one, but that was later on. That's when we moved to South Pasadena, in 1940. I don't remember the month. Do you? Were you there? [laughter]

GALLWAS: I was more than a twinkle in 1940, but—

HUMPHREYS: So that's pretty much the instruments we made. Of course, we did make some other special ones, like the Sugar Model G, the Sugar G they called it. I guess it was just strictly for the sugar industry. I'm not too sure just why they needed that in place of the standard Model

G, but it was a little more precise of an instrument than the other one. I think that was all the instruments that we did over there in Pasadena.

BROCK: Would you say a little bit more about making the Helipot—the potentiometer? What was the story of that?

HUMPHREYS: All right. I think my own idea is that Howard Cary was the one that did all the work on it. I'm not too sure just how much Dr. Beckman played in the part of that. He probably came up with the idea. I think he patented the idea of the helical part of it and developed that, but then Howard Cary is the one that carried it through and produced the actual working models. Then this fellow Test was hired and he made a winding machine to wind the core. It wound the core and put the fine wire around the main core and did it in such a way that it would measure the resistance and vary the speed of the wire going through so that it would give you a linear winding. Then he had to brush the enamel off of the wire to make contact to it and it would make measurements as it was going through the machine. Test was a pretty smart guy. He was the one who started that method of winding these things and making them linear. Charlie Donaldson was put in charge of the winding machine, so he did all that. It wound the core and then coiled it in a spiral, cut them off in ten turns, got the wires out, and then we put them into the case for the Helipot. I used to do that, mainly, assembling them over there. It was fun.

BROCK: Maybe we could stay a little bit in this period before the move in 1940. Once Dr. Beckman left Caltech and was working full time at NTL, could you describe his role and his day-to-day presence in those days?

HUMPHREYS: Well, I can't really tell you too much about that because I was in the back end and he was in the front end! [laughter] The main contact that I had was when he'd come back in the plant and talk to the workers a little bit and then bring people back. That was the main thing. Except one time when, after I was there for about—well, see, I was hired as a temporary thing. They had a splurge on the Model G pH meter and so they needed additional help. I was hired just to lace the cable for a while. So after maybe a month or so, he called me up in the office—he used to call me “Willie,” at the time that's what I went by—“Hi, Willie,” he said. “Well,” he said, “how did you like working here?” [laughter] I thought, “How'd you like working here? Oh boy!” [laughter] I answered, “Nice.” He said, “Well, you've been doing a really good job. So, I'm going to give you five dollars more a month.” So I got a five-dollar raise. I went from sixty-five dollars up to seventy dollars a month! [laughter] Other than that, I didn't have a whole lot of contact with him, except at Christmas time. We'd all get together—here's a picture. I guess this must have been about the second Christmas. I'll be darned, 1938; it's the first one. All right. So, that was pretty good. He used to come out and he'd play the piano.

ASHTON: He kept you from going to the war.

HUMPHREYS: Well, that was quite a bit later.

BROCK: What was your interaction like with Cary? Is there anything else that you'd like to say about the other people who were working there at that time? Your impressions?

HUMPHREYS: Well, Howard, of course, I felt did all the design work on the instruments. Then, Baxter—do you have his first name? Anyway, the Baxter that was in the glass shop, he designed the standard cell—at least that was my understanding—which was a pretty important one for the Model G. But because I was just a young kid—eighteen or nineteen—I didn't really get in with the engineering group too much, so I really can't say much about that. All I remember is I thought he was a pretty smart guy, [laughter] at least at the time that we were over in Pasadena. A little closer there in South Pasadena. I worked with Howard a little more there.

BROCK: What was your sense about what business was like? You were just mentioning you were hired on because of a crunch in meeting orders for the Model G. Did that sort of crunch never end for the pH meters?

HUMPHREYS: Still hasn't ended! [laughter] No, we kept getting more and more orders and then more orders for the Model R, which was used in a lot of the manufacturing plants and the water industry. We had them out in Covina [California] in the water plants there and they used it to check the condition of the water. They had some of them down in holes down in the ground, and in various other places around for monitoring the water conditions. Sugar manufacturers used them because they added acetic acid to the sugar to make it crystallize properly, so they had to know what the pH was—how much acid they had. So they developed a flow meter—a flow electrode—so that the sugar would go through it and it would measure the stuff as it was going through. Then that went to the controller. We built a controller so that it would turn the valves on and off and put the right amount of acetic acid into the sugar.

BROCK: When did you do that whole system? Was that before the move?

HUMPHREYS: Yes, just before the move.

BROCK: Could you say a few words then about the move—what that entailed and what changes that brought about?

HUMPHREYS: Well, I remember them building the place, and—what did he pay? A quarter of a million dollars for the place? Some fabulous amount, I forget, at the time. The move was fairly easy except that when we got into the place, well, it was like a big warehouse. I mean, they had a few benches here and a few benches there, you know. There were not too many of us at the time in this pretty big, big building, you know. The whole bottom part of it was the machine shop. We had half a dozen pieces of equipment down there in this great big place. We thought we'd never fill it up. But that didn't last too long! [laughter] We got that filled up and had to build another building on top of it in the back end. Let's see, what else on the actual move? It didn't take us very long to move because we didn't have a whole lot to move. But it was pretty smooth. We might have set up a few benches and then went back into business in a very short time.

BROCK: When did you first become aware of the effort to make a spectrophotometer? Was that closely following the move?

HUMPHREYS: Let me think. I don't remember too much about the very start of it. Our group—at that particular time I think I was working for Frank Camarda. He was the supervisor—the head of the group of the electronic section, and we made the electronics for the spectro. Now, they had another department where they actually did the assembly of the spectro, so that was not our particular area. It was another complete group that made the spectrophotometer. We made the electronics. Other people did the assembly of it, and put the electronics in with it to make the final instrument. So I didn't get into the actual guts of it.

BROCK: Could you tell a little bit more about the story of the development of it? Did you come in once they already had designed the electronics, or was there some trial and error there?

HUMPHREYS: Oh, I'm sure. The thing is that this all was taking place in the engineering department where they developed it, did the work on it, and got it in the final stage before we went out. I remember that Russ Vanaman was the head of the drafting section over there in South Pasadena and I remember all the drawings and so forth that they had for the spectro, but actually getting into doing much with it—I didn't get into that. I remember seeing it over there in the engineering group. I used to go over there occasionally and see what was going on, but that's as much as I got into it.

BROCK: Was there a pretty rapid increase in production? Did you find yourself working on it a lot in fairly short order, or did it take some time to build?

HUMPHREYS: Well, I think it started off slowly, but then I'm pretty sure it did increase fairly rapidly, yes. The DU spectro seemed to become a pretty good seller, so it did increase rapidly.

BROCK: Were the electronics in the DU very similar to the electronics arrangement, the design, and the components that you'd been using and familiar with from the pH meter?

HUMPHREYS: It was pretty much the same circuit. A vacuum tube voltmeter is really what it was, so it was quite similar. But the first one had its own batteries inside of the spectro on the bottom part of it and, of course, the electronics were in there too. It's a photo cell. The photo cell is another thing that they made there at the plant, as well as the hydrogen lamp for it. Then we in the electronics section made the hydrogen lamp power supply for it. I remember I did have something to do with the layout and the making of the hydrogen lamp power supply. I did that, and a cable board, and I taught people how to lace cables and that kind of thing. I can't tell you too much about the spectro itself or all the little details of it.

BROCK: Did the glass shop have the responsibility for making the photo tube and the hydrogen lamp itself?

HUMPHREYS: Yes. Dr. Baxter is the one that did that. I think he was the one that did all the design work on that.

BROCK: He had joined NTL rather early, hadn't he?

HUMPHREYS: He was there when I started, yes. So it would have been 1936 or 1937.

BROCK: Right. What about Henry Fracker? He was another early person I think that helped facilitate Cary joining.

HUMPHREYS: He wasn't there when I got there, so I don't know. I've heard the name, but I don't remember the man.

BROCK: Could you describe how production worked in South Pasadena? That's probably something I know the least about. I know a little bit more about it at the earlier stage. The

electronics group is producing the electronics, the glass shop is producing all sorts of tubes beyond the—

HUMPHREYS: Yes, they made all the electrodes, and the photo cells, and the hydrogen lamp itself, and the standard cells. That's pretty much what the glass shop did. Of course, each group made their particular portion of it and then it would all come together. The electronic portion would get the panels that were made in the machine shop and all the other parts to go along with it. The machine shop would make quite a few of the parts, and then we'd get all these things and assemble them, put them all together. I remember in South Pasadena, I taught the people to lace cables because I got out of that. Well, actually, not too long after we moved, I was moved into supervisor of the electronics section for mainly the Model R, because that started to grow quite a bit. Also I was doing more work assembling the Helipot. Of course, the Helipot grew because they needed those for the service, and so we were working ten to twelve hours a day making Helipots, and then the Model Rs also. That was growing quite rapidly. So I made quite a few Model Rs, and I had about six people working for me in assembling the Model R. In fact, I can't remember now. We did the Model R and also the Helipot. I'm trying to think of how that all fit together. I know we were working on both of these things because we had worked, you know, twelve hours a day putting the Helipots together because they had such a big requirement for that.

BROCK: Let's take one step back before getting into that story of the Helipots. Could you say some words about the post-assembly production process? I'm interested in what sort of quality assurance or quality-control practices National Technical Laboratories had. How did you test the electronic systems coming out of your section? What did they do to test the tubes? At the end, once the instrument was assembled, was there testing then?

HUMPHREYS: Yes. Well, we had our own quality control. In fact there was one time when—gee, when was this—probably in 1940, Dr. Beckman got a letter from somebody—some higher up, some big shot back East—about the fact that his pH meter stopped working, and they found an unsoldered connection. So, we all were gathered together. Our boss got us together and—

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HUMPHREYS: —just you didn't make mistakes, you know, and you didn't really have a quality control group. [laughter] You don't make errors like that. That's pretty much the way it worked there for quite a while. In fact, I don't remember having any kind of an inspection group up there in South Pasadena. I don't think there was one.

GALLWAS: A very modern concept.

HUMPHREYS: Yes. So it was just one of those things where you did the job and you did it right the first time.

BROCK: Was there a final test on the instruments before they were shipped?

HUMPHREYS: Yes, definitely. They went through testing. Of course, like the standard cell, it had its own test. It had for quite a while and they had to run those for a number of weeks in order to make sure that they were right. The lamps that they made, the photo cells and the other units had all their individual tests. Yes, they had everything set up that way. Then the for electronics, of course we had a couple of people who would do the final testing and run them through to make sure that they met all the necessary requirements.

BROCK: Where were you getting your electronic components, like your vacuum tubes? You weren't making them in-house, were you?

HUMPHREYS: No, we didn't make the vacuum tubes for the units. We bought those and then we tested those, and then we had to process them. We had to coat them with a sealer we put on the top. Anyway, we put a wax-type material on the top and then aquadag on the bottom portion of the tube for sealing. So they all went through their own individual test.

BROCK: Could you talk about the changes that the war brought about at National Technical Labs? You mentioned the tremendous demand for the Helipot from radar.

HUMPHREYS: Well, gosh, what year—1941? We started making the RXG. I think it was 1941. There was a need for the micro-microammeter. My understanding was that MIT [Massachusetts Institute of Technology] had worked for a couple of years on trying to produce an instrument for this purpose for a radiation detector and didn't have success. Dr. Beckman was back there at one time at some meeting and he told them, "We have something on the shelf that'll do the job."

He came back and talked with Howard Cary about it and they agreed that they could do this. So Howard gave me some circuits, modifications for a Model R that we had, the pH meter, and so I went ahead and rebuilt the Model R, and determined that it would work for that purpose. But there were a number of modifications that had to be made. MIT probably had the biggest problem with the input tube.

The problem there was that the current—see, this was down to one micro-microamp for a full scale reading on the meter, and even without any input on there, you'd get a reading maybe half scale. So you had to get it down to a point where it was almost zero, you know, to make it work properly for them.

So Howard and I did a lot of research on that, and he finally came up with an idea of the fact that there must be a voltage being generated someplace in the system that the instrument was measuring. So he told me to take the cap off the tube, and we would paint an aquadag around where the wire comes through the glass.

GALLWAS: Paint a what?

HUMPHREYS: Paint it with aquadag. It's a carbon material. You paint just the very top of it, less than a quarter of an inch around the top. Because what he figured was, where the wire was coming through the glass was a different of potential between the glass and the wire and it was creating a voltage. So by painting around here, this would short this out. Sure enough it did. I did this, made tests of it, and we were in business. Then we had to glue the caps back on again. So I made thousands of tubes! [laughter] Anyway, I had to test each one of them to make sure they would work properly. But that was one of the bigger things that made this whole system work. That was the Model RXG, which later on I find out was used to control the reactors up in Hanford, Washington. It actually would control the reactor and also the water that they'd let out. When they'd extract the plutonium from uranium the water was used for cooling and would become radioactive, so they'd have to let it out in a pool for quite a while before it was usable and could be put back into the river. They used these instruments also for checking that. So, it was kind of an important instrument.

BROCK: This was taking place in the midst of a very large scale-up for just the production of potentiometers themselves?

HUMPHREYS: Yes. In fact, that business got so big we had to spin that off into a separate group. They called it the Helipot Corporation. So that was a pretty good-sized operation.

BROCK: Is that what quickly led to the filling up of the South Pasadena facility, with the Helipot activity, or more work in general?

HUMPHREYS: No, I'd say that both pH meters and the spectrophotometers were the two big things down there. The Helipot was one that added to it and it got to the point where it required more space. They had to really increase the volume very quickly on the Helipot, so that's why they started up the other completely separate operation.

BROCK: I guess you talked about how the Model R demand went up during the War [World War II], and similarly for the DU.

HUMPHREYS: Yes, the Model R during the War was used because they couldn't get rubber. They needed to make synthetic rubber and the Model R was the thing that was needed in order to produce synthetic rubber. That meant that the volume on that went up quite a bit. I can't remember how many we made per month, but probably between twenty-five and fifty a month, which at that time was pretty good production.

BROCK: Was it during this period that there was the development of infrared spectrophotometers? The IR-1 happened during the War.

HUMPHREYS: Yes, well again, that's a little out of my area.

BROCK: You weren't involved with the electronics of that at all?

HUMPHREYS: Well, the IR-1 was something that was developed by Shell. Quickly after that we went into various other spectrophotometers of our own. I think probably the most important instrument that we made was that RXG for the Atomic Energy Commission up there at Hanford, Washington.

BROCK: Do you recall when Arnold O. Beckman, Inc. was established? Was there any interaction there?

HUMPHREYS: It was probably the late 1940s.

GALLWAS: There is probably nobody that knows at this point. Do we know the employees of Arnold O. Beckman, Inc.?

HUMPHREYS: Well, wait a minute, now. Who was it that worked there?

GALLWAS: Do you have a picture of Arnold O. Beckman, Inc. employees? Didn't Bob Marasco start over there?

HUMPHREYS: No, I don't think so. Somebody I talked to just recently is one who started over there in A. O. Beckman.

GALLWAS: We need to find that person.

ASHTON: I can give Bob a call.

HUMPHREYS: I'm pretty sure he did. If he didn't start, maybe Bob knows who did.

GALLWAS: Arnold O. Beckman, Inc. is sort of a clandestine operation because while it existed during the War, it wasn't incorporated until 1946.

HUMPHREYS: Really? That late?

ASHTON: They were making something special just for the War effort.

GALLWAS: That's correct. A. O. B. had it all under his control. Unless we get somebody who was there and knew what went on, we're never going to find out.

ASHTON: What products were they making?

HUMPHREYS: Well, we know what they were making.

GALLWAS: Yes, but we don't know anything about the operation.

BROCK: Initially, I think he organized it as a sole proprietorship.

GALLWAS: Yes. He was turned down by the Board.

HUMPHREYS: Yes. He was making a little oxygen deal, dumbbells, and—well, I know somebody worked over there at A. O. Beckman. If it wasn't Bob Marasco—it might be that Bob worked at another location in the spectro group down there rather than AOB. Yes, but there was somebody else I was talking with that worked down there at AOB.

GALLWAS: So you would have seen him here?

HUMPHREYS: Yes. If I think of his name or run across this individual, I'll have to let you know.

BROCK: Just to return to those War years then, could you describe your particular responsibilities? You were supervising the production of the Model R. You were involved in the RXG as well. Did the organization of NTL change to reflect the change in size, the growth in the number of products on the production side? How was that accomplished?

HUMPHREYS: I don't think it changed. It just grew. I don't think there were any real obvious changes that took place.

BROCK: It was just a case of more or less adding people with specialized responsibilities?

HUMPHREYS: Yes. I was working for Frank Camarda, who was the supervisor of the electronics area and making the Model G and the Model R and some of the other pieces of electronic stuff, like things for the spectrophotometer. Then I was making the Model R under him, but I was actually in a different area by myself with about four or five people and we were just making this Model R. That's all we were doing, along with the Helipot that we were putting together. Then it was decided that I would move that into a separate section, this Model R. I was given that as a separate group and was put over that. So that's kind of the way it grew.

BROCK: How long was the Model R produced?

HUMPHREYS: Oh boy! It would have had to start in 1939 because it was started over in Pasadena—we started there. Then it was produced for quite a few years. My memory on years is not at all good.

BROCK: Was it produced into the 1950s?

GALLWAS: Did you produce it down here?

HUMPHREYS: No.

GALLWAS: That's all right. It's not important.

HUMPHREYS: Probably early 1950s would be my guess.

BROCK: Pat [Patricia Ashton] alluded earlier to a story about Arnold Beckman getting you a deferment or something during the War? You must have been eligible for the draft.

HUMPHREYS: Yes. I was in 1A and out of 1A a number of times, and I used to—my draft board was up in Altadena [California], which is 10 miles north of South Pasadena, and every—what was it—six months or three months? I forget how long it was that we had to go up there, but I'd have to go to the draft board and Beckman would go with me. We'd sit down and talk to the guys and he couldn't tell them why it was necessary for me to stay there or what I was working on, but he assured them that it was something that was necessary. So, I kept getting deferments. This went on for quite a while. I finally got a call to go down for an examination, which I did, in Los Angeles. Then one day I got a notice in the mail that said I was to appear for induction and it said to tell my boss. I got that on a Thursday and I went to my boss, which at that time was Clair Mason, and I told him. I showed him the card that said I was supposed to appear. He picked it up. He picked up the telephone and called some general. I'm not too sure who it was, but it might have been pretty high up. I don't know if it was the Secretary of War or who, but he called somebody and the guy said, "Tell him forget it. Just forget all about it." [laughter] So I did. I never heard from them after that.

BROCK: Was that because of both the importance of the RXG and the Helipot?

HUMPHREYS: Mainly the RXG, because by that time I think the Helipot was starting to be spun off. Yes, there was some general that came to the plant. He got us all together in the little plant and talked about the importance of the—actually the Model R and the RXG—to the War effort, but we didn't know for sure just what this was for. Never did know. We knew we were sending them to Hanford, Washington, but we didn't know exactly how they were using it, what it was for. The atomic bomb was an extremely well kept secret. I guess Dr. Beckman must have known, I would assume, but, boy, not too many others. It was pretty well kept.

BROCK: How did things change when the War came to a close, both in terms of your work and the firm?

HUMPHREYS: Well, I don't remember it slowing down any, which you might have thought would happen. It kept on going and we kept increasing our workload and expanding. Then they had to build the building on the back of the one at 820 Mission Street. They built a two-story affair back there—three-story building. But I don't remember the year.

BROCK: How large had the company grown by the end of the War? When you started, there were fifteen of you. It must have been increased considerably in a very short amount of time.

HUMPHREYS: Yes. I would say—let's see—that picture up there is one that was taken at a Christmas party—well, it was still National Tech—that was 1942. By the time we moved over there in 1942 it had grown quite a little bit. Then in 1945, at the end of the War, well there were maybe a hundred fifty people, maybe even as many as two hundred.

BROCK: When did Vanaman and Cary depart?

HUMPHREYS: Well, we were still in the front building up there. They hadn't built the one in the back. I see Howard in that picture.

GALLWAS: What year was that?

HUMPHREYS: That was 1942.

GALLWAS: Well, he would have to have been there through the IR-1 and the IR-2 because he was the principal designer on the IR-2, so that would have taken it up to the 1944 through 1945 period.

HUMPHREYS: I would guess that it was right about 1945. That would be my guess because I know he was in that building there, which was the front building. Then when we built the new building up there, but I don't remember when.

BROCK: Was that departure quite disruptive, or not so much for you?

HUMPHREYS: Well, it wasn't disruptive for me at all. Before he left, there was another fellow that was hired for engineering. Rolly Hawes—he was the one that took over the engineering group when Howard left. He was another sharp engineer, so he was able to carry on and there wasn't too much disruption there. The only thing was that Russ Vanaman was the one that did all the drawings and so forth, but there were a whole lot of things that he didn't have drawings for. It was all in his head. So that was a bit of a problem. We had to struggle there to go back and try and recoup all the information from a lot of the material that had been built.

BROCK: How did your work and your responsibilities develop in the post-War?

HUMPHREYS: My particular ones? Well, I was made supervisor and I kept that job right along, until the end really. I was my boss's assistant. John Spray was my boss. So I took over whenever he was gone.

BROCK: What was his title?

HUMPHREYS: Production Supervisor.

BROCK: Your responsibilities were which part of the production? What products were you responsible for?

HUMPHREYS: Well, my group did all of the electronics for all of the instruments. I had a day and night shift. At one time I had about a hundred forty people working for me. They made all the component boards before that was spun off to Porterville. They did all that. We made all the LS instruments, the liquid-scintillation radiation-type instruments and the oxygen analyzers, and just everything that came along—almost all of the instruments. We did the electronics, but for those that were strictly electronic instruments, we did the complete assembly. Spectrophotometers were another group. We had a spectrophotometer section or department so all those instruments were made in that particular area there.

BROCK: You held that position until when?

HUMPHREYS: Until 1981. I moved to Irvine. Here in Fullerton I was doing the nuclear instruments and most all of the other electronic instruments, other than the spectrophotometer. Well, we made the electronics for the spectrophotometer. Then things got too big, so we spun

off the boards—the component board making—up to Porterville. We started the Porterville plant. So they started doing that work. I took all my equipment and everything else and had a pretty big plant up there making component boards. Also, Frank Camarda had another section where he built a lot of the sub-assemblies for various instruments. Let's see, what else got spun off? I forget now. Anyway, the making of most of all the other instruments—about the time we moved down to Irvine, all the instruments were spun off, again to Frank Camarda. Then I took over and did the nuclear instruments down in Irvine. I did all the assembly, the testing, and complete packaging of the liquid-scintillation instruments.

BROCK: What period was that?

HUMPHREYS: What did we do? In 1962 we moved down to Irvine, Jerry? Did we move to Irvine in 1962?

GALLWAS: No, it was after that. Because I was here. Maybe 1972?

HUMPHREYS: I guess so. Yes, we were down here. It had to be 1970-something.

GALLWAS: The problem was growth and clinical wasn't big enough to move out. We didn't move until the end of the 1970s. So it had to be about 1972. We can look it up.

HUMPHREYS: Yes.

BROCK: So you're supervising the production of electronics for instruments from the early 1950s into the 1970s. Is that correct?

HUMPHREYS: Before that.

BROCK: Before. Into the 1940s?

HUMPHREYS: Yes.

BROCK: All right. I mean, that's an amazing time in electronics because you are going from tubes to solid state.

HUMPHREYS: Yes.

BROCK: I was wondering if you could share some thoughts about what that transition was like.

HUMPHREYS: It was a different way of assembling things because we went from a lot of wiring, where the people—mainly the girls— would do individual wiring, a harness, hooking up the wires to the various components, to where you'd have the transistors assembled on component boards. That meant that there was very little actual wiring involved and it was just a matter of mainly connecting the boards to the potentiometers and the external parts. It did make quite a difference in the wiring, so that was a change there. But there was still quite a bit of wiring that had to be done. Things had to be hooked up from one place to another, and still you had to hook the connectors from the component boards to someplace. As this production grew, it meant that we didn't really decrease the number of people that were doing the wiring. You stayed the same or kept going up a little bit. So it was quite a change, but people did learn to do something a little different.

[END OF TAPE, SIDE 2]

BROCK: Did you notice any other difference though, in moving from the tubes to the transistors, in terms of the reliability of the electronic components you were using in production? Were they less dicey than the vacuum tubes?

HUMPHREYS: Yes, I think they became more reliable with a longer life, less heat. Heat of course does most of the damage.

BROCK: Were you using components that were made by the Helipot division at that time? Part of Beckman Instruments was creating electronic components.

HUMPHREYS: Of course, we did use the Helipot in most all the instruments because it was designed originally for the Model G and the Model M. So it was continually used for most all the instruments, anyplace where you need a varied voltage.

BROCK: Further than that wasn't that division also making transistors?

HUMPHREYS: No, I don't think they made transistors.

BROCK: All right. Maybe they made different—

HUMPHREYS: They made—what do they call it? Where they had a group of resistors maybe in a small package. I can't even think of what they called those now. But they're integrated, kind of an integrated circuit, mainly just resistors. I don't think they made any transistors.

BROCK: All right. Let's see.

HUMPHREYS: By the way, after I got into this nuclear stuff, making those instruments, and finally the fellow that was in charge of the spectrophotometer testing group—they had a group just to test the spectrophotometers, the bigger ones—he wanted to go back to, production engineering, I think it was. My boss decided that I would take over that group [laughter], so I left the nuclear section and became in charge of the spectrophotometer testing. We did all of that work. That's what I did when I left.

BROCK: What was that like? Can you describe that?

HUMPHREYS: Well, I can describe the fact that the department was in pretty bad shape when I took over. I did make quite a number of changes there and got it back into the point where we could see what we were doing and get it running properly. That was an interesting job, getting things back in shape.

BROCK: It had just suffered from inattention or something?

HUMPHREYS: Well, customers would order instruments in a certain configuration. They didn't know what the customer was going to order, yet they would build instruments in various types and then store them to wait until a customer would order something like that. That wasn't the way that I operated the other nuclear section. I would start off by getting together with the sales group and finding out, "Now, what have we got ordered? What's the customer want?" We'd sit down and make a list of what was required there. Then I'd make up a list of all the different kinds of instruments that they wanted and I'd check and find out what was already made. My office girl went through and found out what was already made, made a complete list of that. I found out what we could use for shipping without building new ones, because there were maybe a hundred instruments or something like that were sitting around on skids. Well, we finally got that thinned down and then I made some other reports and things that were used

by the groups that made the instruments originally, to tell them what style instrument to make and then to inspection. It started to run pretty smoothly after that. That worked out all right. I did about the same thing with the nuclear thing.

BROCK: Yes, I was just about to ask you.

HUMPHREYS: It was pretty much the same sort of thing. That was something that required this. The way I got this, the supervisors went to meetings where we'd go out to different plants. We went down to the automobile manufacturing plant in one of the places in Los Angeles and I noticed that everything was going together. Frames were picked up, put on the line, and the motors would come and fit in here and then the bodies would come down, and the wheels. It all meshed. I thought, "Hey, why can't I do that with the instruments?" So that's what I did. We had certain things that we had to build, like boxes for the component boards where they'd slide in. They had to be made a certain way for particular instruments. So I made up a list and gave that to the people who were assembling these boxes and to the other people were making different portions of these instruments. I had six, eight different lists that I would spread out to my people and they would make them in that order so that they'd all come together and it worked out real well. So it made things run pretty smoothly.

BROCK: So that's a quick run-through of your career. What I wanted to know about were more of your general reflections in looking back on that career, the change of the firm over time, the change of the industry, maybe more broadly, and just your thoughts about the changes in electronics, the changes in the instruments.

HUMPHREYS: Well, things really changed when the transistor came about and there was a learning curve. I had to get to school and learn a little bit about transistors. Of course, I'd been in the electronic stuff all my life. That's the thing I was interested in, so I would play with that at home. Probably one of the reasons why I didn't advance in the company all that far was because those that were going up the ladder were spending most of their time at the plant and going out with their bosses playing golf and so forth and I wanted to get home and work in my shop on my electronics. [laughter] So that's probably one of the reasons why I didn't go up too far, but I was happy with what I was doing. But going into the transistors—of course that did change everything, and things became smaller and more reliable. It was probably the biggest change that took place. I don't know what else I might mention as far as the company is concerned.

BROCK: You really saw it go from a very small operation to an extremely big one. Do you have any thoughts about that?

HUMPHREYS: Yes, I wasn't in a position where I could say I was either affected by the changes too much or didn't see all this change. I was into the business of doing the assembly and all that kind of stuff. I didn't get into seeing as many changes as I might. There were changes in my bosses' bosses, some of which were not to my particular liking. [laughter] Anyway, it all worked out.

BROCK: Great.

HUMPHREYS: Jerry [Gallwas] was never my boss! [laughter] Or boss's boss.

BROCK: Well, thank you very much, Will. That covers the questions I had.

HUMPHREYS: I probably wasn't able to add as much as some might that might have been in little different areas at various times.

GALLWAS: Did you talk to him about Howard Cary, the person, and what his input was?

BROCK: No, I didn't, other than that he was extremely smart and actually was a realizer of certain things, but that is an excellent question.

HUMPHREYS: Yes, I think he could visualize how things were going and he was one of the nicer kinds of guys. He wasn't snooty or anything of that sort. He was just a real nice guy.

GALLWAS: Did he have the reputation of being honest, credible? How was he thought of?

HUMPHREYS: Yes, as far as I know, he was considered to be honest and of course very intelligent. More than that, I don't know.

GALLWAS: There's quite a controversy between what Dr. Beckman believes happened and what others believe happened, about why Cary left. This particular article in the *Times*, which you may recall, says, "One of Beckman's few business mistakes came early (1). Among his top engineers in the late 1930s was Howard Cary who helped Beckman design the Model-B spectrophotometer, a device that revolutionized laboratory testing by allowing researchers to analyze chemical compounds in seconds. It was a big moneymaker for Beckman but Cary thought he could re-design it and make it better. Arnold said, 'Why?' recalled sixty-year-old

Peter I. Lipman, a patent attorney in Montrose”—who I have to look up—“who later worked for Cary. Cary and a handful of other engineers interpreted Beckman’s decision as choosing profit over science. That was the beginning of the end as far as Howard was concerned. He took off and started his own company.”

HUMPHREYS: Yes, I think that’s pretty much the way that I understood it.

GALLWAS: Is that right?

HUMPHREYS: Yes, and also I think Howard and Dr. Beckman disagreed somewhat on wages. I know that during the War wages were frozen, but Howard thought that there was a way around that and he should be paying some of us a little bit more money, but I guess Dr. Beckman didn’t agree with that. So [laughter], it was another one of the contingents there.

GALLWAS: Wages *were* frozen during the War, weren’t they?

HUMPHREYS: Yes, but I guess there were ways around increasing the wages somewhat.

GALLWAS: Yes. Well, thank you.

HUMPHREYS: I guess Dr. Beckman had it set one way and that’s the way it was going to stay.

GALLWAS: Right.

BROCK: Well, thank you very much. I think we’ll switch this off.

[END OF TAPE, SIDE 3]

[END OF INTERVIEW]

NOTES

1. Martelle, Scott. "Arnold Beckman Seldom Found a Problem He Couldn't Solve. Until Now," *Los Angeles Times Magazine*, 2 April 2000, 34.

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