WILLIAM HEWLETT
ORAL HISTORY

COMPUTERWORLD HONORS PROGRAM
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Transcript of a Video History Interview with
William Hewlett, Co-Founder, Hewlett Packard

Recipient of the 1995 MCI Leadership Award for Innovation

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DA: Let's start with some of your background and upbringing and what led you into electronics in the first place.

WH: I guess I was a tinkerer. I like engineering things, and to get facetious, I got interested in electronics because I liked electronic trains. Except electronics had not been invented then. That was a much later term.

Actually I got interested in electronics per se after going to Stanford. They had a professor there who wrote <u>the</u> book on electronics, it was called "Electronics and Radio Engineering." His name was Fredrick Terman, and he influenced me and Dave greatly. Dave Packard had been a radio Ham and he applied as well to take this graduate course in radio engineering. I had not worked with radios yet, but I saw how he enjoyed it and I arranged in my graduate year to take this course. Terman was important really, the single person most important to our success.

DA: Was tinkering with trains or engineering, was that part of your family?

WH: No my father was a professor of medicine.

DA: So you had been familiar with the academic community?

WH: Well yes and no; the medical school was in San Francisco at that time, so it wasn't as tight a community as it is here, but it was a very academic community. I know my mother said that one of the more interesting experiences of her life was having her husband on the faculty.

DA: So did you study engineering as an undergraduate?

WH: Sure, I took a specialty in engineering, and in particular electrical engineering.

DA: And then you went to Dr. Terman as a graduate student?

WH: Yes, with Packard and a third person, Ed Porter, who was a close friend, and also a radio Ham. We talked then about doing a business together, but when I graduated it was 1934, and it was no time to be starting anything. So I took graduate years, and Packard was one of the few guys in the class who got a job at General Electric, and Porter worked for an air conditioning firm in Sacramento.

DA: How did you and Ed Porter meet?

WH: My connection with Porter was really through Packard. Porter was a Ham, Packard was a Ham, and Porter was Dave's friend. So that was the connection.

DA: But you were not a Ham at this time?

WH: No, I never was.

DA: Did they kid you about that?

WH: No, No. Ham radio was a very important program at that time. It still is really. At that time there were some very exciting things going on like the Atoll race to Hawaii. They had just developed aircraft radio, and this plane was flying over there and it had a generator for power. Now the generator would cause a whine in the signal, and the faster the plane was flying, the clearer the whine was. Lots of Ham radios tracking this plane and they heard the pitch go up and up and they realized the guy was going to power dive, and all of a sudden it stopped. They knew it went into the ocean. That was a dramatic example of Ham world getting involved in this.

DA: So the three of you became friends in college, and then you mentioned that Dave Packard got a job. How did your partnership begin to develop?

WH: Well, it didn't. I took graduate work and Packard went on at General Electric and Professor Terman realized that if he didn't intervene nothing was going to happen. So he arranged for Packard to get a scholarship at Stanford, and he would have to break his tie with General Electric. I was there, and after about two months we decided to try and make a go of it. So technically January 1, 1939 is when we started it, but that's an arbitrary date.

DA: But Terman was the person who encouraged you to go into business?

WH: Yes, that's correct.

DA: One of the things we're interested in is people who inspired people in various fields. Tell me your recollections of him and how he inspired you as a student.

WH: Well he was just a very fine teacher. He was way ahead of the field.

There's a background to all this. Early radio communications were high-powered communications, which were via an arc. You could generate kilowatts of signal that way, but it wasn't very efficient. There was a Dane called Poulsen, who invented the Poulsen arc, and there was a young Stanford graduate, an Australian by the name of Cyril Elwell, who went over and bought the patents from Poulsen without a nickel in his pocket, allegedly, and came back to San Francisco and sold his interest in this thing. Now that came to be Federal Telegraph, which is down here in the Bay area. There used to be a big tower there, a 600-foot tower. So that was the predecessor of all Silicon Valley. When it was bought and moved east, a lot of the men didn't want to move, some did, but there wasn't a vacuum left here. There was a whole plethora of trained people who also had entrepreneurial instincts, so we depended heavily upon that.

DA: I take it a lot of that was still Navy work at the time, Navy and well as commercial?

WH: Well I guess during World War I it was Navy, but all of this was primarily long distance communications. You realize before that they only thing you had was an ocean liner. Wasn't very fast.

DA: So when you began to come up with the notion of going into to business with Dave Packard, under Dr. Terman's direction, what did you want to do? What area did you want to specialize in?

WH: I like to say we had the arrogance of youth. We felt we could do anything. We had good training, and there were no jobs. So why not try to make a go of it? That was basically the reason. It was trial and error. We tried some things that worked, other didn't.

DA: Tell me about your early company. Was it just the two of you?

WH: Yes, and Packard's wife. They had a little house in Palo Alto and a garage, and a little house behind that I lived in so we could work around the clock. Lucille Packard kept the books, and we also used her oven to bake panels in, which didn't improve the flavor of the food subsequently. So she was part of it. Then I got married about a year later. So for the first few years our wives supported us. I think we took $50 a month at the time.

DA: What kind of projects were you working on at the time?

WH: Anything that would bring in any money; a foul line indicator for a bowling alley, a shock machine to make you lose weight, a clock drive for a telescope, any of these things you wanted done, we would take a whack at it. Sometimes we made money. Sometimes we didn't, but at least we learned to fly.

DA: What became your most successful early area?

WH: Well, one of the products was an audio oscillator. It was used to measure audio signals. I had done work on this during my engineering degree at Stanford. So we sent a few flyers out to faculty people and we got some replies back. So we sent out some more letters and got more responses. So we felt this was a good area, the field of instrumentation. So this is what we first got into.

DA: So instrumentation was your first specialty, and this business began to grow fairly rapidly?

WH: No, very slowly really. There was a war then and I had a reserve commission, so I was hauled into the Army Signal Corp. So during the war Packard had to run the company.

When I left there were 17 people. When I came back there were 250. Of course when the war ended, we had to cut back sharply on the number of people. That wasn't hard because a lot of them were women who wanted to get back to being homemakers.

DA: Did you go to Europe as part of your service?

WH: I went to Europe when I was a kid. My father, who was a professor, retired when I was only 12. So I was taken by my parents to Europe, and I traveled around for 15 months and got some understanding of what the European community was all about.

DA: During World War II where were you stationed?

WH: I was stationed in Washington. I was in the office of the Chief Signal Officer most of the time, and I was in the office of new developments division of the general staff. That's a special staff. I was sent to the Pacific twice; once to New Guinea to see how general communications were working, and I went to Manila on a program to introduce some new weapons detectors, mortar detectors. While I was there I was called and reassigned to an intelligence team to visit Japan. It was extremely interesting. I met all the top scientific people in Japan. And we had a very good team led Dean Moorehouse of MIT. He was really the head of the whole thing. It was a very interesting group of people. I enjoyed that thoroughly.

We got a good idea of what the Japanese were doing, and there are some interesting stories. We would learn that they were using fire balloons to set fires in our forest here. Professor Yagi was the Chief Scientist there. He was the equivalent of Van Bush here, except Van Bush had a great deal to say about what we were doing, and the Japanese scientist Yagi, didn't have anything to say – he was told what to do. So he was told to work on a death ray. He knew that wasn't possible, but he had to work on it anyway. So there was this conflict between the civilian and military community. We had the same conflict here but the private community prevailed. They had their own authority and the results were very bad. IFF is Identification Friend or Foe. Japanese Army IFF could not communicate with Navy. So if an armed plane would fly over a fleet that they did not know, they would shoot it down.

DA: That lack of coordination really hurt them.

WH: Yes it did.

DA: Did your company do defense work during the war?

WH: Very little. Basically we continued what we were doing in manufacturing test equipment. We had an essential part and we were good at it. We did subsequently take on some government contracts, but that was after the end of the war. So we were able to develop our own products during the war.

DA: Did you every have a question that you would come back to the company? Was it always your plan?

WH: Yes it was. As soon as I got out I dashed toward the company. I drove across the continent in three or four days and started immediately working at the company.

DA: What was the state of the organization at the time? Did you feel like you had a solid future? Clearly electronics was going to be a huge thing in the post-war era.

WH: Electronics was very different from when we went into the war and when we came out. Before we went in there were just a few areas; communications, entertainment, geophysical, and a bunch of things like that.

But the war demonstrated that it had many uses, so we had a lot of versatility to pursue some of these things. Sometimes we were successful, sometimes not, but we weren't afraid to try them.

DA: How did you and Dave assign the responsibilities that you had in the company in the early years?

WH: Basically we divided it. Packard had taken business courses in school and I had not. So he was more on the business side and I was more on the engineering side, but I have to say that is an over simplified, we both did both.

DA: So you continued to work in test equipment primarily in this era, across the spectrum? Did you sense that one area of your work was going to be more fruitful than another?

WH: In the instrumentation area, no. There was a competitor in the east that we followed very closely, General Radio, and they chose not to go into microwave, which I thought was a big mistake, and subsequently proved that it was a mistake, that microwave was an important area. But there were no restrictions. We did whatever we wanted to.

We also at one point were concerned that maybe electronics wasn't her to stay, per se, and we tried our at the agricultural business, helping in rural crops like sugar beets, to thin sugar beets mechanically. So you had a wheel on a tractor that went around and cut one plant and then go another eight inches and cut the next plant. It was a great, but it didn't always work, furthermore, the need for it vanished when they relaxed the immigration regulations. Then you get more labor to do this. But we spent quite a bit of time on this. It was a very interesting project.

DA: So you could pick out the projects that you wanted?

WH: Oh sure, but gradually we realized that our strength was instrumentation, and we said that we weren't going to do anything but instrumentation.

DA: I wonder what you thought were the crucial decisions that were made in those late 40's and early 50's to shape the future of the company?

WH: Well I would say that was one of them; that we wanted to specialize in instrumentation. It was a big field, a growing field, and we had a good position in it.

DA: Who did you think your principal customers would be? Was it other companies? Was it universities?

WH: It was universities, and other companies. As I said, we wrote to the faculties of many of the electrical engineering departments, and we got favorable responses and made more equipment. So we had a pretty good line of instrumentation of electronics, but back then electronics was a new word.

DA: Did you tend to focus on cutting edge research in this period? What would you say characterized your approach to the field?

WH: We concentrated on instrumentation and that covers a broad field. Eventually this led to computers, because the customer wanted data in forms that they wanted it, not in the forms of that the instrument gave it. So we needed a computer to control what product, also needed a computer to translate the results in a form that you need. So we got into the computer business that way.

There's an interesting sideline to that. We had previously reached a decision that we wanted to have our equipment meet Class B conditions, that's technical variation for line voltage and so on. So we wanted our computers to meet Class B conditions. We really had a large market that wanted a very reliable device. That was how we got into the computer business, by trying to solve the customers' needs but in so doing, choosing a course that made a very reliable product.

Another area that was in at the time was time-share. You could sign up for time on a computer, with telephone or teletype. But that had to have very high up time, because you couldn't sell time if it didn't work or you lost your program. Again, it was important that the reliability was there.

DA: So again you saw that your strengths in instrumentation when you moved into the computer field, but you in a different position than you other competitors?

WH: Yes, they did.

DA: Who did you see as your competitors in that area, or did you have any?

WH: Well, there were different competitors at different times. General Radio was always a competitor, and a good competitor. They were very helpful. The guy who ran that, Mel Vodisten, came out and talked to us. He said, "You know General Radio needs competition." That was interesting. He really helped us.

DA: When you think of early computer companies you tend think of IBM and later Digital…

WH: It was really IBM and Burroughs.

DA: Did you see those as being competitors, or were you in another part of the market?

WH: We didn't see ourselves as competitors to IBM, but we were and we competed successfully.

DA: So much of what people think about Hewlett Packard has to do with the way that you fit into the culture of this area. I wonder about that from your perspective. How important was it to be here rather than someplace else?

WH: That's the wrong question.

DA: Okay.

WH: I think the question should be, "Where did this idea of how you treat employees come from?" Basically it came out of the fact that we were out of the Depression era. We had seen what happened when people ran on borrowed money, or extended themselves too far. So we decided we weren't going to have a hire and fire company. We were going to try and have permanent employees as much as we could. We weren't going to borrow money. We were going to grow on earnings. And those factors were very important to the company in the early days because it restricted what you could do, but it also kept you from making bad mistakes.

DA: Bad mistakes like?

WH: Borrowing when you don't need to, because borrowing has to be paid back.

DA: So you always had a very conservative fiscal policy?

WH: Yes we did. For employees it was the same thing, we didn't want to hire and fire. The point is it has effected how we looked at things. We did everything in the company from sweeping the floors, to designing the equipments, so we understood what it meant for our employees to have trouble. For example, one of our employees came down with tuberculosis. This was devastating. He couldn't work and he had no money. We carried him, and at the end of that time we also took a chance and took catastrophic medical insurance, which was unusual at that time, but it indicated our concern fro the employee. So it was a simple relationship. We work with employees and they work with us, and we listen to what they said.

Also we tried to push the decision point down as low down in the company as we could. It kept the overhead down. So the guy was doing the job, he was much closer to it than we were, so we gave him a lot of responsibility.

DA: You relied heavily on Stanford as a place to look to get new employees, did you not?

WH: Well, indirectly. Again Terman set up a program called "Honors Cooperative Program, and it said that if your company signs up for this program we will guarantee that we will reserve say, 50 slots for graduate students. Provided you meet certain standards that we provide, we will guarantee we will take those graduate students. So we would go out to a lesser known college, say like Utah State, which had a good school, but we might get only one or two out of the class.   So we would get very good people, and we would use them, put them in positions of top responsibility right away, and this helped a lot.

DA: So I gather this was keeping responsibility at the lowest level?

WH: Oh yes.

DA: And that was unusual in those days wasn't it? You're talking about the 1950'and 60's right?

WH: I think so. We were growing rapidly and were concerned about growth. So we had a management meeting with ten, twelve top employees. We went up to Sonoma, and in winter Sonoma is a dead place. So we sat down for a whole weekend and discussed how to run the company. Out of that we developed the "HP Way." We broke the company down into smaller units, four units to be exact, and they were based on laboratory technology. Then we put people in charge of those. We gave them a great responsibility. We set our corporate objectives, and those corporate objectives are basically the same today as they were then. We've added one or two, but they guided the company through all that period. One is the passing of responsibility down to the lowest level, two was concern for the employees, three was be a good corporate citizen, and if you look at the company, they are worth looking at.

DA: So that management direction in terms of how you treated your employees and how they responded to the community was central to your business?

WH: Yes. We something help your community we helped you. Packard ran a school board and I ran a hospital board, and Porter, who I mentioned before, became very involved and very successful, and you could see how we were intertwined with the community. We are a very important part of the community. As a matter of fact, through Packard's influence, after the war, most schools were on double sessions, but Palo Alto actually had enough schools built so they didn't have to do that.

DA: So he brought this strong commitment to education, from the company into the community?

WH: That's just an example of how this system worked, helping the community.

DA: We are going to talk briefly about how your company got into computers in a different way, because of your background both in instrumentation, particularly scientific and medical instrumentation, and then working into computers. How did that position you strategically differently from other companies?

WH: We took a different tack in terms of computers. We had a couple guys in the laboratory who were interested in anything computing. Dave and I were interested but didn't understand it. So Dave brought around a couple of guys and said, "Here is a guy who has got a really good sense of the computer, and here is another guy here who has a good process for doing trigometric functions, and we should put the two of them together. We could try it." So we agreed to work on this. It did work but it put us on a different tack.

It very simple computing algorithm, and the computers were desktop calculators. The reason we called them desktop calculators was that at most corporations that had a computer there was something called the IBM guru, and if it wasn't IBM, it wasn't any good. We knew if we called it a computer it wasn't going to get sold. So we called it a calculator. Of course it took over like a bomb. It was particularly strong in Europe because Europe did not have a computer background, and this was something very simple, you could get into quickly. It was a very powerful tool. It was our introduction to the computer business. I said we called it a calculator, but they were very sophisticated computers.

That grew our interest in pocket calculators. The same guy that put us into the computer business talked us into going into this pocket calculator. It literally became a pocket computer, something you could put in the breast pocket here. So that became the standard size if I could measure my breast pocket for size. That was a gamble. For those who remember the slide rule, you had ones that just did your multiplication and division. You had the ones that did trigometric functions, and we had one that did trigometric functions as well in this, so we had a very powerful device.

So this guy said he would come back to us on Groundhog Day, whatever year that was, and he would come with a proposal. He came up with a proposal and I said, "Okay let's try it." He got it ready in six months, and it was a stunning success. We said if we made 10,000 units a year we would be successful. The first year we made 100,000. So you can see how successful it was. People like Nobel prize winners, people like that couldn't believe you could get that kind of computing power off a little pocket calculator. There were guys determined to look at this. So they went out, they sent a two man team out, one was from the finance team, accounting; the other was a technical engineer. They came back with a whole list of things that the community needed, the financial community, and we put it in there.

I remember we used to go to the IRE, the International Radio Engineers had an annual meeting and we always had a show there. There were always a lot of security analysts there. We had a table with one of early firms, and we showed them the calculator. They passed it around and they didn't understand it, they didn't want to understand it. So we realized that for the business community, for it to be successful, we had to make a calculator just for them. So we brought out the Model 80, which was a tremendous success. For instance, to figure out the value of a bond if you sell it short, the bond table was a stack of books this high. Well we got the whole bond table into the Model 80, and we saw that there was an error in the bond table. The question was, "Should be put the error in, or should we leave it out?" We decided if you didn't agree with the bond table you were damned. So we had to build the error in.

The Model 80 was an incredible success. At one point a quarter of our profits were coming from that one project.

DA: Who knew that in the future it would be adding this calculated ability from some of the others at this table?

WH: Yes. In error you moved some of those computations into the instrumentation field, but it's as highly complicated as it is interesting.

DA: Now, clearly much of this work depended on your involvement with the semi-conductor industry. As you were saying just a few minutes ago, it was the fact that your were out here and at the same time, semi conductor developers were out here, that led to many of the things, made possible that you did. What was your relationship to companies like Fairchild and Intel?

WH: Suspicion. I mean not the way you think. We didn't understand the computer, the transistor computing. So we went to elaborate means of devising a way to use it.
I won't go into technical detail, but you could devise routines and build them into the computer hard wired, and that was a tremendous success.

The first place we really used semi-conductors was in making counters, high speed counters. Previous to that time the highest you could count was 200-thousand a second, and we felt that there was a need for bringing it down to about 10 million counts per second. So to do that you needed something to count. These became frequency counters. Frequency is how many times something occurs in a second.

DA: So that kind of led you into the business of putting the computing in the semi-conductors together with the counters and instrumentation.

WH: This was highly iterative. You did the same thing over and over again. So we felt and so one of our first uses of that was in these counters, high speed counters, and from that we got into other areas like frequency standards and so on.

So this was a wide field open to us, and at first we distrusted it because we didn't understand it. But as we did it our way, we discovered there were simpler ways of doing it.

DA: So it sounds like because of your established position with companies and universities and things that you were able to exploit the new technologies that came along, you were able to come up with new products.

WH: Yes. The old method of frequency measurement was very cumbersome. It was slow, prone to error. This was direct and fast so it made a world of difference. This actually got us into the frequency industry. The first thing we knew we were making cesium clocks, which is now the gold standard for clocks, but it was just an outgrowth of fact we could compute so fast, so inexpensively.

DA: One of the questions that a lot of people don't have the answer to, is how you became such a leader in the printing are.

WH: Well, that's also an interesting story. In a sense it goes back to our making decisions at the lowest possible level. We took a look at what Canon was doing in terms of printing, for facsimile really and we saw a great demand for something to be done that way. So we had a guy up in Boise who was just a genius, both technically and how to manage things, and he really got us into the printing business. Before you knew, we had a major business. I still have it, a license plate design, saying "one million computing and still counting, and that ain't small potatoes." The Idaho people didn't like the small potatoes, but that was a typical example of letting a guy have his head and letting him run. He did an absolute marvelous job for us.

DA: That's a remarkable story.

WH: It truly is. Without one man's accomplishment….

DA: It's all about getting the leadership and the decision making authority to people at all levels.

WH: Yes, he was up in Boise. He said basically, "Keep out of our hair." We did, and he produced.

DA: Well you must have had a major concern about the kind of people that you hired, because if you give people that level of responsibility at the low levels then you have to get the right people at the outset don't you?

WH: You don't know. We didn't know we had this jewel until he popped up with these ideas.

DA: I just wondered if you had a recruiting policy for whom you would bring into the company that was different from other companies, or whether you just tried to get good people in general?

WH: We tried to get good people in general. I talked earlier about the "Honor Cooperative Program" which allowed us to get excellent people in.

DA: Now you and Dave Packard had such a remarkable partnership for so long over so many different eras, from the time that your company was small to time that it grew. How did that partnership grow and change over the years?

WH: It started with the partnership because it took the least tax. We finally realized that we were paying a tremendous double tax. So in 1947, something like that, we changed it to a corporation, but interesting that we chose it something least tax for that year, and that caused us to have a fiscal year in October. That's not the usual time, but it turned out by fortune to be a good time because all the tax returns were out of the way. So we had more for CPA's to work for us.

DA: Did your relationships, what you did in the business, did that stay constant over the years?

WH: Oh sure, yes.

DA: Dave Packard stayed on the financial side and you stay on the engineering side?

WH: Well, we had specialists on all sides, but Packard, he was a hell of an engineer. I had not had, nor did I take the opportunity to get an education. My interests were technical.

DA: And they continued that way even as you…

WH: No, I tell you Packard was a top engineer.

DA: Were there surprises for you as the company grew over time? You mentioned that printing was something that you were kind of surprised that it grew as it did. What were some of the other things that amazed you in terms of the way that the company grew and changed?

WH: I guess that was one what surprised me the most. It started off as a simple idea but there was a tremendous market because the quality was so great and the cost was so low. There are a hundred methods of printing. Instead of facsimile type printing, we used ink drop printing.

DA: Another area I want to talk to you about is the whole area of the personal computer and its development, and how it related to HP.

WH: That is one I needed some help on, that question. The answer was basically that that we did not have a product, nor did we have a distribution system, so we were not competitive. But we got along with some parallel techniques, and we became competitive but we were very late. We were very late in covering that, but I think we have an ideal position now.

DA: So you didn't see that initially as a continuation of the incredible entry you made into calculators?

WH: No, we didn't. It was a different tack.

DA: I just think it's interesting to look back and see what people see at different times. I was curious if you had discussions in the company, and how that looked to you in the early days? There didn't seem to be much of a market for it?

WH: It just looked attractive. We didn't have a distribution system to touch that market. We had to work with distributors and it became possible.

DA: Can we talk a little about your marketing of business in Asia?

WH: Well we were worried about our marketing in Asia because it's a very large market, but we didn't have a base of operation, like in Taiwan or so on. So I sent a team of guys over there to look into Taiwan and then came back and said, "Taiwan is all right, but Singapore is better." And I said, "Singapore is for the birds," but I said okay and I sent them back in and they came back and proved to me it was worth it.

So we set up in Singapore and that has been a very successful operation. It's got a good government. In fact it forced us to get a union so we wouldn't get our wages too high. We were so successful in Singapore that we went into Malaysia, B' Nang. So these are our centers for manufacturing in Southeast Asia. We have got a small operation in China and Japan, a pretty good operation in Japan, but the real interesting one in Singapore gets a pretty good tax break there. We can use that to invest in other companies.

DA: And you were welcomed in Singapore, by the government?

WH: With open arms.

DA: You mentioned that so much of your policy here in this country depended on the ways you related to employees, did you find that to be the same with your Asian employees? Was it the same or was it different?

WH: Well not too different. They're not used to the independence that we have here, but the more we give them they grab hold of it. They are smart people.

It's interesting, we have an operation in Japan for quite some time, and we always had an American manager and finally we got a Japanese manager, and he said to me, "Mr. Hewlett, if you let us run this the way we want to, we can do a much better job for you." I said "Okay." And they did, and ran it much better than we did. Again it is all about the three principles.

There is something called the "Demming Award," and it's an award for quality. And they set their mark for the Demming Award and by God they won it. So all the HP divisions went over there to see how they did it, and took immediate feedback to the rest of the company.

DA: So you began to pick up management techniques from them?

WH: Yes. And something you think it won't work in this country but it does work. In fact we have suppliers some and say to us, "First time we have ever been paid to do something more than we ordinarily do." But if on time quality is what they want, and if the work is on time, they get a bonus. So if they customers got benefits, so did the workers.

DA: One of the questions I wanted to ask you was about just the change in the nature of electronics now from when you came into the field, before they taught much about electronics. Some people think that we've kind of come to the end of innovations in electronics. How does the field look to you now as you look at the way it has developed from when you started in the 1930's?

WH: Well I'm a long ways from the decision making points. I think that may not as dramatic as these biochemical things, but there is a long ways to go, with a lot of areas that have not been exploited. I think it's a good field.

DA: Do you see opportunities for HP to continue grow in these new areas?

WH: Oh sure. We've got major operations all over the world now.

DA: And is this blend of instrumentation and computing continuing to be the life's blood?

WH: Well we're about 75% computing now, 25% others; medical electronics, chemical and analytical electronics. They're small areas but still a good area.

DA: As you go back over your career, what stands out for you as the most important things that you were involved in?

WH: I think probably that management meeting in Sonoma. That brought focus to everything and pointed what we wanted to do, the management by objective, which was scoffed at, but we proved it worked. So that was a key point. And also I think our whole treatment of how we treated employees. We treat them as equals not as subservient people and they appreciate that.

Interesting story, a complaint was often made that on the wiring line, which is the production level, that the pay differential for men and women caused a differentiation in employment. So we sent up a plant in Santa Rosa and the guy said, "I don't think it's true." So he hired an equal number of men and women for each job, and I came back there 6 months or a year later and all of the jobs were filled with women. The men had gone somewhere else. So I asked them what caused that. There was a long pause and one of the women said, ""Well, men have an objective of what they want to do. They've been trained to do this. They were trained to take courses to improve themselves, but women were never encouraged to do this. So we made them set up training courses." It was a very interesting highlight of how the culture could make a difference. How we could help on that. To this day I remember that statement, that men know where they want to go and women don't. I think that has changed a lot today.

DA: Is there anything else you would like to discuss before we end this interview?

WH: No, but when you leave I will think of a hundred things..(laughs)

DA: Well thank you so much for your attention and time.

WH: Thank you.