
NATIONAL MUSEUM OF AMERICAN HISTORY
SMITHSONIAN INSTITUTION

Transcript of an Oral History Interview with David Packard
Co-Founder of the Hewlett-Packard Company
Winner of the 1995 Price Waterhouse Information Technology
Leadership Award for Lifetime Achievement

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DP: Both Bill and I are very sorry we can not be with you here today, but we are both under doctor's orders that we can not travel very much.

DM: That's okay, we understand. This is for the National Museum of American History, Smithsonian Institution. It's an interview with Mr. David Packard and we are going to discuss his career and the role of Mr. Packard, his friend and colleague Bill Hewlett, and information technology. Thanks very much for giving us this time, Mr. Packard. I'm going to start with some questions about your background, where you grew up and how you got into electronics. The purpose of the interview is to capture a sense of what kind of people got into this business and made this revolution.

*** David Packard's Birthplace**

DP: I was born in Pueblo Colorado in 1912. My mother and my father had both gone to Colorado College, and after finishing college my father went back to Pueblo, it was his home. He was a lawyer there. I spent my years through high school in Pueblo, Colorado.

In those days, Pueblo was not like a farming community. There was a steel mill there and several smelters. They brought ore for

the steel mill from Wyoming, ore for the blast furnaces from Leadville, coal and limestone from southern Colorado. The odors from these mills were very strong on the south side of Pueblo. We lived on the northwest side of Pueblo at the edge of the prairie and the prevailing wind kept us free from the smells of the steel mill and the smelters.

DM: Your father was a lawyer and your mother was educated as well?

DP: My mother was a high school teacher until she married my father. She was a very good scholar and was elected to Phi Beta Kappa in her junior year at Colorado College.

DM: One of the things we'd like to find out about the folks who are leaders of this revolution, are what kind of things they were passionate about as young people growing up. What were some early interests in things that you got really interested in? I understand that you were interested in explosives, radio and a

bunch of other stuff.

DP: I remember from my very early days that I enjoyed mechanical things, locomotives and various other kinds of engines, ships and so forth. It was probably that which convinced me at a very young age that I wanted to be an engineer. I have never changed my mind since.

DM: You've got a new book coming out which I've been privileged to see. You had a friend, Lloyd Penrose, when you were a young man growing up.

DP: It will be announced as a book coming out in May and I can't say very much about it today.

DM: What about radio? When did you develop your early interest in radio?

*** David Packard's Early Interest in Radio**

DP: I had an interest in radio very early. I had spent some time with crystal detectors but there were no radio stations close enough to hear. I remember when I was about ten years old, I hooked up my first vacuum tube on the diningroom table. It had "A" batteries and "B" batteries and the other components, including a headset. I remember hearing WHO in Des Moines, Iowa, some six hundred miles from Pueblo. Before I left grade school I had made a fairly sophisticated radio set.

I became interested in amateur radio and I was chosen to be the secretary of San Isabel Amateur Radio Club. The club participated in activities in Denver. That gave me the opportunity to go to Denver when I was still in high school. I continued my interest in amateur radio through high school.

This was a very important part of my career because amateur radio was the reason that I became acquainted with Professor Fred Terman.

DM: How did you get from Pueblo, Colorado to Stanford?

*** The Stanford University Experience**

DP: It's a very interesting story because it was on a trip in 1929 that I learned about Stanford.

I drove my mother and my sister to California in 1929, the first year of the Great Depression.

We went to Southern California for a few weeks during which time we visited several relatives we had in that area.

Then we drove to Palo Alto where we stayed with a friend of my mother's from Colorado College. Her married name was Neff. Her oldest daughter, Alice, had just finished her first year at Stanford.

She took me to see the campus, including the engineering school. I had visited the engineering school at the University of

Colorado, where I had planned to go and I thought the engineering school at Stanford was the better of the two.

I decided to apply to Stanford in addition to the University of Colorado, and much to my surprise, I was admitted to Stanford.

DM: So this was in 1929 you came and in 1930 you entered Stanford.

DP: I graduated from high school in the spring of 1930 and started at Stanford in the fall of 1930.

*** Fred Terman's Influence at Stanford**

DM: Now there was a professor at Stanford named Fred Terman. He had a pretty significant influence on your life. Could you tell me a little bit about him?

DP: He was very important, of course. Let me say first that both Bill Hewlett and I enrolled at Stanford in the fall of 1930.

We met there and we had a number of courses together. There was an amateur radio station at Stanford and I spent a little time at the station. It was in a small building in back of the engineering corner of the main quadrangle.

Fred Terman was developing a radio research laboratory on the top floor and the amateur radio station was right next to the stairway on the floor below. Professor Terman would stop by and visit with me at the station now and then.

I never really knew who he was at first. His father was the author of the famous Stanford Binet Intelligence Test.

Fred began in a career of chemistry. He was kept at home with a serious illness for a year during which time he spent a good deal of time at his own amateur radio station at home.

People from Stanford were involved in wireless transmission at the beginning of the century. A man named Cyril F. Elwell

graduated in the first class of Stanford. He was engaged by a group of people to investigate patents in wireless. In the course of this he discovered the Poulsen Arc patents in Denmark.

These patents were very valuable because they made it possible to send voice and music on a wireless system. Cyril Elwell went to Denmark where he negotiated a license to manufacture the Poulsen Arcs in the U.S., and he brought several arcs home with him. He must have been a good salesman because he had no money himself, and had to raise the money to pay for the license and the models when he got back to San Francisco. He was able to raise the money and this effort became the Federal Telegraph Company, located in Palo Alto.

This company manufactured Poulsen Arc equipment for the Navy. It was the main wireless equipment for the United States Navy during World War I and until vacuum tubes took over in 1928.

Fred Terman knew about these and other early developments in

radio. This convinced him that he should change his field to radio engineering.

He wrote a book entitled *Radio Engineering* and the syllabus for that book was his main graduate course for students in radio engineering. This book was the highest selling technical book in the years of World War I and after the war, until vacuum tubes took over in 1928.

An important part of this course in radio engineering was to visit the radio companies and the radio research laboratories that were in the San Francisco area.

These included Karr Engineering in Palo Alto, Charlie Litton's laboratory in Redwood City, Philo Farnsworth's laboratory in San Francisco, Heintz and Kaufman's factory in South San Francisco, the Eitel-McCullough factory also in South San Francisco.

It was in the spring of 1933 that Fred Terman told me that I could take his graduate course in radio engineering in my senior year.

DM: And you were an undergraduate.

DP: I was an undergrad and it was a great thrill for me to be the first undergraduate to take his course.

I enrolled in Fred Terman's class in the fall of 1933.

That same year a young man named Barney Oliver transferred from Cal Tech as a junior and he asked Fred Terman if he could also take his graduate course that year. Professor Terman said that he could, but he also told Barney that he would have to drop out if he flunked the first mid-term examination. Well who do you think got the highest grade in the first mid-term examination? It was Barney Oliver, and he got the highest grade in every examination that year.

DM: So Mr. Oliver had to qualify. This is the same Barney Oliver that was head of R & D?

DP: Yes

DM: That's a great story.

DP: That was a very interesting situation. Bill and I had known each other since we were freshmen but it was Fred Terman's class that brought together the four of us who eventually became the top managers of the Hewlett-Packard Company--Bill Hewlett, Ed Porter, Barney Oliver and me.

In the spring of 1934 we all became concerned about whether we could get a satisfactory job when we graduated.

It turned out that I got a job offer from the General Electric Company. Fred Terman encouraged me to take the GE job because he said I would learn many things there that would be

helpful when we started our own company. He also said that Bill Hewlett would benefit from a couple of years of graduate work.

Ed Porter had a job with a distributor of electrical equipment in San Francisco. In a few years he won the prize for selling the most G.E. air conditioning equipment in the Sacramento Valley. He was doing very well and did not join Bill and me when we started our company.

Barney Oliver did some graduate work in Europe and then took a job with the Bell Telephone Laboratories in New York City. He also was doing well and did not join Bill and me when we started.

DM: I'm going to ask you just a few more questions about your personal life and then I'll ask some of the official Smithsonian questions that I need to ask. 1934 was important to you because there was a girl from Delta Gamma that you went out with in

1934. You met a girl at a dance that would become Mrs. Packard in 1934.

DP: I met her at her sorority house where I was hashing during the rush week. Some of my friends wanted to go to the Mark Hopkins Hotel in San Francisco to a dance with Anson Weeks. I did not know a girl that I could ask off hand. One of my fraternity brothers had a sister in the Delta Gamma house and he asked his sister if she knew anyone who might be able to go with us. She said that she did and I was in the kitchen washing pots and pans with my sleeves rolled up, when Lucile Salter came out to the kitchen and stood beside me and asked, "When do you want me?" That was the beginning.

DM: And you were married for nearly 50 years. You have a son.

DP: I have a son and three daughters.

DM: In 1935 there was a break between the time you got out of Stanford and the time you founded Hewlett-Packard. You went to work for GE for a while?

*** The General Electric Years**

DP: Yes. We were interviewed at Stanford by a man from GE whose name was Boring. GE had the practice of hiring a number of graduates from universities all across the country to come to work for them and they continued this during the depression, although they did not hire as many as when times were good.

My job did not begin until February of 1935. In the meantime, I took some courses at the University of Colorado.

After the new year I drove my mother and my sister to Pittsburgh where they wanted to visit some friends.

Then I drove up to Schenectady. My first visit there was with

Mr. Boring who had interviewed me at Stanford. There were a number of courses we could take at GE. I signed up for two of them. One was a general course in business practices. It included writing letters, simple courses in accounting, etc.

The other was called the Advanced Course. It was equivalent to a university graduate course in electrical engineering. It included some advanced mathematics, and some difficult problems that might be encountered at GE. This course required a considerable amount of work.

Mr. Boring then discussed with me what kind of jobs I might take. He knew from my interview with him at Stanford that I was interested in radio engineering. He told me that there was no future in radio engineering at GE and that I should take some jobs in heavy machinery, power generation and transmission or things that were related to products they were making. He had a list of the jobs that were available and told me to take a job in the refrigerator department where they were producing a

refrigerator of their latest design.

This job was not very interesting and I found out that you could look around and find a job for yourself.

I found a job in the vacuum tube department. It was located in the same building as their main research laboratories, and I had the opportunity to get acquainted with some of the people working in the main research laboratories. I spent the rest of my time at GE in that job.

It has been very interesting to me to remember the advice Mr. Boring had given me, because the Hewlett-Packard Company has become larger than the General Electric Company was at the time he gave me that advice.

DM: So sometime around 1939 you got brought back to Stanford. How did you folks link up again at Stanford?

*** Dave Packard's Return to Stanford**

DP: I drove back to Stanford in the summer of 1937. I wanted to see Bill again, but more important, I wanted to renew my friendship with Lucile Salter. So I drove back and met her, and we decided to get married. In the spring of 1938 she came all by herself, all the way across country. I did not want the company to think I might be leaving so we were married on Friday afternoon and drove to Montreal for our honeymoon over the weekend and I got back to work on Monday morning.

DM: This no doubt had an effect on your thoughts about flexible hours later on in your career. That's a great story... You come back to Stanford. You and Bill Hewlett formed this company which has been a major success in shaping the whole culture of Silicon Valley. Why do you think it was successful? What were the reasons for the success?

*** Starting the Hewlett-Packard Company**

DP: I will go back a bit and cover some of the things that were

involved. I came back and Fred Terman arranged for me to get credit for the Advanced Course I took at GE. I took two courses at Stanford in the fall when I returned. One was in business law, and the other was in business accounting. Both were at the business school.

The combination of all of the courses Bill and I had taken combined with the experience I had at the General Electric Company gave me considerable confidence that Bill and I could manage the company we started without any difficulty.

Bill had found a house for us on Addison Avenue. Lucile and I had the lower floor which had a fold-down bed, so Lucile could use it as an office in the day time. There was a small building in back of the house where Bill stayed and we used the garage for our shop. That garage was where the Hewlett-Packard Company started and it has now been designated as the birth place of Silicon Valley.

DM: Tell me about your partnership with Bill. What part of the business did he manage and what did you manage?

*** The David Packard and Bill Hewlett Partnership**

Bill and I had sold our first product, his audio oscillator, in the spring of 1939. That was the date that we started our business. With the interest Bill found on his trip to Portland, Oregon, in the fall of 1938, we decided that we should start our business with that product. I recall taking pictures of the oscillator on the mantle of our fireplace at Christmastime in 1938. We prepared a sales brochure and a sales letter and sent them to a list of potential customers that Fred Terman had given us. We received several orders in the next few weeks, some of them with a check for payment. We had already been talking with Bud Hawkins at Disney and with Norm Neely and so this all came together and our company was under way in the spring of 1939. Bill and I had not yet graduated, so we did not get very much done in 1939, but our sales for that first year were \$5369, and our profit was \$1563, and we have made a profit every year

since. Bill and I worked together in starting our company from 1939 until 1942. We had only a few employees but we developed our basic management policies during this period. Bill was a reserve officer in the Signal Corps, and right after Pearl Harbor he was called to active duty. We had only a dozen or so employees, and we both did whatever we needed to do from sweeping the floors, building the products, testing them, and boxing them for shipment. Bill came home after the war was over and we did not have to think much about how we would allocate the responsibilities between us for we had fewer than two hundred employees at that time. It just turned out that we had known each other for a long time and worked together long enough so that when someone asked Bill about something and he or she received an answer they did not like, they would ask me and I would give them the same answer without knowing what Bill had said, and vice versa. We just had that very close relationship with our employees and we each did whatever needed to be done.

When we started our company we did not know what we were going to do. We both thought very strongly that we wanted to do something important. We wanted to make a contribution, not just do "me too" engineering. That was a very important guiding principle that was behind our success from the very beginning.

DM: Your first product, I guess the legendary product, as the audio oscillator and there's a legend about the sale to Disney.

DP: Let me go back a bit now. Recently there had been a new technology called negative feedback developed at the Bell Telephone Laboratories. Fred Terman became quite interested in this. He had the knack for taking something very complex and making it look simple.

Professor Terman had a group of students, including Bill Hewlett, working on some products that used the negative feedback technology, and that would be useful in the audio frequency

range. Bill's audio oscillator was one of these. They also designed a wave analyzer, a vacuum tube voltmeter and several other products which we modified and built.

DM: One of the most famous stories was the story of the sale of this audio oscillator to Disney and its use in the movie "Fantasia". Can you tell me a little about that?

DP: Well, yes. But that story has been greatly exaggerated and we should get the truth out here. Bill and I put together a model of his oscillator and he took it up to an IRE show in Portland, Oregon, in the fall of 1938. It created quite a bit of interest, including that of Bud Hawkins, the sound engineer of Disney. He was impressed with Bill's oscillator and fortunately the only competition was an oscillator from General Radio which cost \$400. We told him that we could build him an oscillator for less than \$100, and he gave us an order to do that. We did not really make any technical contribution to Disney, we just saved them some money. They wanted some changes made and we sold

them the oscillator with the changes for \$71.50.

Professor Terman did not think it was a good idea for Stanford to require a payment for the license of patents to users of the technology developed at Stanford. He thought that Stanford would get far more money from gifts from successful companies than they would get from royalties. That was possible in the field of electronics because patents were not very strong in that field, fewer than 50% of the cases challenged in the courts for infringement were upheld. In other fields such as chemistry and drugs, patents were very important and the policy that Fred Terman advocated probably would not have worked.

Stanford has received at least one billion dollars in gifts from the Hewlett-Packard Company and its employees. Far more than Stanford would have received in royalties. In addition, the Hewlett-Packard Company has benefitted from the technology and the education Stanford has provided during the entire life of our company.

DM: Speaking of money, you grew up in Colorado during the Roaring Twenties and started school in the year of the Great Depression. That had an influence on your attitude toward capital and finance. You want to talk about that a little?

*** Growing a Company**

DP: Well, there were some factors that influenced what we did later on. My father was the referee in bankruptcy court for the State of Colorado. In those days there was no title insurance. If you wanted to know about a piece of property you had to go to the local courthouse and look up the background of the property. I spent some time with my father doing that in my summer vacations. What I learned was that those companies or people who mortgaged their property to borrow money, lost everything because the banks simply foreclosed on them. Those people who did not borrow money had a difficult time, but they did not lose their property. That experience made such a strong impression on me that I decided our company was never going to borrow money. We were going to make it along on a pay-as-

you-go basis.

DM: Didn't people think you were crazy?

DP: Well, it is possible that we would have done as well with a typical fiscal policy. I think we have benefitted from the policy we have used because it requires strict control of assets, a discipline that is often lacking with the usual fiscal policies.

The company has grown to be so large that we have to borrow money for working capital and other needs, but we have kept our long-term borrowing at a very low level, and that was the reason.

DM: It turned out okay. There's another interesting story about your relationship with Charlie Litton and Litton Industries. Something about a fire.

*** Charlie Litton and Litton Industries**

DP: Well, that was a very important situation. I had come back to Stanford because Fred Terman had arranged a fellowship for me to do some work for Russell Varian. Mr. Varian had some ideas about how to design a vacuum tube so it would work at higher frequencies and they arranged a \$500 stipend for me to do the work. I needed some of that for materials and small tools, etc. A good part of that \$500 provided some money for Lucile and me to live on when we came back to Stanford. Lucile also got her old job back as secretary to the Registrar at Stanford, and we did a number of small jobs in the fall of 1938, and that is how we got by. To put this in the right context, room and board cost about \$1.00 per day at that time.

Fred Terman had arranged for me to do the work on Russell Varian's tube at Charlie Litton's laboratory and shop in Redwood City.

Charlie Litton was a very talented person. He could do almost

everything better than anyone else.

That first year when we were back at Stanford, I would go to classes in the mornings, Bill and I would do some work in the garage in the afternoons and I would go up to Charlie Litton's place to work after dinner. Charlie liked to start late in the day and he would work until 2 or 3 o'clock in the morning. This gave me an opportunity to work very closely with him.

As I have already said, he could do anything better than anyone else. When he built a new building, instead of hiring someone to do the excavating, he bought a Caterpillar loader and did the excavating himself. I worked with Charlie and learned how to do this kind of work myself.

A few years later Bill and I bought a ranch in the Mount Hamilton Range and we bought a bulldozer and I helped build about twenty miles of road on our ranch.

Charlie had a number of interesting projects. He was one of the first people in the area to use a four-wheel drive vehicle in the Sierras. He hooked two truck vehicles together, each with a motor and a two-wheel drive, and he could maneuver in some very rough and steep country. He was one of the first to buy a Jeep after the war and Bill Hewlett and I bought one too. The first time we took it in the mountains we got stuck with all four wheels off the ground, but we learned how to drive it in rough country and went hunting and fishing together for many years.

DM: There is a story about you and Charlie Litton and about how you let him use your manufacturing facilities. Is that a true story?

DP: Charlie Litton and I became very good friends. There is some very interesting history about radio on the west coast.

I have already told you about Cy Elwell and the Poulsen Arcs.

He got a license to manufacture Poulsen Arcs in this country and this became the Federal Telegraph Company located in Palo

Alto.

Charlie Litton had a job at the Federal Telegraph Company to build vacuum tubes that did not infringe on the patents of GE and RCA, and he was very clever in doing that.

About 1928 it was decided to move the Federal Telegraph Company to the east coast. Many of the people including Charlie Litton stayed on the west coast.

Charlie Litton decided to build his own vacuum tube manufacturing company and in a typical Litton decision, he concluded that the manufacturing equipment for vacuum tubes that was available on the market was not good enough, so he started his company by designing and building his own. One of the most important of these was an all metal vacuum pump that used low vapor pressure oil. It could be operated at a much higher temperature than the glass, mercury vapor pumps that were used almost everywhere else and with the higher temperature a much better vacuum could be obtained.

One of the problems that he had was that low vapor pressure oil was expensive and in short supply. Charlie found that he could distill a particular brand of motor oil that was on the market and he then had all the low vapor pressure oil he needed. At the beginning of World War II when they started the Manhattan Project, they decided on a system that required a large amount of low vapor pressure oil. Charlie set up some stills in a building that was made from a large redwood water tank, and he produced all the low vapor pressure oil that was needed.

He was still making glass blowing lathes and other equipment when I started to work with him and I learned a great deal about vacuum equipment.

At the beginning of World War II the Federal Telegraph Company built a large modern plant in New Jersey to produce one of the magnetrons that was critical for the war effort. The plant was built by the key owner, Sothanese Behn, and it was laid out so he could take the high officers from Washington

along large aisles to see the operation. The plant had only one problem-- they could not make even one magnetron that worked. Charlie Litton agreed to go to New Jersey to make the plant work. They sent a fine administrative man, Jack Copeland, out to manage Charlie's plant in Redwood City. Jack did not have any technical experience, and I was still working on the vacuum tube project for Russ Varian and so I offered to help Jack at Charlie's plant. About a year later they had a fire that destroyed their machine shop. By that time we had built up a good machine shop at our plant in Palo Alto, but we were not using it at night and we let Jack Copeland use it at night to keep Charlie's work going.

DM: Hewlett-Packard went on to develop leadership in many, many different areas. How did your company develop its corporate strategy?

*** H-P's Corporate Strategy**

DP: One of the most important things Bill and I did was to

decide that we would do something that would be a contribution, we did not want to be a "me too" company. That was the basic philosophy that determined almost everything we did.

DM: No "me too" products. What would you say are the most critical choices you've made in guiding Hewlett-Packard over the years?

DP: There were several different ideas that came together in 1939. At the IRE show in Portland, Oregon, in the fall of 1938, a manufacturers representative in Southern California, Norman Neeley, was interested in selling our oscillator. He called on us when we were still operating in the garage. He emphasized one very important factor in selling equipment like our oscillator. He said that it would be much better to have a complete line of audio frequency measuring equipment. In case a customer did not need an oscillator, he might need something else to use with the oscillator.

For this reason we decided to develop a complete line of audio frequency measuring equipment. We found that we could design our products to be better than our competitor's. As we broadened our line of measuring equipment into wave guide products, we could use better tooling and better manufacturing technology so that many of our products were both better and cheaper than our competitor's.

Any company in a complex and rapidly growing field has to attract and keep the best people. Here again our relationship with Fred Terman was important. Stanford had developed one of the best programs in electronics of any university in the country. We developed a plan with Stanford that worked in this way. Fred Terman said that tuition paid for about half of the cost of a graduate student. He said that if we would make a commitment to give Stanford an amount equal to the tuition for a given number of students, Stanford would hold that number of places for graduate students that we hired from universities across the country.

This plan, which we called the Honors Cooperative Program, enabled us to go to the best universities in the country and tell their best graduate students that if they came to work for us they could do graduate work at Stanford at no extra cost.

We tried several ways of doing this. One was to allow students to take time off to go to their classes. Another was to allow the students to work for a quarter and go to Stanford for a quarter. When closed circuit television became available we could have one terminal in the class at Stanford and the other in a classroom in our plant.

The students attending the class in the room at our plant did better in their examinations than the students in the classroom at Stanford.

We have hired some 400 scientists and engineers under this plan. A few have left HP but the majority have stayed.

It has been a great asset to HP for it has enabled us to stay ahead of our competitors in attracting and keeping the best technical people during the early years of our company.

Many of the instruments that we designed and that kept us ahead of our competitors, involved students who we supported in this program at Stanford.

DM: You're unusual as a company in that Hewlett-Packard is heavily involved in scientific instrumentation as well as computers. Do you think that's helped?

*** Scientific Instrumentation, a Key Focus for H-P**

DP: As we started out in instrumentation, the General Radio Company was one of the largest and best companies in the country designing and manufacturing electronic measuring instruments. I recall looking through their catalogue when I was in high school and drooling over their instruments. When we decided to concentrate on electronic instruments they were kind of a role model for us.

There was a man named Melville Eastham who started the General Radio Company. He had some very unusual ideas about what a company should do. He thought the General Radio Company should go beyond just designing and making instruments. He thought they should become involved in the community around them, and this impressed Bill and me.

Fred Terman introduced Mr. Eastham to us and he spent nearly half a day at our plant on Page Mill Road. I knew that he knew by then that we were going to be in competition with him and I anticipated an uncomfortable meeting. However, he said that competition was a good thing when you were developing new products because it was better to have two companies designing new products because that made the product more credible, and the competition resulted in a better product. We maintained a close relationship with the General Radio Company and this had a large influence on what we did later.

DM: You were not an early developer of personal computers

even though some of the people who later made some of the earliest pc's worked here and even though you had early leadership in calculators, why didn't you get into personal computers earlier?

DP: In the 1960's we had recognized that computers would have a very important relationship with measuring instruments. They could improve the accuracy of the measurement by ten fold or more. And they could put the results of the measurement in a form most useful to the person making the measurement.

I decided that we should look for a partner with experience in computers. I took a trip to New England where there were a number of small computer companies. The Digital Computer Company was the only one that looked attractive, but I decided it would be too difficult to consolidate our management practices.

I also visited Wang Company where they were developing an

electronic calculator. It was so complex that I decided we should not get into the electronic calculator field. That all changed when a young engineer named Tom Osborne showed us the electronic calculator that he had built while he was working at a mechanical calculator company across the bay, named Smith Corona Marchant. We verified with them that they did not want to build an electronic calculator and we hired Tom Osborne to come to work with us and we built the first model as a desk top calculator, the Model 9100. It was highly successful. Large scale integrated circuits were not available for both the calculations necessary and for the memory. We used a 14 layer printed circuit for the read only memory and we also used individual components and Nixie tubes for the read out. We had a good program in light emitting diodes which our engineering teams did not want to use. Bill and I kept it going anyway. The Model 9100 was introduced in 1968 and it was highly successful. By 1971, large scale integrated circuits that could be used for the calculations and the memory became available and with the light emitting diodes we had developed,

enabled us to produce the Model 35 and later the programmable Model 65. I was at the Defense Department in 1969, 1970 and 1971 and I had just returned to the company in 1972 when Bill and his team at the company introduced the pocket sized electronic calculator.

The circuitry in these calculators could have been used to develop a 32 bit computer which would have been far ahead of any computer that was being built at that time. We decided it would have been too large a gamble because we did not have any experience with computer technology, or marketing. This was a great disappointment for some of our people who would have been involved and some of them left the company.

Sales for these calculators and their descendants have now totaled more than 15 million units.

We had about two years of the market without any competition, and then other companies got into a price battle, but we did not

follow them down in pricing.

During the 1970's we built up our marketing and our manufacturing capability, and these have been very important developments for the rapid progress in the computer business. Our progress in computers was slow and erratic until the 1980's but today we enjoy a leading position in the computer field on a world-wide basis. It is based on our commitment to make a contribution and that contribution is not only in technology, but in manufacturing and marketing as well.

In looking back at that situation, I have often wondered whether we were too conservative but I do not know whether we would have done better to be more aggressive. Of course there is no way of knowing that now, but both Bill and I agreed on the course to take.

DM: How would you compare the opportunities today in electronics to the time when you entered the field? Is this as an

exciting time to get into the field as it was when you got in it?
What are your thoughts on that?

*** Electronics Opportunities Today**

DP: We are in the middle of a watershed change in electronics and for some reason not very many people are aware of what's happening.

All of the technology we have put in place during the Twentieth Century clear up until the end of World War II was based on science that has been building up for a long time. An important part of this science was in place by the middle of the Nineteenth Century and it was rounded out clear up to the end of World War II.

This science was based on the concept that an atom is the smallest particle in the universe. It had a nucleus of protons and neutrons, surrounded by rings of electrons. From that image the periodic table could be constructed and an atom bomb could be

designed.

Shortly after the end of World War II, we and our allies and the Soviets undertook a masive program in high energy physics. We did this because it was thought that one might discover something that would provide a decisive advantage over any adversary.

That did not happen. What did happen is that we discovered that an atom is not the smallest particle in the universe. An atom contains ten smaller particles and there are forces within the atom that react on these ten particles with forces that do not follow Newtonian laws of gravity. With the science we had before, artificial materials that occur in nature could be made, such as artificial diamonds.

With the new understanding of science, materials that do not occur in nature can be made, such as materials that are harder than diamonds. Scientists working at the forefront of knowledge

believe that materials with desired characteristics can be designed and made in the future. The opportunities to do this are almost unlimited. With the opportunities this new science offers are far more impressive than anything Bill and I were involved in when we started our company in the middle of the Twentieth Century.

To put it in more general terms, exponential growth can be determined by a mathematical relationship that the rate of change is proportional to the level of effort. The level of effort is many times larger than it was when we started. To put it in other terms, it took many years for our company to reach one billion dollars, and we are adding over five billion dollars worth of new business every year, and many other companies at the forefront of technology are doing as well.

DM: If you could give advice to young people coming out of college or thinking about college, what advice would you give?

DP: The advice I would give anyone is two fold. Learn as much as you can about the field you are working in, for knowledge is power. And do the best job you can whatever it is, for people who do a good job in any field will have preference for the next job.

DM: One of the things Hewlett-Packard is famous for, in addition to its products, is the way it deals with its people. Tell me about how you developed the "Hewlett-Packard Way" of managing people.

*** The Hewlett-Packard Way**

DP: The HP Way comes from a combination of some of Bill's and my thinking about what kind of a company we wanted to build, combined with a very close relationship with our people during our early years.

My wife, Lucile, and Bill's wife, Flora, had a large influence in the early years of our company. In the first few years after the

beginning of the company in 1939, we had only a few dozen employees. Lucile started the custom of giving a wedding present to every employee who got married, and a baby blanket to every child they had.

Bill and I worked very closely with our employees for over ten years during which we had, at the most, 200 employees. It was not until the early 1950's that our employment increased rapidly. By that time our policies relating to our employees had been established. There had also been a rapid change in industrial personnel policies, which meant that the tide was going our way. While I did not have a strong religious background, the Golden Rule seemed to me to be a very important way for people to work together.

It is quite clear that the HP Way is a positive and a fully accepted way. Bill and I have often said to our employees, the HP Way will survive if you think it should, and we now have one-hundred thousand employees working all around the world

supporting the HP Way. People leave the company from time to time because they are offered jobs that are more attractive. Bill and I think this is as it should be. We do have many excellent people in the company and when they leave they almost always take some of the HP Way with them.

DM: You were one of the first companies, if not the first company in the United States to introduce the idea of flexible hours. What did people think?

DP: We have operations in nearly every country in the world. The flexible hours policy came from Germany. It worked very well there and it has been well accepted nearly everywhere. It is really very important for it expresses a trust of confidence to your people. It has turned out very well everywhere it has been used. With the recent trend of using more computers for the jobs people used to do, flexible hours is a very logical approach.

DM: If you look at Hewlett-Packard from the outside it looks

like a steady progress of success. Was there ever a time when you were really worried about the decisions you were making, that they were really scary?

DP: That's a hard kind of question to answer, but the answer is "no". I have always been an optimist. If you look at all of the things we have been involved with, I have never been concerned that we could not accomplish what we set out to do. It is very important to have that attitude, because if you don't have that attitude, you probably won't accomplish what you set out to do. Now you may not do exactly what you wanted to do, and that is because almost everything you do is more complicated than you thought it would be.

DM: Looking back, there's so many things that Hewlett-Packard has done and you've done personally. What do you consider your most significant achievement?

* **Deputy Secretary of Defense**

DP: The company, no question about that. I cannot think of anything I have done personally that was anywhere near as important as that. I have done some other things that were interesting. I had a very interesting time when I was in the Defense Department. That helped us get involved in China in the early days of the recent changes there.

DM: You worked with Melvin Laird. You were Deputy Secretary of Defense.

DP: Yes.

DM: This was 1969 or 1970, during the height of the Vietnam War.

DP: That was 1969, 1970 and 1971. You know our company had been involved with the Defense Department from its early days. We have made only a few products to military specifications, most of the products we sold to them were our standard catalogue products. I had only a casual acquaintance

with Mr. Laird. I met him only one time before he asked me to join him as his deputy.

The conflict of interest rules were very strict. I had to give up my income from the company and also any appreciation that occurred in the value of my HP stock during my term at the Defense Department. I was willing to do that for a limited time, but the stock began to increase in value during my third year there and I decided I could not stay in the department longer than three years.

In fact, three years in the Defense Department cost me about twenty million dollars in the appreciation of my HP stock. The value of that stock I had to give away would be worth well over two hundred million dollars today. It did two things that made the loss worthwhile. It gave me considerable credibility with the Congress while I was there and it helped the charitable causes that I gave it to.

We did some things there that were improvements in the management of the Department, but it was a difficult management problem.

I commented at the time that managing the Defense Department was like pushing on a forty foot piece of rope and making the other end go where you want it to go.

It was a bit tough on my wife. She lost sixteen pounds the first six weeks we were there. She would hear something on the morning news that would spoil her breakfast and she heard something on the news at noon that would spoil her lunch, and then I would come home and tell her what a miserable day I had at the office and that would spoil her dinner.

She learned not to listen to the news and then she got along fine.

DM: It's called the "David Packard Diet". It also speaks to another issue. This business has given people who have great

passion for what they're doing to do wonderful things and change the world. It's also the cause of the growth of the industry and the tremendous amount of influence it's given folks like yourself and Bill Hewlett and Bill Gates, tremendous power. You're tremendously powerful people in the world right now. Do you have any thoughts or advice about corporate responsibility and how people who have that power ought to use it?

DP: Well, a good many things we have discussed already are on that point. But I do not think that the way Bill and I have dealt with that problem is better than anyone else. I can really only speak for Bill and myself. As I have told our employees many times, "You are the ones who built the HP Way. Bill and I couldn't do it. You all did it and that is why it has gone so well." That's really the whole story. We did this together and it works. It's accomplished something important and our people can and should be very proud of what they have done.

DM: A big part of the HP Way has always been not only making HP a great company and a great place to work and a great place for its customers, but also a good corporate citizen.

DP: Yes, I felt all along that a company has a responsibility to the community in which it exists. I remember going to a meeting at the Business School of Stanford clear back in the 1940's with representatives from many of the companies in that area. The question came up, "Do the managers of a company have any responsibility to anyone beside its shareholders?" A large number of the people there said "no". I objected, I said that a compnay has a responsibility to its employees, to its customers and to the community where it operates. I was almost laughed at, but you know, that kind of a policy I supported at that time is now almost completely supported by the business community.

DM: It's one of the major impacts of this revolution. Something to be proud of. It really is. I've got one other

technical question to ask. That was to talk about Hewlett-Packard's development work in printers. Is that unusual? Did it develop from some strategic corporate direction?

*** HP Innovation**

DP: That is a very important issue.

Our company has thousands of customers spread over the whole world. It is just not possible for the chief executive to know enough about all of them to make any detailed decisions. We do have some over-all policies, many of which we have already talked about, that are well enough established to be followed everywhere in the company. But the company is built around many small units which have similar products, similar customers and similar competitors. These are not very small in some cases. These units have complete authority to develop the products needed to stay ahead of the competition. They can be measured by the success they have in staying ahead of their competition. There have been times when the higher layers of management

try to make the important decisions. To do this they have to build up a bureaucracy and this adds committees to make a decision. At one time there were thirteen committees involved in making a major new product decision. We cut all of those committees out of the new product decision and the one person who knows the territory can make the decision. This makes it possible to move very fast even though we are a fairly large company. The person making the decision can ask for advice from executives above him or responsible for activities that may be affected by that decision. We had a very capable executive in Boise, Idaho, Dick Hackborn, who was the driving force behind our Laser Jet printers and our Ink Jet printers. He has built up a team that has over half of the world market in printers. As we are successful in areas like this the competition increases but people who do a good job have to look ahead for several years.

DM: One of the things one can't help notice from looking at your life and your biography is that you have a lot more interests than just business. What are some of the outside things that you

do? I know you're a gardener and a reader and a fly fisherman. What do you love besides business?

*** Dave Packard's Other Interests**

DP: I do have some other interests. I have always enjoyed working in a machine shop. I have a good one at my place in Big Sur. I can do almost anything there, including making lost wax casings. I have reached the age when I cannot do much myself anymore, but I have a very good man who takes care of my shop and does some things for me.

I have always been interested in the environment and population control. The population of the world is about five billion people today, and it will reach ten billion in just a few decades.

If we do the right things, the population could actually be brought down to five billion again. That is the most serious problem we have for the future.

We established a family foundation in 1964 and we deal with many of the important problems of the future through that foundation. All of my children are on the board of our foundation and in the mid 1970's we decided that our foundation should establish some of our own programs instead of just supporting the worthy causes of others.

I have two daughters and a son-in-law with some of their friends who proposed that we convert the old Holden Cannery into an aquarium. It was owned by the Hopkins Marine Station which was the first marine science institute established by David Star Jordan, the first president of Stanford.

Stanford had purchased the cannery to protect the Hopkins Marine Station from commercial encroachment.

We had a feasibility study made by SRI, and they said it would be a good place for an aquarium, it would be self-supporting and would cost about ten million dollars.

With that information we established a separate foundation, hired architects and engineers and proceeded to design and build an aquarium. I did not know anything about aquariums so my wife, Lucile, and I visited every aquarium in the United States and some of our children visited some aquariums in other countries.

We learned that nearly every aquarium was built with a fixed budget and did not provide for proper corrosion protection behind the exhibits. I decided that if we were going to build an aquarium we should do it right. We bought machinery to make fiber reinforced cement and fiber reinforced plastic and we looked into the best materials that could be used in the construction. The aquarium cost forty million dollars instead of ten! My youngest daughter, Julie, took on the management job.

Some of my children wanted to keep the admission price low so people with low incomes could afford to come.

I said we were not going to do it that way. We were going to charge what it took to make the aquarium self-supporting. We completed the first ten years in 1994 and Julie not only covered the cost of operation, but also built up a surplus of \$35 million to apply to the cost of a new wing that we will open in February 1996.

We have also admitted 100,000 children each year and we have held courses in ocean science for teachers in the schools of the area.

We did not have an extensive research program at the aquarium but I have learned enough about ocean science to realize that it is the last frontier we have to explore. We started a program using an unmanned research vehicle, ROV, to explore the deep ocean canyons in the Monterey Bay. We have operated a system using equipment off the shelf for several years and we have discovered a number of things that no one knew about before. We will complete this year, an entirely new system that is better

than anyone in the world has had.