CHM Computer History Museum

Oral History of David Hampton

Interviewed by:
David C. Brock

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Brock: Well, David, thank you again for joining us today. It's a real pleasure to sit here with you. I thought we could begin at the very beginning and just ask you when and where you were born.

Hampton: Okay. I was born in Cincinnati, Ohio, and that was December 18th, 1951. <laughs> Even that's interesting. I was not supposed to be born until February of that next year, and through my mother slipping in some ice in Ohio-- I was raised in Ohio, born in Cincinnati. It saved my life, in fact. So I was absorbing embryonic fluid, had allergic reaction to the whole thing, and I would've not survived that, except for my mother accidentally falling and saved my life. So being born premature, December, at that time I was in an incubator for about three and a half months.

Brock: Could you tell us a little bit more about your family of origin, your parents and their primary activities?

Hampton: Yes. My father had a wide variety of careers I found out later, but at the time that we lived in Ohio, he worked at Autolite and later Chrysler and General Motors. He did combinations of things. He was a mechanical engineer[1]. He also was familiar with metallurgy. He-- in my later years, I found out that he did a wide variety of things. He was a trapeze artist.

Brock: Really?

Hampton: Yes, <laughs> and worked on a fishing boat and so my father seemed to love a lot of variety in the jobs that he held. My mother was very much a homemaker at that time, and she was born in Cincinnati. Also I found out later that my great-grandfather, my grandfather, my mother and myself were all born in Cincinnati, Ohio. So very much I grew up blue collar. My mother had not completed high school. My father completed high school, and I had three younger brothers. I was the oldest of four boys, and because of the automotive industry changing very quickly during the '50s and '60s, we ultimately ended up in a suburb of Detroit, Michigan, Roseville, Michigan, where I spent my junior high and high school years.

Brock: Was that, were there, plant closures in Cincinnati and so it was moving to a different plant?

Hampton: That's correct. Yes, yes.

Brock: Okay.

Hampton: Yeah, absolutely correct, and so things kind of compressed around the Ohio area and migrated north. He worked in Toledo for a while and ultimately Roseville, Michigan.

Brock: Oftentimes there's, in households, there will be a predominant or set of dominant themes in the household, like religion or learning, politics, mathematics, music, things like that. Would you say that there were some prominent themes in your household along those lines?

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[1] [Interviewee's note] my father's vocation was Tool and Die, and Pattern Maker. Also note my youngest son James Hampton was extremely helpful in proofreading this document. (His chosen vocation.)

Hampton: Yes, absolutely. So my father was born in Germany and came to United States when he was about 13, and so that side of the family, my father's side, was all Catholic, so I was familiar with all of that. But my mother took the responsibility for myself and my b rothers. We were-- we grew up Methodist and... But what else you alluded to was just music and some other things, and so my mother always did have music playing around the home and I remember the 78, you know, glass records, and a lot of music from the '40s, you know, and so we grew up with music playing in the home because of my mother.

But I think one of the more important things is that what they really tried to instill is that we were capable of just doing anything that we really set our mind to. That was very important to us, and the other thing that they really thought was quite important is that it wasn't so much important what we did, but that we would do something that we loved doing. So they would-- because then we would have a job that we would just love to go to, and through our enthusiasm, probably be better than other people at that job. So that was something that was very important in our house and I can-- and I tried to do the same for my sons when I raised them.

Brock: Could you talk about, I guess, in Ohio, what your sort of primary school educational experience was like? Did you enjoy school? Did you take to it? Did you not? <laughs>

Hampton: I absolutely loved school. I just couldn't get enough of it. But, you know, for me, at school was-- not only was the going to school and I-- I don't know. It was more like a sponge effect. I just tried to do everything I could possibly do. I just loved learning and I loved reading and because I was the oldest and because my next brother wasn't born for another four years, my mother got to spend a lot of time with me, and part of what that led to was I read.

I was doing a lot of reading before I even entered kindergarten, and that love of reading has stayed with me even until today, and there's many things. It's like I mentioned that I fly airplanes. I didn't learn how to fly airplanes by reading, but there was a lot of things I could learn by just simply reading them, and so ultimately computers and technology and electronics, there's a lot of reading you can do and-- yeah.

But what else happened is this was outside of Cincinnati where I grew up. I grew up in New Richmond, Ohio, and in fact, seven miles outside of that. That was a farming community, and at that time they were growing tobacco and a lot of corn, and because it was a-- oh, and the town New Richmond itself, at that time, there's probably 500 people in the community, but it led to something that I believe was also important in my life and that was we had a lot of alone time. We had a lot of-- yeah. We had 13 acres. By the way, we were the city slickers in the area, because everybody else had 1,000, 1500-acre farms, and here we are with, you know, 15 acres, 13, 15 acres. But we had the goats and we had the chickens and we had those kind of things and grew up with an acre garden where we supplemented our food source and there was bartering going on.

But more importantly, because we had our own time, we created our own toys, we created our own environments, we, you know, we did the proverbial string-and-cans and we flew kites and very much blue collar, so it wasn't like we had a lot of-- I didn't realize until later we only ate meat a couple times a year. A year. Duh. We ate meat a couple times a week, because it was a money thing, but we never knew that growing up. But we created our own toys. We created our own entertainment. We ran down to the creek that was at the back of the property and

explored and those type of things. So we learned how to think for ourselves and how to be by ourselves and entertain ourselves.

Brock: Do you relate that experience very directly to your subsequent work in designing and making things?

Hampton: Yes, absolutely. Just as I was able to enjoy the creative process, when I was younger, because there was a lot of-- there was not a lot of outside noise. There wasn't a lot of outside influence. I mean, family members, of course, and school. But yeah, no, absolutely. I learned to love the quiet time and the reflective time and times that I could be, later I learned to be, you know, very creative, but...

Brock: Does anything really stand out to you from that time that you designed or that you built, that just really stands out in your memory as significant or pronounced? <laughs>

Hampton: Yes. Yeah. There's a couple interesting little things. As early as the third or four grade, because I was reading quite well, I was reading-- I didn't know it at the time-- I was reading-- a bookmobile had come around, which was the library.

Brock: Okay.

Hampton: And I was reading junior high school and high school books which initially they wouldn't want to let me check out, and so I had to-- and by the way, being self-taught I didn't know the pronunciations. In the fourth grade I think I called a capacitor a capacitator or something like that. But I had to convince them to allow me. "No, no, David, you can't check that out." But I had to convince them that I was capable of reading that and getting information.

But I ran around school when-- in third, fourth grade, with motors and lightbulbs and, you know, those kind of things, and the-- probably the couple of things that I remember very, very early is at that time there was a movie that came out called, "The Time Machine," by H. G. Wells, and they talked about time travel. Well, you know, in the perspective of a fourth grader, I was trying to think about what you would do to make a time machine. So the projects of space were very much in the forefront of what we were being exposed to both at school and at home, and so I had enough knowledge to know that you had to have oxygen in space and that vacuum would present less friction, so I came up with this idea, and by the way, to make the calculations early, easy, I just did a tube that was a mile in, you know, circumference. You took the air out of the tube and then I would have an oxygen-- like a scuba diver's tanks on my back for-- to be able to be in this environment and put myself in a projectile, and interestingly enough, the projectile would be supported by electromagnets, and then I just had a simple motor and a little switch that would switch the electromagnets on and off and then accelerate the projectile with me in it, and then by skipping magnets, so to speak, accelerate the-- so that was my way of thinking about, you know, and so I presented to some teachers and some teachers were, like, very, very enthusiastic about it and others thought that it was a little strange, so--

Brock: It's essentially Elon Musk's hyperloop, isn't it?

Hampton: I-- it's the oddest thing, and I may have drawings of that from that time.

Brock: <laughs>

Hampton: But the other thing that was important is in my years of going to school, there were a couple just teachers that just really made a huge difference. By the sixth grade, I started with very, very of my-- my own designs, like radio transmitters. A theremin, which creates music, were of my own, and very, very simple. They were at that time I had-- we had learned tubes younger and then transistors were coming into play, and my sixth grade teacher I remember very well, James Putman, he had courses in electronics that he was not completing so he gave them to me, and I was completing these courses, and the other thing at the time is there were some kits from Bell Laboratories, and they had some of the early-- they were more for high school, but he had gotten his hands on them, and there was one that created just the first speech synthesis and just did vowel sounds, "A, E, I," and so I built that. I made my own photocells by-- you had to have a high temperature oven, which my father working in the automotive industry got on loan a little. So I cooked up some, you know, photocells in the sixth grade, and they worked. So yeah, it's...

Brock: Were you doing all of this work at home? Did you have a dedicated electronics laboratory in your home? Was it your bedroom?

<laughter>

Hampton: Yeah. Later more of a-- in later, there was the dedicated room that was in the furnace room with the layout.

Brock: Uh-huh. <laughs> Right, right.

Hampton: Right. But I had, you know, a kitchen-- an old kitchen table that I could do my experiments on, and so it's interesting. My parents were very, very supportive but yet very-- really didn't understand what I was involved in and couldn't help me in that regard, but they helped me by being supportive and supporting some strange things that were starting to happen around the house.

Brock: And you, I think you were mentioning earlier, that you were also encouraged by a grandparent into your--

Hampton: Yes, yeah, my grandfather--

Brock: --interest in electronics.

Hampton: --had a-- he was the-- so he bought me a crystal radio kit when I was seven, and I really did wind the coil and sand off the varnish and make the little slider for the inductor and-- now, my father did, he didn't know what he was doing, but I had a-- he built a dipole antenna that had to have enough length in wire, but we had the room in the country, and so it ran-- I was just fascinated that I could listen to radio stations and there was no power, no battery. You know, it was, you know, the old crystal radio set, and my grandfather, my mother's father, had the first Polaroid camera. He had the first stereo tape recorder, of which we just listened to jets fly back and forth and trains. That's-- there was no music that was in stereo at that time, and he had a big Lionel train set and he just said, "Electronics is

going to be the wave of the future, and if you work in electronics you're going to be, like, having a great time," so I was exposed to that 7 to 14 or 15. He died a bit young, but later I also found out he taught at a museum in Cincinnati, oil painting and charcoal, all the art, all this art drawing, which is-- happens to be a really strong hobby of mine, and I enjoy oil painting as well. But yes, he, you know, he couldn't-- his influence was just very, very dramatic, and by the time I was 13 we had-- 13, 14, we had moved from New Richmond, Ohio, to Roseville, Michigan, and that was a suburb of, it is a suburb of Detroit, and so I was buying parts at the local TV shop and what that led to is I was offered a job by the family that owned the-- it was Telestar Television, and it was on Fraser Road[2] and-- in Michigan. So I worked from the age of 13 to maybe 16 fixing radios and TVs.

Brock: Hm.

Hampton: Yeah.

Brock: And well, just to go back to ask a couple questions, with being such an early and voracious reader, was it primarily through the library and the library's bookmobile that you were accessing books? Was that-- yeah.

Hampton: Yes. Yes, absolutely. Boy, I would've loved the internet in those days, but...

<laughter>

Hampton: Yeah. But yes, absolutely. Bookmobile, and occasionally, like, Mr. Putman, would get me some information from, you know, like a kit from Bell Labs or a course or something. But yeah, for the most part bookmobile.

Brock: And you're reading a lot of technical electronics-oriented material, it sounds like. Were you also reading fiction? Was science fiction a part of your world?

Hampton: Yes. Something that was very, very important to me. Well, so it's interesting. I had chores around the house and for the chores that I did I'd get a quarter a week, and so I'd save up four quarters and then once every couple months we'd go into a larger area to do shopping, and I don't remember. It's Batavia, Ohio, and I would buy, for a dollar, a book that was Tom Swift, Jr., because there had been a Senior before my time, but in the '50s, and Tom Swift was a series of books about a 19-year-old that was doing inventions, and so I really just-- and so it involved electronics and it involved an atomic submarine and a robot and all these things, and I would have the book finished before we had, like, I would sit out-- buy the book, sit out in the car and read the book, and by the time the shopping spree was over, whatever was being bought, it was-- and going home, I had already finished the book.

<laughter>

Hampton: So Tom Swift-- and, you know, it's like I wanted to contact the author at some time-- Junior, and by the way, the Senior had written the books and the son became the writer of the Tom Swift, Jr. series, and it had such a

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[2] [Interviewee's note] 10 Mile Road was the correct location of Telstar Television.

huge influence and impact on me, more than I can even really fully comprehend. But it gave-- there was an excitement, a hope, a being part of all that, inventing things.

Brock: That's great. So it was in Michigan that you attended high school.

Hampton: Junior high and high school. Yeah.

Brock: Yeah. And how was your experience there?

Hampton: Changed quite a bit. So coming from farming community to a suburb of Detroit, things got serious <laughs> really quick, and everybody was much, much busier in school and-- but again, there were a couple teachers, typically science teachers, and I started, you know, getting real serious because I wanted to go to college and I was taking, you know, the things to prepare me for college, but again, a couple teachers were very important to my development.

There was a Mr. Roberts. I don't remember his first name. He taught science, but he was also in charge of this photo lab, and I really got involved in photography for a while, so much so that I borrowed my first $50 from my father to get a Bogen enlarger, and I set up a darkroom in Michigan, and that quickly turned into a business developing all the neighbors, at that time, black and white film, and also slides, color slides. Not much more than that in that time, and so that business paid off the Bogen enlarger, and that photography and that experience in the darkroom stayed with me for quite a while, and the other thing at that time is that the neighbors found out that I worked at the TV shop and all of a sudden I ended up with a basement full of, like, TVs and toasters and stuff to fix, and ultimately my, you know, my mom was going like, "Okay, David. This is kind of like, you know, you got to get some of this fixed and not take on any more projects here for a while."

Brock: Right.

Hampton: The other thing that happened very clearly during that time is not a troublemaker but I, if anything was happening weird in a neighborhood they would call my house. During that time I designed one of my own designs. It was a tube transmitter, and I remember very clearly that the power output was from a 50C5 pentode tube, and I did something interesting. I connected a 6EA8 tube, which I used as a screen modulator, to put voice on it. So I had a friend that I had met in junior high, a Keith Dodsworth, who him and I would buy stuff from surplus and we had a radar transmitter sitting in Keith's basement that we had refurbished. Later, much to our chagrin, we found out that the frequency was the same as the police band, so whenever we turned it on we were kind of blocking the police...

<laughter>

Hampton: The police band at the time, and so what it was alluding to is that I built my own transmitter and so I would talk to Keith on my transmitter and he had modified, changed the frequency, of a CB radio, to be able to talk on-- and I forget whether it's 20 meters or what frequency that is, so we talked back and forth on our-- well, we talked back and forth on our radios, but what happened is my antenna was just pointing right-- it was much small-- suburbs, much smaller yard. I had a dipole for 40 and 20 meters, I believe, and it was pointing where all the telephone cables run, and what I didn't know is they didn't put the-- at that time I didn't know-- they didn't put the

shield back on the box, so every time I talked on my transmitter, if you picked up the phone, whether anybody had dialed you or not, you could hear me talking on all the phones in the neighborhood.

<laughter>

Hampton: So they'd say, "Hey, is your--" you know, "Hey, is that David talking on the--" you know, and then I had won a science award for a science competition, a science fair, and so I get to go step back again, and we went to a University of Miami? It was in Ohio. I don't remember. But I saw Tesla coils, and I have a visual memory that I've relied upon, and so I looked at these Tesla coils, creating these huge sparks, looked like lightning, and so around the time in Michigan, from my memory, I built a Tesla coil and created these huge sparks, and my younger brothers were running around the backyard holding fluorescent tubes that were lighting up, you know.

Brock: <laughs> Yeah.

Hampton: And what I didn't know is-- well, a Tesla coil has a spark gap on it and when you adjust a spark gap, it, you know, you adjust the spark gap and it tunes the-- there's an inductor and a capacitor. I made the capacitors out of glass and put them in an aquarium with oil and I rubbed aluminum foil on the glass and made the capacitors for this Tesla coil. But it's a spark gap transmitter and that transmits on all frequencies, and so all the televisions in the neighborhood turned black and rolled while I was running the Tesla coil and nobody ever figured it out. My brothers years later laughed about the fact that my dad would go over to the-- because it was tubes-- and hit the TV set and it would start working again because before the oil started to-- I could only run the Tesla coil for maybe 15 seconds or 20 seconds and the oil would get warm and start to boil and so the TV would start working again. So my dad would pound on the TV and it'd start working-- but my brothers were, like, hearing this, you know, Tesla coil running and going, "Uh.. gee. Our dad didn't associate, like, this noise downstairs that Dave's making with the television going black," but-- and chemistry and just was involved, and the other thing is, quite honestly, my schoolwork, I did enough to get by. See, I developed some bad habits and that was electronics was all-encompassing, and then there was-- I'm excited about it still now-- and chemistry and photography, and I spent all of my time doing that and as little time as possible as doing the more of the traditional schoolwork. So yeah.

Brock: Yeah. Well, so you worked in the television and radio repair shop throughout high school, or most of it?

Hampton: For about three-- for a couple years in junior high and a couple years in high school.

Brock: Okay.

Hampton: And you know, what's interesting is I remember when I was five, six, seven years old, a TV repairman would come and we had the old, you know, '50s TV, black and white, and they would pull tubes out and in, and even at the age of four I was, you know, my mother talked about this, I would take shoeboxes and they would help me punch holes and I'd put tubes into shoeboxes and, you know, play with TV parts and stuff. So I don't know what that <laughs> attraction was.

Brock: <laughs> Yeah.

Hampton: But I just, I couldn't get enough. I would stay up as late as possible in the evenings and read or do whatever. It's just so exciting, just-- yeah.

Brock: Well, as high school was coming to a close, how were you thinking about pursuing your passion for electronics?

Hampton: Yes. I had planned on going to college. There's a couple things that happened at that time. The draft was-- this is, I graduated-- I started school a year late because I was born in December, so I graduated in '70, and the Vietnam conflict was going on at the time. I was a low draft number, 13, 14, 15, and something else interesting that not many people are aware of, is that Nixon had made college exempt for the year you were in-- this is '71-- and you could finish that year, but you couldn't continue school. So it was no longer that I would start college and be able to continue until I finished. It would be just that year. What else happened is that really the focus at home was very much work, home, you know, and not much thinking about the four boys, because it was just surviving, and to be fair, my father left Chrysler Motors when I was on a scholarship program in my junior year, and took a job at General Motors, and so I lost my scholarship, and there was really no discussion about that. It was just-- so because of me reading magazines about electronics, Popular Electronics in particular, they said if you wanted the best electronics education, that you would go in the Navy, because being shipborne for the most part, they would have to repair all levels, depot-- well, it's called depot level, I level and O level maintenance, so you would learn all levels of technology, unlike some of the other branches. So, interestingly enough, because I had been-- I didn't know this at the time, but I placed very, very highly in the scores at Detroit in the-- where I took the entrance exams-- so much so that seven years later, I was in for eight years, my name was on the wall, and I walked into the recruiting office and I see my name on the wall and I said, "David Hampton?" He goes, "Yeah, do you know him? He's, like, scored the highest--" you know, "--of the entrance exams here in Michigan for the last--" period of time. I said, "Yeah, that's me." I was never told about that. But anyway, electronics, Navy. I signed up. I went in the military. That was January of 1971, and because of my preparation for college, it led me to be able to take-- it allowed me to do very, very well on the entrance exams, and I just thought you got to pick what you wanted. See? And so they said, "David, you should pick either nuclear submarines or Naval aviation." Well, it was based on my scores. I didn't know. I thought everybody got to pick what--

<laughter>

Hampton: I was 19 years old.

Brock: Yeah.

Hampton: So I headed for the Naval aviation field. You know, there were entrance-- I'm kind of oversimplifying it. There were entrance exams and then there were other exams and there was the boot camp and some other things and more testing, but ultimately I ended up in Naval aviation, and I was really, really quite heartbroken about the whole thing of not being able to attend college.

Brock: Mm, so you-- it would've been the case that had you not enlisted you would have been drafted.

Hampton: You know, absolutely. In fact, what happened is while I was in boot camp, my parents sent me the letter of-- from the Army saying that I would have been-- that I was being drafted, so... Because the timing of everything was such that they hadn't finished the records. You know, I enlisted, went in in January, and then sometime in January they just thought it was pretty funny that they sent me this letter from the Army.

Brock: Drafted. <laughs>

Hampton: Yeah. So...

Brock: So where did you-- so why did you choose avionics or that route rather than the nuclear Navy?

Hampton: It's called a problem, a little bit of a problem with claustrophobia.

<laughter>

Brock: That's very valid reason.

Hampton: Right. And I had-- my father had flown small airplanes, and in fact, some of the earliest dates of my father and my mother were flying down the Ohio River in this float plane that he would rent, and so I had always had an interest in learning-- or for very long time had an interest in learning to fly airplanes. So I just kind of was more interested in the aviation side of things, and at the time of entering the military, little did I know that although being in the Navy I really never ended up on a ship whatsoever. I was either part of an air crew or land-based or whatever.

Brock: I see. Well, could you talk about your sort of immersion in electronics and in electronics training in the Navy that led to what I think was the mainstay of your early activity in the Navy, which was as an aviation electronics technician for the Lockheed Orion aircraft?

Hampton: Right. The P-3 Orion, which is interestingly, at that time, the training for all of that, happened here at Moffett Field, not far from here [The Computer History Museum in Mountain View, California]. But through testing and placement and scoring very, I didn't know at the time, relatively high, I was able to choose duty stations, and again, I-- you just, when you're in it, you accept things as just kind of normal. That's what happens for me. But later I found out it wasn't the norm, and I asked for Barbers Point, Hawaii, and I had even instructors that kind of laughed, because the chances of that happening were very slim.

In my case, my first duty station that I was assigned to was in Barbers Point, Hawaii. I became part of VP-1, which flew the P-3 Orion, which had a lot of electronics on it, and the P-3 Orion, not only is it a anti-submarine warfare aircraft that served for a long period of time, but it also did missions of reconnaissance and surveillance and those type of things. Four turboprops, a crew of somewhere between 11 and 13 individuals, and so I did a lot of-- there's A schools, B schools, and C schools, and I signed up for six years initially because they guaranteed at least two years of schooling. So I thought, "Ah, that's a nice," you know, "a nice compromise between..." and I got to-- and I had more in the way of choice. But you had to qualify for that as well. But ultimately, VP-1, and this is during the Vietnam conflict, and I became part of a test-- so I was a crew member on the P-3 Orion. I sat port aft observer, and

I was the only electronics person on the plane, and not much longer-- sorry. Not much later after joining VP-1 they did a test program where they had this idea that the ATs, aviation electronic technicians, could potentially repair aircraft in flight, and I was one of the first probably 15 ATs that start repairing, during missions, aircraft electronics in flight. Sometimes it's rather precarious because you can't turn off power to certain critical systems, and what this led to is that the P-3 Orion had radome-- radar in the front and back, 360, but you were not allowed to be out on a mission without any radar. So we would-- so if I repaired electronics in flight-- well, there were certain critical things that you could not be on a mission without them being functioning, and some-- that was some radio equipment, some particular navigation equipment, radar equipment and so on and so forth. So the P-3 Orion could fly missions 15, 16, 17 hours, and so you'd get out to perform a mission. If something went wrong all you'd have to do is turn around, go back home, which led to this program of the in-flight electronics technician, and it became a success, and so much so that each crew then later, and for many years after, was assigned a in-flight electronics tech.

Brock: What was-- were there computers in the aircraft at that stage?

Hampton: Yes, there were, and they had drum--

Brock: Oh, my gosh.

Hampton: --memories and the RAM was a-- ah, and the names elude me, but it's core. There's core memory, so it's--

Brock: Magnetic core memory. Yeah.

Hampton: Yes, uh-huh. Absolutely, correct, and there were tactical-- there was a tactical coordinator station. It was all electronics. There was the navigation equipment, the radio equipment, the auto pilot, the crypto gear, and it's interesting. People talk about a top-secret clearance, and having one, I know that it only is used during the time that you need it and when you don't need it you don't have it anymore. So for crypto access I did have, carry, a top secret clearance. But there was also the anti-submarine warfare type of where they launch sonobuoys and they analyze the spectrums of the-- that would be received of the information, the water, the spectrums, of the-- or the signatures of things that were in the water. That equipment was all electronics. So for the time it was a rather sophisticated aircraft.

Brock: Was that your-- had you been exposed to computers prior to that?

Hampton: I had only been expo-- I had been exposed in high school in a Algebra II class to a-- the teletype, and it was connected to the computer-- I would think for a minute and I would remember the name. But it was on a campus and it was over the old acoustic modem, and we typed-- I remember typing in a program that just simply converted Fahrenheit to Centigrade or Centigrade to Fahrenheit, and being exposed to that paper printing out and very, very, very fascinating, yes. But as far as anything more sophisticated, the Navy was my first exposure to that, and really my first exposure to learning, you know, ones and zeros and Boolean algebra and those type of things.

Brock: And what was your response to it? I mean, was it something that you--

Hampton: Oh--

Brock: --took to or like you did with all of this electronics activity or...?

Hampton: Well, you know, here's what's interesting. At the time, I learned what I needed to learn, and it was fascinating. But the reason it didn't go much further than that is that it was just a huge, expensive system and so I saw no correlation between that expensive equipment and something that I would ever be touching in the foreseeable future. But yes, it was of great interest, but it wasn't quite as, I was not quite as enthusiastic as I was for the things I'd be able to take home with me and get involved with and make part of what, you know, what I deal with.

Brock: Were you continuing your sort of what we might for lack of a better term call your hobbyist activities while you were in the Navy?

Hampton: When I was land-based for a period of time, I did start oil painting. I did start playing guitar, and electronics-- it was hard to really set up much of an area to build too much, but I kept up with Popular Electronics and Popular Science and those type of things. But the Navy was really, other than the electronics that I worked on for the military, it was a period of time where I started doing other things, and I studied the Japanese language before being stationed in Okinawa, and I studied the Thai language before being ultimately stationed in Thailand. And I learned, you know, I owned a Thai restaurant when I was stationed in Thailand and learned how to do Thai cooking. So it was kind of a cooling off period in some ways. I still electronics very much there, but I couldn't, I couldn't pursue it because I was largely not in control of my life anymore. I could be in in the Philippines one day and in Thailand the next, and then all of a sudden be in another place within a-- so in a matter of days or weeks, all I did was carry around a couple duffel bags for a while.

Brock: Well, I-- For how long were you stationed in Thailand when you had that restaurant?

Hampton: Right. So Thailand, I was-- it was supposed to be my last duty station. I was going to be there for three years. And I was there during the time that the conflict it was closed. It was over. So I ended up being there at that time about a year and six or seven months which led to me then going back to my final duty station when-- Where I was stationed was actually a Thai naval aviation base, U-Tapao. And there was a large Air Force presence there, but only 15 of us or 20 of us in the Navy there. But yes, so I always there about a year and seven, eight months and then the conflict was over and we quickly left Thailand.

Brock: And that's when you went to San Diego?

Hampton: San Diego VS41.

Brock: And there it was-- was that supporting a different aircraft, the Lockheed Viking?

Hampton: Yes, yes, the S3--

Brock: Similar mission or--?

Hampton: Similar mission. Now, there's a huge difference, though. I would not be a crew member on an S3A. It was a smaller aircraft and it was carrier-based.

Brock: Oh.

Hampton: So the P3-Orion, being 100-foot wingspan and 4 turbo props, was always land-based. So that meant even though I was in the Navy, I was land-based overseas and such. Now S3A, VS41 was a training center for electronics and flight and all of that that applied to the S3A and that was in North Island, which is, you know, right, it's San Diego. And much like Moffett Field here was the training center for VS31, that was the training center, VS41 was a training center.

So I was in support of the electronics in reference to the training center there. By that time, because everything was happening so rapidly, I was promoted six pay grades in a matter of three and a half years. That had a lot to do with test scores and what they considered mission critical and what was going on. So by that time, I was managing an avionics shop and I was not running out to the airplanes so much, and I was no longer a crew member. In fact, I lost being a crew member when I was assigned to Thailand as doing both I level and depot level maintenance for mission critical electronics. Yeah, so San Diego was a training for the S3A.

Brock: And was it, had you decided, you initially enlisted in the Navy for six years; you were in for--?

Hampton: Eight.

Brock: Eight. So somewhere in--

Hampton: I enlisted in--

Brock: Near San Diego--

Hampton: Before San Diego enlisted--

Brock: Before San Diego you enlisted for another two.

Hampton: Well, that's kind of, yeah, that's a little bit of a delicate topic, which is interesting. What happened is when you enlist for six years they guaranteed this bonus that when you would be released, it was 10, 12, 15, I've forgotten the number. And I was getting ready to get out after six years, and they did not pay that bonus. There was a, there was a change of-- something happened. I found out later that a bunch of people took that and then and took it to court and they were ultimately paid. But here I was ready to get out of the military, prepared to have a certain amount of money in my hands to help that transition, but ultimately that didn't materialize and I was overseas at the time and so I did another two year stint. So the total for eight, yeah.

Brock: And but as the eighth year was coming to a close, were you fairly-- I mean, some people, you know, make the Navy their career.

Hampton: Oh, yeah, sure. No. I knew.

Brock: Now were you-- Well, how-- Tell me about what you were thinking.

Hampton: I absolutely was not going to be career Navy. It was a wonderful opportunity. It was wonderful in visiting lots of places and learning new languages and cultures. It could have not been surpassed in that way. But as far as electronics went, I didn't-- I had-- I didn't have choice. I didn't have a lot of choice of what I was doing. So, in preparation for getting out, I got my hands on every single book that I could. The Navy at that time was not using a lot of CMOS technology, TTL, all the integrated circuits that were developed at that time. It was, it was wonderful technology, but it was still behind, you know, the times, and this is we're talking 1978, 1979.

Brock: Yeah.

Hampton: And so I just grabbed everything I could to read and catch up on all of these integrated circuits. At this time, we were seeing the signs of the first personal computers. And I'll be very honest about that. I just loved the idea but when I saw that you were flipping switches to enter data and that it was very much a tape and, you know, like the first S-100 bus things, they weren't doing very much. And I didn't really, I didn't-- I saw what could happen, but I didn't know it would happen so quickly. It happened much more quickly than I could've ever realized. And I became part of that in my first job after the Navy. But for the last in San Diego, of which I was there about 2-1/2 years I believe, it was a catching up and getting-- a catching up and reading and getting involved with all the things that I loved about technology again. So that's what I used that for.

Brock: So could you tell me about what you did immediately after leaving the Navy?

Hampton: Right. So getting out the Navy, I could only prove on paperwork that I was capable of technician type of work, and I interviewed at a couple places in San Diego, and interestingly enough, I was always very direct, hopefully not arrogant, but you know, direct.

And so I'd interview and I'd said, "Well, if I do something interesting, how fast can I be advanced?" And you know, some places to say, "Well, David, no matter what you do you'll be at this job for one year and then we'll do a review and then--" And so I said, "Okay, great, thanks." But one of the places said, "Well, it's interesting you're asking that." And they don't understand. During an interview process, you don't usually ask those questions, but I'm enthusiastic and I wanted-- I want to give and I want to, you know, I want it to be a mutual benefit.

Brock: Right.

Hampton: And so I had a place, and it was that I interviewed at. It was called Digital Development Corporation. They made hard drives for submarines. They said, "Well, you know, David, if you do something interesting or different that deserves merit or recognition, of course we would consider a promotion." So I took the job that actually paid, I remember, $6.25 an hour <laughs> instead of, like, $6.75 an hour on the hope that I would be able to do something of benefit there.

So I was there about six weeks and they were aligning-- they were calibrating a large hard drive system and this hard drive system was very, very different in that it had 255-- a large number of heads that didn't move. There was no Manchester encoding at a time where the clock is encoded with the data for recovery. They had a separate clock track on the outside circumference of the hard drive. But what happened is by no moving parts, it could survive a lot more and much better in the environment of a submarine. But the access time is very, very quick. You just electronically switch the heads. No movement. So very fast access, very high speed RPM, a very large drive. It was occurring-- It was-- Sorry, my mind races and, you know, my tongue trips over what my thoughts are.

But what was going on there is that a large hard drive, it would take 16 or 17 hours for a technician to calibrate all of these circuits and heads and the clock track and the phase lock loop that, you know, it was a long process. So I came up with an idea to make a computerized test set. And I, much as throughout my career, I don't think about whether something's innovative or not, I think about more about whether it solves a problem. and I didn't know it at the time, but it was innovative to create, at that time the characters came out of a character ROM and so it was a character set that you could put alphanumeric characters up in, numbers and such. But I, by doing a parallel bus kind of thing, arranged RAM memory to be able to store a custom character set, so to speak. So the idea was to draw a circuit board on the screen and through a mux, through analog muxes, connect with a DVM. There was DVM chips were out there, a digital volt meter, which means I could measure voltage or resistance of a current, program the probe to do whatever I needed, flash a little area on the circuit board to connect the probe and then flash X at the bottom of the screen, show the calibration point and just a calibration point until the X flashed. You wouldn't even need a technician for that, and it became more of like for five hours rather than 16 or 17 hours. So it's a very long story there.

Brock: So you were making to essentially automate and speed up this calibration process--

Hampton: Yes, that's--

Brock: You made kind of a microprocessor-based custom tool for doing this calibration.

Hampton: That's correct. And we nicknamed it the PAT Tester. The Programmable Automated Test set. It was 6502-based and very, very much, yes, a custom design. And so I found myself being promoted to test equipment engineer and being and heading up a department to get this test set developed and built. So, but now I became recognized as being able to do engineering work, which served as a steppingstone for the later jobs that I held and the later positions that I held. It was very much I had to show people what I was capable of doing rather than show the degree that I didn't have, so.

Brock: Right. And was that your first outing in creating a microprocessor-based product, if you will.

Hampton: Yes. Absolutely.

Brock: Yeah. And you designed a-- Did you write the--?

Hampton: I wrote, yeah, I started writing the code for all of that--

Brock: In the-- in assembly language?

Hampton: It was assembly language. And yeah, a difficult situation, though. What happened is everybody has a better idea and being-- But anyway, yes, it was the first exposure to really 6502 and developing the buses that interfaced-- At that time, you had to just build your own display board and build your own character generator, put it on the display board and RAM was separate and very expensive. And yeah, so on and so forth. So it led to the next year a job in test engineering. And interestingly enough, only a year or so later, I went to a place, MSI Data, and they were using computerized test sets. Not quite as sophisticated is what I was developing at the previous job, but 1802 processor, and that led to a whole bunch of other, you know, things, so.

Brock: Well, could you talk about MSI, I read from your CV that they were making handheld computers. Could you could you talk a little bit about that company and what they were making and your experience there?

Hampton: Well, you know, it's interesting is with the large battle of trying to convince people about computerized test sets at DDC and going to MSI, they were already on board. I didn't have to, like, you know, battle with anybody to convince anybody. But they were making an 1802 and that is a RCA processor. It was CMOS-based and what that allowed you to do is have it portable. It could run off of batteries. So they made some of the first, and we're talking about, 1980-81, the first handheld data collection terminals. And what I mean by that is it was handheld battery powered with some keys on it, and then it had an optical reader so you could scan barcodes and do inventory control.

Brock: I see.

Hampton: And so they had already got it. They were on board with all of that. And so I went there as a test engineer and helped to learn-- I learned how to set up-- You know, here's what's so nice. I've always had the wonderful opportunities to get jobs where I was over my head. And I kind of sought, you know, I would seek that out, because what happens is they, in fact, without really being fully aware of it, trained me in these wonderful ways that became stepping stones for what I did later.

And in fact, I think this is very, very important. I have learned it doesn't matter what you, within reason, what you've learned in life. There's at some point in time, you'll be able to call upon that knowledge or information, knowledge and information you get to keep forever, you know. And so nothing is wasted in my opinion, when it comes to, you know, reading and gaining information and knowledge. And it's just all exciting, whether it's music or painting or electronics or-- In fact, I'm going to probably digress a bit here, but what's really important is I made not a mistake, maybe a misunderstanding.

I thought that my love was electronics. And don't get me wrong, I love electronics. But what I have come to find out is it was the love of learning, the learning of-- the discovery process. And I found that same love in writing and composing music and the same love with painting, the same love. Although I didn't mention it much, I play a couple music instruments. But unless you do that a lot, you don't stay very proficient for very long. But all of those things-- and flying. I like flying airplanes. It is the love of learning and gaining knowledge and being creative with that, and you can be creative in anything. I've always found and whether it's, whether you talk about motorcycles, or cars, or

airplanes, or dentistry, or medical, or… there's huge opportunities to learn and change an industry by being excited about what's new.

And invention to me, I didn't invent anything that never existed. What it is is a combination of knowledge that you gain and you rearrange it in a different way and then you present what seems to be a new concept. It's what you've learned. And so by learning something from painting, and learning something from electronics, and learning something from programming, and so on and so forth, I have more things that I combined and can create new ideas. That's what I found out is the most exciting thing of all, so.

Brock: Well, it seemed that, you know, it seemed that the next couple steps of jobs that you had were, you know, in the kind of similar vein, you know, from MSI and working on automating testing and, you know, more exposure to microprocessors and programming. And then I think your next job was at a, like, a CNC programming. Very brief. But then and please, you know, <laughs> I'm so fascinated to see the story of it, it almost seems like then there's almost, well it reads like a discontinuity when you go to Western Technologies. It seems like it's a change of place, although maybe not that terribly far, you know, up more into Los Angeles region. But it seemed like a completely different domain. Could you talk about that?

Hampton: Yes, I can. And so it's not something that you can easily write about.

Brock: Yeah.

Hampton: But here's what happened. At MSI Data, I was responsible for getting new products shipped out, and I was working with both hardware designers and software designers, and I found something very interesting at that time in '80, probably '81, '82, is that when something went wrong, when a new product wasn't-- had some difficulty, the hardware engineers would say it's a software problem and the software guys would say it's a hardware problem.

Well, up to that point, it had been some software, but mostly hardware, you know, and, oh, and by the way, what else was interesting is that their vocabulary and talking about the same thing was different. So inside of a chip, there could be an area of storage inside of a chip and the hardware people talked about those as registers. And because of the way those registers are used, software people may refer to those as a stack. So you could be talking hardware: a register, software: stack, and they'd be talking, sometimes, about similar problems or the same problem and not understand the vocabulary.

There was-- and remember, this is '80, '81, so at that time, I thought, if I'm going to be sticking around this industry very long and be able to keep up, I probably need to learn and become as proficient at software programming as I do hardware. And if I could somehow know both worlds, I would be able to solve problems that neither field by itself would solve. Now, ultimately, you know, I'm going to tell you the punch line. I never would have guessed at that time, it led me to be able to develop products that no one else could that were low cost because I could trade-- the cost of software occurs one time-- and that's called-- it falls under non-recurring engineering. In other words, you write the code, and once you write it, you don't pay for it anymore. It costs a certain amount of memory space or whatever. And if you put in hardware, you solve it with an extra transistor or a chip, you pay for that every time you make that unit. So by having an intimate knowledge of both of those, I ended up being able to become part of what we allude to with that industry, where I started writing videogames and ultimately being invited to join a think tank

at Mattel Toys, by combining those two disciplines, usually that's multiple teams, and you know what, it works. But it's not the same as being in one head, one brain. So that discontinuity was that I said, I'm going to have to start writing as much software as I can to raise my skills so that now I integrate at an equal level, hopefully. That was, that was a goal.

Brock: And was that deliberate?

Hampton: Yes.

Brock: Huh, interesting.

Hampton: Yeah.

Brock: And so was it the case that, well, was it more about an opportunity to delve deeper into programming and software than computer games per se?

Hampton: Absolutely.

Brock: Okay.

Hampton: Yes, absolutely. I had no idea, really, about computer games. They weren't-- You know, they were popular, but they're not what they are today, where everybody—You know, there's a lot of people that'd love to start writing, you know, video games.

Brock: Right.

Hampton: But here is also the aspect of it. What I had been involved in is real time applications, and that's what also is exciting, and that is the hardware has to run very quickly, respond to human interface and respond quickly enough. And then the code has to run quickly. It's not like in the early days where you would do a digital commercial and you could, like, have it render overnight.

Brock: Right.

Hampton: And then come back. No, everything was real time. And so the attraction was video games were very much real time. They had to be very efficient. They had to be very small. And here's another analogy. When I started taking my private pilot training, I didn't-- <laughs> I didn't-- Ultimately, the first airplane I bought was not tricycle landing, which is the easiest thing to take off and learn-- I mean, take off and land and learn in. I bought a tailwheel, was my first, and the whole idea was that if I learned to be-- to fly the airplane, a more difficult airplane, I would be a better pilot from then on. I had seen pilots I had flown with that got a little lazy. They didn't use much rudder pedal in the trike landing because you didn't have to-- you have to use so much rudder. But if you do something wrong in a tailwheel airplane, you do something called a ground loop and the plane spins around--

Brock: Right.

Hampton: And then you hit a wing or something or and you cause some damage. So I was very much focused on real, the real time aspect of programming. And here's something else that happened. Because I had such a wide varied career, something,-- okay, this is a weakness of mine and I had to try to turn it into a strength. In normal corporate, in normal jobs, when you do something well, they want you to do version A, and B, and C, and D, and do that. And I've had friends that they spent a career of developing hard drives at Western Digital, for example. That's not me. And so I became also aware that I was having jobs for a period of a year, a year and a half; ultimately, that doesn't look very good on a resume and I had to start-- <laughs> I had to start my own business. That was part of it.

<laughter>

Hampton: And it's just the truth of the matter.

Brock: Yeah.

Hampton: But I became bored easily. And so, anyway, so that discontinuity was me. I really did, I promise you, I made a mental conscious decision that I needed to get my chops up in software as I had developed over-- as the hardware, if I was going to be in the industry for a very long period of time. That was my belief.

Brock: Could you talk about Western Technologies and how you, you know, became associated with them and joined them?

Hampton: Yes. Now, interestingly enough, by that time, I had such a diverse background that I had to go out and find a job recruitment service, otherwise known as a headhunter, because you can't walk in the front door and say, "Oh, yes, I do RF design, and I do audio design, and I do digital design, and I program, and I… you know, whatever." It just doesn't-- So by finding this job placement service, they could represent me. And then I interviewed with them. I did this, you know, and my wife was actually part of saying, "Hey," it was Cindy, "It wouldn't be a bad idea if we, like, get somebody else to represent you because this is, you know--"

And so, Western Technologies was two companies, J. Smith Engineering and Western Technologies, very well known in the toy industry, and they were known for developing, I didn't know it at the time, but LCD handheld games were big at that time and Atari 2600 was doing quite well. And so, I interviewed and based on my background and my excitement and enthusiasm, I ended up with a job at Western Technologies. Western Technologies was the development company and the patents were held and the royalties and such were collected by Jay Smith Engineering. So they had a separation of the two companies. And he's very well known as a toy inventor and a video game--. And so I was exposed to a version of a think tank. And what was really interesting about this is after the interview, I came home to my wife and was so excited. They were shooting rubber bands at each other, and they had, like, refrigerators full of soda and snacks and listened to music. And, you know, you could go off and if you got a little bit bored, you could go off and play arcade games a little bit or-- And so it was really, really an unusual environment. So I had to come-- become-- So here's what works for me.

I had to become familiar with an Atari 2600 very, very quickly. And I took-- there was a manual that they had, I think it's a Stella programming manual or something, and I read that, took it home and read it, you know, multiple times and became familiar. And so real quickly, there's a-- there was a critical routine that in the Atari 2600, you had

to put all of the-- you had to create the vertical sync pulses, the horizontal sync pulses and all of these things just to get something to display on the screen. So, I rewrote that routine and optimized it, and <laughs> they ended up using that for the basis of all the games. That became the standard that they used. And really quickly again, within a matter of-- And I wrote a game for an in-house development that was being sold to U.S. Games called *Raft Rider* and nothing of really-- But it's what I cut my teeth on.

Q*bert was a very, very popular arcade game and Atari said it was impossible to port *Q*bert*. Port is-- porting is to take a game from one machine and you put it on another machine. It would be impossible to port *Q*bert* to the Atari 2600. Here's why I said no info-- Here's where I earlier said no information goes wasted. Because of my experience at the TV shop as a child, you know, a teenager, I knew the timing of much more detailed than what programmers did. Programmers round things off, at least at this time, and they didn't have the exact horizontal sync pulse timing or the exact vertical interval timing, you know, the refresh time. And because I knew those timings, I was able to take out the horizontal sync pulse at each, the end of each line, and that saved three bytes of code when you only had a 4K cartridge--

Brock: Right.

Hampton: Per line and there were 218, 15, 18 visible lines. And it didn't waste the time. It didn't waste the memory, but I had to hand count all the cycles in between so I could do no conditional branching. I could do-- It was all-- And if I made one mistake in coding the whole picture lost synchronization. But that was the fundamental trick where I never did anything that was impossible. Ultimately, I just did things that were more difficult than most people would be willing to take on. But because of my experience at the TV shop at 13, 14, 15, I had the experience of being able to solve and program *Q*bert*. The punch line for that is, that's why not much longer after that, I was invited to join the think tank at Mattel Toys.

Brock: May I ask a follow-up question here about *Q*bert*? In-- as an arcade game, was that built-- Was that microprocessor-based when it was an arcade game? Or was it all kind of discrete logic boards?

Hampton: It did have a-- Well, there was a lot of discrete logic for the graphic creation and for the sprite creation and for collision detection. But the game was written, if I remember, I may have it wrong-- Well, I know that I believe there was a 8086 processor, but interestingly enough, there was like a Z80 processor and a little LPC speech synthesizer, I mean, of the TI variety, which I end up using later that made *Q*bert* do this little [imitates Q*bert sound].

Brock: Oh, yeah, yeah.

Hampton: Yeah, yeah. And then, and then there would be a little solenoid that hit. When he fell off, he'd go, [imitates Q*bert] and it would hit the-- You'd hear the solenoid hit and it would sound like he hit something in the ground, you know. So, yes. And my work at-- So within a relatively short period of time, I was flown out as a technical representative to convince Parker Brothers that you could do the game, even though Parker Brothers couldn't and Atari couldn't. It was kind of interesting. It wasn't at Western Technologies all that long before I became the representative, and I had the interesting experience where we had management fly in as well, and they

talked about, you know, how we would potentially proceed. And Parker Brothers was intimately already familiar with the Atari 2600 because they were releasing games under their name.

Brock: Right.

Hampton: And they said, "No, no, no. We need to know how it's going to be done. You're speaking in generalities." So I had to give them-- This is where you either do your disclosure and get the job or you don't or you be secretive and there's a balancing act there.

Brock: Yeah.

Hampton: So I had to give them enough information to convince them that, in fact, I was going to be doing something different. And we walked back with the contract for the 2600. Why that was so important is that then the *Q*bert* contract was awarded for all the platforms, which at that time was the Atari 400, the 800, the ColecoVision, the I don't know if we did it for Intellivision, but the ColecoVision and 400, all of those were awarded to that company. And because of my work, also what happened is they, Gottlieb,-- Well, okay, so Gottlieb Electronics made pinball machines. They were bought by Coca-Cola and became Mylstar Electronics and they did the early laser disc games where you had a background that was very, very high quality of rather than computer-based, it was video.

Brock: Right.

Hampton: And then you used some of the audio tracks to synchronize data of the sprites that went over so you could do collision detection and stuff. So they awarded-- I started working on a game that was not released called *Q*bert Circus* and that contract came in because of my work with the 2600. So you see how this all has this snowball effect, in a good way, and it led to me learning how to program arcade machines <laughs> and laser, interface to laserdisc systems. And I developed some of my own development equipment because I knew how to build hardware. And I'd walk in and you know, Mylstar walked in and said, "This is not one of our, you know," <laugh> you know.

Brock: <laughs> Yeah.

Hampton: So, and the only reason those games were not released is that the video game industry collapsed and the company that I started at Western Technologies when there were 13, 15 people and it had grown to 65 or 8 people, I was never fired, ever and I was never-- I was laid off once, and so there were 8 people left and I was laid off. And I believe that of those 7, most of those were family members. But yeah, that's--

Brock: So it was kind of in the port of *Q*bert* for the Atari, it sounds like it was just this kind of combination that you had been intending, like a deep knowledge of the hardware so that you could do all of this tricky programming to take advantage--

Hampton: Yes.

Brock: Of the timings, and the cycles, and make it very exact and fit it in there. So did you-- And was that, I mean, I imagine that game was a market success, that was.

Hampton: Yes.

Brock: Yeah.

Hampton: Oh, yeah, in fact, it was such a success that they never really wanted to publish the numbers. It was the first time also, I got a whopping penny a cartridge up to a limit, but it allowed for about a, you know, $40,000 dollar down payment on my first home that my wife and myself bought.

And I got calls from Atari and I got calls from later what would be Sega America and I got-- And I thought, you know, I'm all set. I'm going to, like, you know, be getting royalties and, you know. But the industry collapsed, so, at that time, so. But it-- How could you have anything better than setting out to learn software and it happens to be on a very, very successful-- It was game of the year for the cartridge industry in '83 and '84 and received large recognition.

Here's something else that has come to mind that's very, very important. At the time of the success of *Q*bert*, and we're talking, you know, 15 million cartridges or something, which is huge in that industry, I don't know the exact numbers, but I have rough ideas. And what happened is they said, "David, this is it. This is your career defining moment. You're not going to, you know, this doesn't happen, but like very rarely in anybody's lifetime, and you've had this. So, you know, just, you know, enjoy this because it's not going to happen again."

Brock: That's kind of gloomy. <laughs>

Hampton: If I believed that for a moment, I would have never continued. And one of the things that I forgot to mention is that one of the reasons I was able to walk in off the street, so to speak, and talk about a computerized test set at Digital Development Corporation is those individuals, all highly talented, they fell in love with something. And when you fall in love with something, you hold on to it too tight. And they had gotten their degrees in the sixties and early seventies and they did a great, you know, hard drive. And there were some really unique technology, but they were, so, they were holding on to it so tight that they weren't exposed to-- They weren't exposing themselves to new things.

And so I was able to walk in and during the interview, or during me presenting the idea, I presented a block diagram. And so the president was in front of me, the test department, which I was part of was to my left, and there were some engineers from the engineering department and development. It was, "Well, David, you're going to measure voltage, right?" And, you know, I said, "Yeah." He goes, "Well, where's the, you know, A to D, the converter?" an analog to digital converter. And he goes, "Are you doing dual slope? Are you doing a dual slope or single integrated," all these things. And you used to build analog to digital converters discretely. And see, he had been prepared by the engineers. They didn't believe my block diagram. They had held on to what they had done so tightly, they were not aware of a chip, and on the block diagram, it said, "DVM," and I said, "Well, you know that chip that says DVM..." I had to be very cautious of course. I didn't want to be rude, but I said, "That's a digital volt meter, so all of that's just part of that chip," and it cost $8.50, and there were a lot of surprised... So I did make a

conscious decision to try not to fall in love with something so much that I could not let go of it, and so that happened with *Q*bert*. I had to say, "Well, that was nice. What's next?" And that's a conscious effort.

Brock: And unfortunately, there's a sort of legendary industry downturn in the home computer game market at the time, so that the Western Digital, or Western Technologies, pardon me, shrinks greatly. You know, what was your thinking at the time? What did you do? What were you thinking of making of that situation?

Hampton: Yeah, no. Here's something else interesting. You know, creative types as well as engineering types try to plan. I don't-- I'll speak for myself. We try to plan things out. So I had gotten married and, you know, I had this all timed. So we're getting married and we have the-- or we have this down payment, we're going to buy this house, and a year later my son Mark, you know, we didn't know at the time, but January, right?

So November, I get laid off. In November, a week before Thanksgiving. Nobody hires November, December, January. The budgets come in. So I had it all planned out and then all of a sudden I'm sitting there with a house payment, a child on the way, which I'd lost my medical, and I had no job for the first time in my, you know, life. Since age of 13 or 14. But so that's where I took the work with Kaiser hospitals for a short period of time, and me and Kaiser, it was not a good fit. To try to get new technology into a large established hospital. They're wonderful, but it's a difficult proposition and...

Brock: And probably an inherent and maybe desirable conservativism, you know, when you're in a clinical medicine context, you know, to new things, in a certain sense, so I could see how there could be a tension.

Hampton: Well, and-- you're a hundred percent spot-on, because what happened is I set up the-- a new lab. They had built-- I moved from L.A. to Walnut Center, which was a new building in Pasadena, and I set up the lab there. I left before the equipment showed up for the lab because what happened is, being a hospital system, they had to take a logic analyzer or an oscilloscope which would never be in the hospital because-- but-but... They had a policy. It had to be inspected and tested for ground. It was disassembled and looked at. You would a piece of medical equipment, in case, by accident, it ended up somewhere in a hospital somewhere. So we're talking about it took a year and a half to get the equipment to start doing the work. So <laughs> you're just absolutely correct. So what's interestingly-- interesting is that that time at Kaiser, you know, you grit your teeth, you do what you have to do to provide for your family. That was very much that. I always have tried to stay-- you're talking to a person that didn't have a choice and got drafted. You're talking to a person that just would've given anything to go to college and I didn't get to do that. How do I do that? I look for the future. I try to stay as optimistic as possible. I remember my enthusiasm and my excitement about what I enjoy doing, and then I have this huge advantage of for the most part in my life getting to do exactly what I love doing. It doesn't get better than that, and while I was at Kaiser, that's when the call came from someone that knew me at Western Technologies that was now a manager at Mattel, and said, "David, we would like to invite you to join the Mattel think tank, New Business Concepts." You do not apply for that job. Most of those jobs are filled from the inside from people that have been at Mattel toys 15, 16, 17 years, and here I get a call out of the clear, blue sky to release me from my Kaiser responsibilities.

Brock: <laughs>

Hampton: And as far as jobs go, Western Technologies and now Mattel toys were the most wonderful opportunities that I had in my experience and I stayed at Mattel for over four years, and the group was amazing. It was set up by a woman named Susannah Rosenthal. The group had consisted of 15 to 18 individuals. I worked with a dollmaker that had made Chatty Cathy and all of these historic toys. He was from Lithuania, and a illustrator and mechanical engineers, and so I was electronics guy, in all of these varied disciplines, and the group reformed itself, which is quite brilliant, based on like the boys group would say, "Hey, we want to do something for racecars," you know, and so I would work on their project and help them with electronics. If I presented a concept that needed mechanics, I would try to get one of the mechanics teams or an illustrator or a sculptor or a mecha-- whatever to join and work with me for a while. So it was very dynamic and it was regrouping itself and reforming itself and it was very, very rare, very creative, and a wonderful opportunity. Now, another example of going the extra mile. One of the things that happened at that time at Mattel is electronics was not doing very-- Intelivision had shut down and that division had been shut down. When the video and game industry collapsed, that Intellivision, ironically enough, I had applied to Intellivision at around the same time. It was one of the places the headhunter had me interview as well as Western Technologies, and they said, "No, no, David. You just don't have the experience." Wasn't that dodging a bullet?

Brock: Yes. <laughs>

Hampton: I would've been...

<laughter>

Brock: Absolutely.

Hampton: So... <laughs> So the whole timing of this, in this Mattel toys think tank, so here's what I was going to talk about. Electronics was not getting through. The Intellivision had just shut down that much earlier. Electronics was still not like the favorite word around Mattel, but what I learned is there's a costing department, and you talk about costing within at least a tenth of a cent when you do production.

When you do production at a toy company, you're going to make at least 250 to 500 thousand of something, and if it's successful, more. So every fraction of a cent becomes critical. So electronics products were always costing too high and not getting through the system. So instead of taking lunch, what I did was I would go hang out in costing and get information from costing and talk to costing and learn about costing. I started doing my own costing and I used their sheets and they were going, like, you know, "Where'd you get this from?"

By doing my own costing I started getting electronic products through the system, and because of that experience I was able to go in ultimately with Furby and I did all the costing and I did-- knew where to get the parts and I knew where to do sourcing and I knew where to-- who to get down and how much it cost for assembly in Asia. Like, you either get-- you pay a percentage or you pay a penny a part at that time. How much it cost to drill a hole and what boards and whether they're stamped or whether they're-- I knew all of that from the costing experience at Mattel, so again...

Brock: Could you talk about Mattel's place in that industry? I mean, it certainly is a name that I know, and I'm sure that I have, you know, as a younger person, used many of their products. <laughs> But could you talk about their place in the industry? You know...

Hampton: As far as computer industry or...?

Brock: Or no, in the whatever you would call it, the games and toys industry, or-- I'm ignorant of the correct phrasing. Yeah.

Hampton: Oh, yeah. Okay. So... So in consumer electronics, Mattel-- now, see, this has all changed because of video games and technology and cell phones and all that. Toys are not selling quite as well as they were in times past, but at this time, Mattel-- well, now, I was isolated from Mattel-Mattel by being in this think tank, and so we did think quite a bit differently, and in fact, New Business Concepts, not only was it to develop toy products, but it was thinking of new ways for Mattel to do business and we did that as well, and one of the ideas that came up is that there were a lot of names that Mattel held, like Wizzer tops or just things that were popular and famous names and so-- but if you don't make a certain number of them, we don't-- we're not going to do that. We have to make 500-- 250,000 or 500,000. So why don't you license that name to some-- or yo-yos, like the Duncan or whatever the yo-yo brand names they had.

Brock: Yeah.

Hampton: Why don't you license that to somebody else, let them make that, collect some royalties-- so that's a new way of doing business. So that was also what happened in New Business Concepts. Mattel toys, you know, now, in particular, New Business Concepts, it was a precarious thing, because Susannah, the head of the department, was very, very smart and she-- we didn't report directly to marketing. When you have a new concept-- and by the way, in hindsight, I could see ideas that we worked on that were 7 to 10 years ahead of time. It's hard to market something when you don't know anything-- it's just that new.

Brock: Right.

Hampton: Ultimately, New Business Concepts had successes and failures because of that odd thing of coming up with things a little bit too early, but we reported directly to the chairman of the board and the board directors rather than through marketing, and at that time it was John Ammerman. But Mattel has tried to straddle this-- see, they had Intellivision to do the video games and they had, you know, they have this-- this huge doll market does good for them, and soft goods. What's called soft goods does well. The plush and the, you know, the doll things, and you've got-- and then to modernize they try to, you know, they tried putting electronics in things. So for example, See 'N Say. You know, the old corded device that talked?

Brock: Yes.

Hampton: Well, I developed the first new electronic version of that, but interestingly enough, they didn't release it at the time. They said, "The corded one's doing fine, and-- but we're prepared for if we have competition or we see signs that it needs to be replaced, we have this electronic one developed." Well, little did I know at the time that I

was developing a product that wouldn't be put on the market right away. Yeah, there's just-- it's just it was a wonderful experience and there's a lot of different things about that.

Brock: Well, did you see in the projects that you were doing for Mattel, did you see a growing importance for microprocessors and software, kind of--

Hampton: Thank you for--

Brock: --like in the example we just spoke about? Was that, like, a big trend that--

Hampton: You're absol-- thank you for that. That is a very-- a good question and right on. Yes. This will give you some examples. During the time I was there, there was a doll called Heather, which was the-- one of the first electronic dolls, and I did see technology becoming integrated with toys, and one of the things that I did is this is where you play little tricks in knowing about production costs and what chips cost.

There's something called a digital signal processor, which is a DSP chip, and this one in particular's made by TI and they were very, very expensive at the time. You couldn't put them in a toy product. But in speech, if a bit of data is corrupted, you won't-- unless it's more than-- depending on the clock rate, if you're clocking out the data, you don't normally-- wouldn't hear anything. So I came up with this idea of buying defective-- shouldn't say defective-- but a DSP chip that would not test to normal specifications would be fine for speech synthesis. So we were able to acquire the not premium DSP chips at a much lower cost which led to them being able to be put into a toy product. That is the creative way that we had to work at that time to get electronics into products.

We were working on visual-- VR using a Polhemus device and 3D and we're in '85, '86. I was working on it was a-- it's interesting. <laughs> It was a small four-rotor helicopter that had Styrofoam blades, and what I was trying to do is create the electronics to make it easy to fly for beginners and then lower the-- what the electronics did to fix mistakes until you can fly the helicopter, if you really knew what you were doing. We never heard something called a drone with-- I know. <laughs> And this is like in 1988, '89, and so how far-- and so it's interesting.

It went to the focus group and the blades were made out of Styrofoam so that if they broke it wouldn't-- hit something-- it wouldn't damage, and you could replace them. The reason they had trouble with the focus group is that the parents still saw it as the toy got broken, even though it only cost, like, 98 cents to buy blades for it. But there's something that I learned at Mattel. There's a whole lot of things I learned at Mattel, but one thing in particular I remember. So focus group is where you have-- there was a large room full of toys. Some new toys and some more, like, tea sets and building blocks and just a variety of things, and you would see-- and it was all filmed and there were two-way mirrors and the parents would be invited sometimes to play and sometimes the children played by them-- you know, alone, and we would present them with various things and see what the reactions were. Well, Heather was presented to a very bright nine-year-old girl and so she sat Heather down across from the tea set and says, "We're going to have tea now." You know, young women like to do this tea, and Heather kept interrupting the girl's play pattern. What you want to do is like, "I'm hungry. Let's eat now," or whatever it was. It was just interrupting, and I watched that and I'm going, "I don't like that. I don't even like the feel of it interrupting the play." So why I said a bright nine-year-old is she took the batteries out of Heather and sat Heather down and went, "We're going to have tea now."

Hampton: So later when it came to Furby, I said, "I do not want to do anything that interrupts the play, imagination, of a child," and that's why I developed a Furby language, and the Furby language was developed-- and it is-- it was really a language. It follows a format, it follows lots of details of a language, and by some it's been classified officially as a language, but for the younger children they'd say, "Hey, let's have tea," and, "Ol day-- u-tye, u-nye," you know, "boo-bay way-loh," or whatever, and so the child would say, "Okay. You wanted Black Earl tea?" you know, right? But for the older children, they would learn it was a language and ultimately I was interviewed at a period of time later and they said, "You've got children that are talking back and forth to each other kind of like pig Latin. They've learned Furbish and the parents don't understand what they're saying. What do you think about that?" I said, "What could be better?"

<laughter>

Brock: Yeah.

Hampton: Yeah. So, you know, so-- but that was-- the purpose of that was not to interrupt the wonderful, vivid imagination of Furby. As a hobby, I studied magic for a while. I was by-- under a professional magician, and what I learned about-- and I did that for reason. When you're making a toy product that you want to seem-- make alive, you do things that are a magic act. In other words, you know, you play with perception and you let-- inside our brain there's something some people refer to as an inference engine. In other words, the brain doesn't like missing information or data, and so it fills in. A perfect example is I know my wife very well, Cindy, and I could see her walking over on the sidewalk away from us, and I-- and by the way she walks and whatever, I'd say, "Yeah, that's Cindy," and I can see her face. Well, there's no way that I-- that my vision really does see her face, but my brain is filling is filling in missing information. We've had that experience where you walk up to someone that we think is--

Brock: Yes.

Hampton: Yeah, and we go, "Well, hi, Sue," or whatever, and they go... "Oh, you're not Sue." Well, our brain filled in the missing information and made it-- made us think that, yeah. So I allow specific missing information to be filled in by the user that interacts with the Furby toy, and it's very much a magic act.

Brock: Interesting.

Hampton: So it was so magic, in fact, that NSA banned Furby for initially being able to learn and report-- sorry. Learn and repeat secrets. But later they said, "Well--" they were worried it might be transmitting something, or if they were to have talked to me at all, it had 100 and-- or 256 bytes of RAM. It had ROM. It had nothing that could, you know, could've done this recording, and reporting, and transmitting.

The other thing is the Furby language also allowed for the development of the toy to evolve and seem more lifelike. If you interacted with the toy, and more often than someone else, it started intermixing Furbish and English until it spoke more English. So it gave this evolutionary process to the toy, and interestingly enough, nothing goes to waste. The Furby language is made up of some kind of little jokes. Like sleep is called "way-loh." But Thai language,

Japanese language, a little bit of Hebrew. "A-loh" comes from the word "Elohim," and "a-loh" means "light" to Furby, "bright," or "light." Chinese, I won't say it correctly, but "dah." So when Furby says something like, "Dah-a-loh-u-tye," "dah," Chinese "big," "a-loh" from Hebrew, "Elohim," means "light," and "u-tye" means "up." "Big light up," that means, "good morning," or, "good day," or something like that. But anyway, that was all developed not to interrupt the imaginations of children.

Brock: Will you-- forgive my ignorance about it, but actually with I guess how Furby operated. <laughs> I hate to-- I'm--

Hampton: No, no, it's fine.

Brock: Yeah.

Hampton: It's--

Brock: Which is that its response was it wasn't doing any form of speech recognition. It was just, you know, hearing that there was a sound coming and then it would, you know, play some response and-- or maybe you could explain it to me. Yeah.

Hampton: Yeah. No. So here is the trick. I have a sensor that recognizes light and dark. I happened to pick a cadmium sulfide cell, because it has the same kind of sensitivity and spectrum that our eyes do, and there's something else called hysteresis. In other words, it doesn't-- it changes over a period of time. So it could slightly adjust. It was very, very critical that it's all relevant, it's all-- see, we think in gray. We don't think, "Yes, no," binary.

So there's a simple weighing system inside of Furby which some people have classified as A.I.. So put a light sensor. It could know-- so if it was-- if we were in a bright light we could tell if it got somewhat brighter or somewhat darker, or if we were in a duller, in a dimmer light like a bedroom, a night light, it would adjust to that level, consider that normal, and it'd still be able to say brighter or dimmer. There was a sensor in the back, it knew if it rubbed your-- touched the back. There was a sensor in the tummy area. It knew if you touched the tummy. It had a very simple ball mechanism that allowed if you could tell if it tipped side to side, or if you held it upside-down, and a sound detector that would go to the ambient level of the sound and it did-- it basically could tell if there was a loud sound and if the loud sound repeated within a certain time period and you would say, "That must be a rhythm." It could detect the beat of a song and start dancing.

So by gathering sensor data and combining it together in a way, we present the illusion that the creature is alive. So when you rub its back, it purrs. And another trick to the programming is that there was something that was developed by Maslow that talks about this, a pyramid. I didn't do an exact. Within the world of the creature I created something that if it was hungry it didn't care as much if you rubbed the back or if you tickle-- so by just putting the programming in a specific order, it developed the level of needs or how things worked, for free. I didn't have to write the code for that. Just by saying, "Oh, if it's sick, it's not going to do anything else other than be sick."

Oh, and there was an infrared beam so they could talk back and forth. My son Mark was 12 at the time, and our family was very much involved in the process. As well were some of the neighborhood kids, and I said, "There's a rule. A Furby cannot do anything that looks dumb," and, like, I didn't give it hands because if you had food and you-- it couldn't reach out and grab the food, it would look dumb, and it didn't have legs because if it gets stuck under the kitchen table or in a corner, it would look dumb.

So Mark at 12 went, "Well, okay, Dad, you got a bunch of Furbies in a room." "Yeah." "Okay. What do they do?" "Well, you rub them the back they purr and you tickle their tummy and they laugh and you hold them--" "No, no, no. Does one Furby know that another Furby's in a room?" and I go, "No." He goes, "Dad, that's dumb." <laughs> So my 12-year-old gave me the idea of adding two-way communications where they could talk back and forth to each other. The other thing that it did is if one's sick and it sneezes it gives the other the cold.

Brock: <laughs>

Hampton: Through the I.R. transmission, so-- and then there's a little-known disease. I've forgotten the name of it, or an affliction, where people that there's a sudden light change and they sneeze, and you can look it up on probably Google. But I put that in there. But here's how it was interpreted. There was someone that let me know that they had-- they were dusting and housekeeping and they said, "Oh, I'm sorry. He started-- the Furby started sneezing because I got dust in his nose," you know, but it was the light change from the dusting. So people started-- yeah.

Brock: Again, it's that inference machine aspect to it.

Hampton: So you call on that, and so those sensors, the more sensors the better, and they can be very, very simple, and the most difficult-- here's another little interesting point was that there's a lot of outside stories about how Furby was developed and how long it took and all of these other things, and I can tell you that the real code for Furby started after Toy Fair, and started in February, and it was released in July. So we're talking five, five months, that-- yes, and so I had to do a table-driven implementation, which means I could change things very quickly.

Brock: Right.

Hampton: Things were looking very well, but it was very, very nice that I was left alone. That ultimately allowed me to succeed. Tiger was very busy with their own in-house development and things for Toy Fair. It was a big rush, and after they had their products. So I was left alone because to be very honest what happened is I had all of these things working, but it didn't seem like a life form, and so if somebody would've come to me and said, "Okay, Dave, show me what you got," like a month ahead of time, even, like, six-- even four weeks ahead of time, it would've looked like a big failure.

But what happened is I was able to-- you know like a joke or like a magic act, the sequence, the timing, all lends credibility. So I was able to quickly adjust all the, like, how long it responded after a touch and how long it took to go through the verbiage and so on and so forth. Made it seem more alive. Another trick that I did, and I didn't-- I talked about it a little bit with the Universal Studios, but I did some movie special effects work early in my career doing animatronics with movie creatures, and I met a group of people called puppeteers, and puppeteers walked

around with socks on their hand, you know, and-- or puppets, and they'd say, "Okay. Should he say, like, 'Hi.'?" If you just say, "Hi. How. Are. You?" that's different than, "Hi. How are you?" you know.

Brock: Right.

Hampton: And so the idea occurred to me, because most electronic toys, both before this time and after it, so like, "Hi, how are you?" and it's muffled, and I got-- I hired a group of puppeteers. I created a program where the puppeteers moved their joysticks on a-- typically a Futaba transmitter or a joystick, and they created the database.

So there were several tricks about that. One is it made a more accurate tracking and it had more subtle, more emotion. When it was more emotional the mouth could open, and the ears added to the emotion, and so they-- they did what they thought as puppeteers should be done. But there was another little scheme behind this, and that is instead of me writing all that programming, I wrote a program that collected the data from their movements and created a database structure that ultimately went into Furby. So it sped up the process time. I had five months, you know, and so puppeteers were-- and it also led to something else.

The worst thing that could happen is you ship a couple hundred thousand of something that would be a breakthrough toy and it breaks. <laughs> Yeah, and word gets out real quick and you kill the project. So I had models built that were being used for puppeteering initially 10, 12 hours a day and ultimately, because we did foreign languages, we did Furby Baby, it turned into 24 hours a day. But for the Furby project, we had models and they were operating, and I could see if they were going to hold up and what was going to-- and the motor, all of this mechanism was driven from one motor. That's one of the patents that I hold, and the Futaba[3] motor's not supposed to go backwards and forwards the way that it does, and-- because it had a carbon brush-- no, no, I'm sorry. I apologize. Copper brushes instead of carbon brushes. If you want to go backwards and forwards, typically you would have carbon brushes, but they drop the voltage too low. This product had to operate off of batteries.

So Futaba[4] said, "You can't use--" they heard what I was doing. They said, "You can't use this motor for this," and they-- the project was in dire, like, it was going to-- it might be canceled. So I just went to the people that trusted me and said, "Hey, look. We've been running these models for 24 hours a day now for two months and we've not had a failure in the motor, so I don't think we have to worry about it." So we went forward with it and I would've never been able to do that. So I was testing the models, having the puppeteers basically write my database structure for me, <laughs> and so there's a lot of thought that goes into-- and the thought came from experience with production, experience with costing, experience with hardware, experience with software. I did a GeoSafari Talking Globe. So high-quality, linear-predictive coding. In my resume I mis-- I incorrectly stated 80 bytes per second. It's actually 80 bits per second of speech. So all of those things tied together.

Brock: Well, let me take you-- that is fascinating, but I want to take you back into the chronology a little bit to get to, to get you to the genesis of your work on Furby, and it struck me that you were having, you know, you're in the Mattel organization and it seemed to me that it sounds like that you created your own design studio or your own

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[3] [Interviewee's note] the correct name of the motor used in Furby is "Mabuchi".
[4] [Interviewee's note] "Mabuchi".

firm, Sounds Amazing Design, kind of at the end of your time with Mattel. Could you talk about that transition or how that worked?

Hampton: Yes. Yes.

Brock: Yeah.

Hampton: Combinations of things. Mattel was a wonderful opportunity, and like I said earlier, one of the best jobs that I had. But when you have children you start, you know, you start thinking about, "Where am I going to raise children? Where am I going to have my children schooled?" and all of that. So thoughts started turning to leaving the Anaheim, L.A. area for our children, and so Mark was about-- Cindy's oldest son was already living with his father at this time. Mark was about ready to start kindergarten, so that was part of what was happening.

I wanted-- and so Cindy and I were both on board with me starting my own business. Part of it was the point that other than Mattel I'd worked at places for a year, year and a half. The other thing that interestingly happened is that I had just, salary rise-wise, I was just making way more money than-- I would've had to step backwards into a typical electronics job and would've got paid less money and would've been bored. So it was a creative way of-- I loved Mattel toys and the think tank. A job is never-- you don't do-- never get to do exactly what you want to do at a job. So I just kind of had this idea of maybe creating a better place to live for my family, my just starting family, as well as me getting to be a little bit more picking and choosing about what I worked on and getting to choose more about things that I was interested in, and when you're interested in them I could do a much better job than if I was, you know.

Brock: <laughs>

Hampton: And now, there's always a reality with me. I've been very grounded, because I've really had to convince others of my capabilities and I've had to prove and do all of this on my own, and with my wife and family's support. I don't belittle that for a minute. It would've never happened without Cindy around. But it's not like I just said, "Oh, I'm going to start my own business," and took off for the wilderness. In fact, we did move outside of Grass Valley and live off grid for a decade when I started my own business. Unintended consequences, and if I don't remember-- it's really wonderful and it was great, it worked.

But so what I did was I started working at home. Something I don't talk about much is I did not have the traditional contract with Mattel where everything that you do 24 hours a day is owned by them. I had stuff that was on record that-- and I was interested in doing things and the new part of me working there was that I still had my own work, and I was not going to compete with them in toys. One of the things I very, I firmly believe in, is ethics is something very, very important and so I honored that commitment. I did not work in toys until years later, you know, and I was released from that five or-- year period of time or whatever, not competing in toys.

But what I did do is I start working in the evening, and I start working with Universal Studios doing movie special effects stuff, and I did an RF controlled-- there's something called walkarounds where people would put on a costume and they walk around and I developed a transmitter receiver battery pack system that transmits data from a

tape, a magnetic tape at that time, that transmitted the signal, and they were on stage in the workaround, walkarounds, and the eyes and eyebrows and mouth all synchronize.

Brock: Oh, I see.

Hampton: And I was doing that kind of work and still working at Mattel, so I was working two full-time jobs because I wanted to develop a client base to then do a transition to my own business, and interestingly enough, Mattel broke its own policy in allowing me to continue to work with Mattel. It never really materialized in the way we thought, because I was working on that four-rotor helicopter thing that we would now call a drone, and because we reported directly to the board of directors, I did a demonstration flight where I flew it right down the board of directors table and blew the papers off in their laps and then I hovered it up above, up to the ceiling, and then brought it down and I flew it right over and land it in front of Susannah Rosenthal, the director of the department, and they're, "Oh, my. We have to have this. We have to have." "Well, you know, David's going to be leaving us in a--" "We don't care. We have to have it." So they waived their own-- yeah, and that's a whole long story in itself, but you get the idea.

Brock: Okay.

Hampton: So--

Brock: So you kind of took your job with you in essence. You know, developed some, a few other clients, and then, you know, brought that project from Mattel with you.

Hampton: I never was able to finish that with them, but I was building clients to work and then I moved to-- and I did start-- initially Sounds Amazing, that name came from as I developed products for my career, the Talking Globe or the other-- well, that was later, but as I developed products people would say, "David, if you can do that, that sounds great. That sounds amazing."

Brock: Yeah. <laughs>

Hampton: So now for the more creative firms I could say Sounds Amazing, but for the more engineering firms, because I did, later did HVAC controllers, heating and air-conditioning, and I did some more interesting but not quite as, you know, but interesting enough, I had to have Sounds Amazing Design. They liked that better, so...

Brock: <laughs> And forgive me. Where was it that you then moved to? You moved out of the area to Grass Valley; is that over--

Hampton: Grass Valley, Nevada City area, which is outside of Sacramento.

Brock: Oh, oh, oh. Yeah. Yeah.

Hampton: Yes, and we moved 45 minutes outside of Nevada City. We were in Nevada City, on their land but it was 45 minutes from town. Off the grid. Generator for power, wood for heat. We lived that way for a decade, had

a-- it was a Bavarian farmhouse, and there's pictures of Furby and the creation of Furby in that lab that was in that house.

We very much-- there're some other important things that happened during starting my business. My wife and myself never had credit card debt. We would wait for something and pay for it in cash. We started the business by buying a home here, buying a home in Anaheim at, like, 128 and selling it at 242, and we had paid down the principle even quicker than we were supposed to. We walked away $144,000 in 1989, and put half down on new house. The payments were low, and used the money to start the business and never took a loan or anything. So the confidence of my wife and-- yeah, led to all of this, so...

Brock: How were you doing that work so remotely? Well maybe you could explain…

Hampton: No, no, no, go ahead, yeah.

Brock: Yeah, I was just curious about your work process and how you managed that.

Hampton: Yeah, so we picked a place where number one, the school was great for the boys, it was a very small school, it was really back to the golden age of education where first grade, second grade was in one room and third grade and fourth grade was in another room and there was a teacher and teacher's aide in each one of those, so two teachers, two teacher's aides. It was for the Forestry Department Service and so we happened to be able to participate in that for our children's education.

We made sure that FedEx came to our location even 45 minutes out of town, so in large part I would order parts through catalogs, the internet was just starting, and my wife would drive things back and forth to town. Now here was the unintended consequence that really, it just really helped. So I was working with Universal Studios and they said, "Dave, we need some more units. We were only going to do this for six months but now-- " it ended up, they ran it for like seven years or something and my stuff wasn't designed-- and they'd beat it up and they'd drop it. So Universal Studios would drive up, they went, "David, this is gorgeous, you're in the middle of the Tahoe National Forest." Some people would call before they got there, goes, "Are you sure we haven't passed the place yet?" And here's what happened, the rumors started going around that, "This guy lives out in the middle of the woods, he must really be good."

<laughter>

Hampton: And it was a self-fulfilling prophecy. And they would come out and do camping and a little vacation, "Well wait, we'll do some fishing or camping or whatever while we're waiting for the-- and we'll take it back with us." And so people-- I had people in Bay Area out, in electronics in Silicon Valley going, "David," when work was-- "Work's kind of thin, what are you doing? Where's your ads? What are you doing?" "It's all word of mouth, I just-- " "Could you send me some of the-- " and later in my career, even before Furby I started-- it was very difficult, it's a balancing act between taking enough work-- so many stories there.

One of the things that happened is I learned early on that if I have one or two large clients and one of them goes bankrupt, it almost put me out of business because they owed me in 1991, $36,000 dollars and it was six months

worth of work from one of the clients, so don't put all my eggs in one basket was one of the things I learned. But there were so many-- and the logistics of living out there was interesting, we had to use wood for heat and chop wood and all that kind of stuff, but it was a very, very exciting time and I got to do for the most part what I want.

Early on, I took more projects that weren't exactly, but later, it became so successful, I had people a little upset with me because I would say, "Okay-- " oh by the way, see again mind racing, I got to see what new products failed, what succeeded, why they failed, why they succeeded and somebody else was paying for me to learn all of this, that's why I could do Furby years later. And so what happened is sometimes it would be a great product but no marketing and no distribution. Sometimes it was great marketing, great distribution and no product. Sometimes they didn't understand the true cost of doing the tooling or injection molding and so I had become familiar with what it cost to do an injection tooling and a mold. And the time involved and production stuff and so sometimes they had enough money to do the electronics engineering but no money to do all the tooling for injection molding.

And I watched and eventually-- and I had-- and really in the world of new concepts and like Mattel Toys, if you develop, let's say you come up with 100 new ideas a year and by the way, I would come up with maybe eight to ten new ideas a month, if you made one or two to market, you were considered brilliant, that's statistically where we're sitting at. And so later in my career, people would come to me and they'd say-- well I'd say, "I'm not available now." "Dave, it's fine, we'll wait," word of mouth and reputation, it was just unbelievable.

Brock: Would you characterize it-- I know you said you did a few different things that were more on the-- like the HVAC engineering thing, but would you say that the majority of the work that you were doing was in toys and games or how would you mainly classify what these projects were?

Hampton: Whenever possible, I tried to do projects with the most flexibility of creativity. For example, I did a product for Educational Insights called GeoSafari Talking Globe in the '92, '93, somewhere, they still make it to this day. What's interesting is they came to me without that in mind, they're a very-- it was two brothers, owned a company, there's still around, I don't know who owns it now or if the brothers still own it, and they said because of reputation they came to me and said, "We want to do an educational product." I said, "Okay." "We wanted to use CDs." "Okay. How much is this product going to cost?" "Four hundred dollars." I said, "Four hundred dollars, who's going to buy this?" "Oh, the school systems will buy it." And I said, "Well do you know about speech quality and the cost of speech per second?" "Well no, we want CD quality." I said, "Well what if it doesn't take CD quality?" "Well we could talk about that."

So I went down with a presentation and typically it would be a table full of people and so I presented CD quality speech and different technologies each using a lower, you shouldn't call it lower quality but a lower data rate and in that the lowest was LPC and then there was just normal PCM and all the various ways of encoding. It eludes me all the technologies that were available in '93, but I demonstrated each one of those and it got down to LPC which I had developed because of See and Say at Mattel I was exposed to LPC speech and developing of that and recording of that and worked with some Disney characters, Mickey Mouse, so because of that experience, I had been doing LPC speech in some of the other products which is 80 bits per second.

And they said, "Well that sounds fine." So I went, "Okay, we don't need CD, you don't have to have $400 product," and ultimately because of my background in gaming, it turned more into a game and it ended up retailing for $99.

And that had all kinds of tricks in it but it was LPC encoding and so those were the products that I wanted to work on. They offered me, I would be able to contribute the most. I mean I did some innovative things, some HVAC controllers that were considered homes of the future, you can only go so far with heating and air conditioning. So yes, whenever possible, games, toys, those type of things, movie special effects, movie stuff and-- yeah.

Brock: And sort of the things you were doing with the movie studio as you described before, so kind of in the consumer electronics and entertainment nexus.

Hampton: That's correct, and that, there was a company in Grass Valley that had a contract with Neil Young, it was the singer Neil Young and he had bought a portion of Lionel Trains and they were trying to develop a technology to control model trains. And so I'm the one that, I'm on the patent, Neil Young and myself developed a new concept which was an electromagnetic field, a train-- is a model train, drives on a track, there's a brush that picks up AC that powers the train. And again, I had learned because of my earlier experience with the Tesla coil and the spark gap transmitter, when you have a little AC motor trying to get powered off a track and it's jumping, the brush is jumping and making sparks, that's transmitting on all frequencies and it causes a lot of noise issues. And so everybody traditionally was trying to send data through the area where you have a spark gap transmitter and all this RF noise.

Brock: Right, right by the noisemaker.

Hampton: Yes, and infrared doesn't work because as soon as you go into a tunnel which is really popular on the model train sets, you lose control. I don't know exactly how to explain the process. By the way, sometimes it's better that I don't know how many people have worked on it and haven't come up with a solution, it's always better that I don't know those things.

So I was just sitting up in-- a group of people had come in to visit me to talk about potentially what would I do if I was working on model trains and I think that all of the information you gather is there available at a subliminal level initially and I just knew, it's the oddest experience, you just go, "I know what I can do. So instead of sending a signal through the track, we'll send the data around the track," and, "What does that mean?" I said, "Don't worry, I'll do it, I'll be able to do that." It's something that is at an intuitive level, a gut level, it's-- and I didn't know what it was at the time but then I had to think about it and then I could coax it out so to speak and that…

Brock: So you saw the kind of highest level design solution – "around rather than through" -- and then figure out what around means.

Hampton: Yes.

Brock: Yeah.

Hampton: And so just like Furby, I saw within what's reasonable what it looked like and you visualize and you think about what it does when you pick it up and-- and so I start at it's done, then I figure out how to get there. And so that's been very much the way for me especially in my later career. Mattel Toys attributed, I'm sorry, contributed a lot to the whole brain storm thing, they taught you-- they brought in experts in brain storming so I was able to

learn from that process and some of the key things were don't stop an idea before it matures. And what I mean by that is let's say I'm going to develop anything, a new doll and you'd say, "Well the doll should be this tall and it should be-- " "No, no, no, we don't need to talk about that yet." And then there's something else that combines with it, whether there's left brain, right brain is a true definition of something it's easy to explain in this fashion, when I do production, when I do test engineering, when I set up, do costing and I do known things, the temperature of solder, the temperature of a molding machine and when plastic melt, all that, those are known, that is very much left brain, it's limited, it's known, it's math, it's that. When it's right brain, it's very much more like painting, it's very much more like unlimited, it's almost dreamlike, it's almost not physically present, it's more without form and-- so those feel very different, dreamlike in fact.

And so whether that really exists or not, I've learned how to switch that on and off in good portion because of my experience at Mattel Toys and so when you're brain storming, the tech part of me goes, "You can't do that, it would cost that much, it costs too much and you can't-- and it won't run off of batteries for that long and-- " no, you silence that, every time that comes up, you just remove it. So the process evolves into something unexpected and the final product is beyond any initial concept as it evolves and you cannot stop it.

The other thing that's very, very important if that you get into new product development, I've had to look at it this way, okay, I do something, it doesn't work, "Oh, I know what doesn't work, I'm going to try this." Too many people when they do something and it doesn't work, they go, "I failed," they don't take the next steps to ultimately find out what the real solution is. I mean we hear the story about Edison and a thousand or whatever time, how many filaments he tested but we don't think about it or apply it in our own lives, so I tend to be very, very cautious.

Furby failed hundreds of times, really and even in production there were critical times where the ears weren't moving and they had samples ready and everything was going to start getting released for October and Christmas and it was critical and there were three companies sitting there with a whole table of people an I'm sitting in Mainland China and they said, "The Furby's ears not moving, the Furby's ears aren't moving, we don't have time, we just won't make them move." I'm going, "We can't do that, the puppeteers tied the emotion of the character with the ears, we can't remove that." And there was just panic and the ears wouldn't move and I had a prototype, the ears moved fine.

I needed a quiet moment and I went in the other room and I looked and I did some-- it was just simply they had not followed-- soft goods are like the fur and where it went around the ears there's a pattern and what happens is they weren't stitching it right and the fur was getting stuck around and so what I did is took some scissors, cut the fur and took it back and it worked, I said, "I had to give him a haircut, it worked," and diffused the whole situation. The same way the infrared is very, very low cost, I couldn't afford the normal TV channel changer integrated circuit that does pulse width modulation and sends data out over a carrier, there's a carrier that carry it and then you-- yes, and that's how get infrared data. I just put out pulses because I don't need to talk much further than face-to-face and then for production reasons I made it double that so Furby's designed IR would only work about 12 feet and in real life, ten feet, four feet because of tolerance of-- so it wasn't working, "They can't talk back and forth. "We told you that wouldn't work, you can't use that, you have to use pulse width." Well, here's what I found out, in saving time when you do injection molding, there's a machine and you have to heat the cavities and then you heat the cavities of the mold and then you inject the liquid into the cavities, well the cavities weren't sitting long enough, part of it would be cool and what happened is as the material hit, it would cause a ripple or a wave effect. So what I considered a lens

in the front where the IR came out, it was making IR do this[5] and I found that because I had Chinese newsprint on the table and I'm putting these lenses looking at it and I couldn't read the Chinese underneath one of the lenses so I said, "What happened?" "Well we're saving time, we're not letting the-- " so I said, "You got to let the tools heat and-- but anyways so Furby failed hundreds of times.

Brock: Now you mentioned that you moved, that you were ten years in Grass Valley and then you moved at that time, is that correct?

Hampton: Well what I did was when my oldest son got ready to go to high school, we didn't want him riding the bus for three hours a day so we moved into town. But no, during my active years of Furby and such, that was at-- and I ultimately shut down from '97 to 2001 because of Furby and all the languages and all the Furby babies, that was my main full time job and then right after that, I shut down my business.

Brock: Well could you talk about the very genesis of the effort that would lead to Furby? It sounds like you were doing projects for other clients, other companies but this sounds like a project of your own if you will.

Hampton: Yes.

Brock: So could you just talk about your decision to do that and how you came to the general idea.

Hampton: Yes. Necessity is the mother of invention and what was happening is I was at the point in my career where I was turning down 10 to 12 projects a month, everything was going well, the income was great but I don't know about other small businesses but I don't know. So I had a son that needed jaw surgery and it was to the tune of about 100 to 110 thousand dollars.

And I don't know about other small businesses but I didn't have an extra 100 grand laying around in the bank but what I did have is a year and a half or two years worth of expenses in the bank, so I talked with my wife and I said, "The only way we're-- " and we tried getting help, we couldn't get help anywhere and there are different places that said, "No, we only do from the neck down," and, "No, this is considered preexisting," and, "No, no, no." And no insurance and none of that.

So Cindy and I sat down and talked with each other and said, "How are we going to take care of this?" And I said, the only place I know that I could get enough money is that I'm known in the toy industry and if I could come up with an idea with a toy that would create a royalty they would run a minimum above three to 500,000 and if I could get somewhere between like typically in the toy industry in those days you would get five percent, but if I can somewhere between five, not a Lucas and not a Disney, they get higher and that's five percent of the wholesale manufacturing, the company's cost, not the retail. If I could get 50 cents, 75 cents, whatever, and they'll run a minimum of 250 to 300 thousand units, maybe 500,000 units, we could pay for this and maybe pay down the house some more, maybe if we get a couple of hundred thousand dollars.

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[5] [Interviewee's note] I held my hands up to show a scattered IR beam, which would not work correctly.

Because we didn't have debt and because we had enough money in the bank, I shut my business down and I talked to Cindy, I said, "Okay, look, we've got about a year, year and a half worth of money, so if I can't come up with something in the next six to eight months, I'll shut my business down, I'll work on this full time, do what I need to do, if I don't end up with something, I'll start the business again." Yeah, this is what happened. So because of other people, watching other people develop their products, I learned don't stick a whole bunch of time in this and don't stick a whole bunch of money in it. And so I talked with a mechanical engineer about helping with-- well, here's what happened, I need to backtrack.

Okay, well where do I come up with a new idea? I was known in the toy industry so I could get in the door of the Toy Fair which is closed to anybody but professionals in that trade and so I went to the Toy Fair in New York in 1997, that would have been February, January or February of 1997 and I went through. I was there for four days, five days, whatever it was, in a little hotel room and looking at all the new products. And it's like, "Okay, more yo-yos, oh more this, oh more that. This is not working." Well okay, well I spent the money, well what's going to happen next?

Well the last day of Toy Fair, I walk into a booth that was set up by Bandai and at that time Bandai was the Power Rangers and in there was a product that I later read about that was a huge hit in Japan, it was Tamagotchi. I saw the little LCD display and I picked it up and I went, "Oh, that's interesting but it's kind of flat, it's kind of not so personable, if I were to do something like that, I would make a three-dimensional virtual pet."

I still get chills now because here's what happens, remember from my experience at New Basic Concepts, I went, "If I'm too far ahead, not going to work, if everybody's joined the party, I'm too late." But now if Tamagotchi becomes a huge success like it was in Japan because nobody knew about Tamagotchi yet, virtual pets, the idea of virtual pets will be exposed and will have had some success and I can piggyback on that and then launch what I was hoping would be a better virtual pet, I wanted a 3D pet that you could touch and you could feel and you could rub it and it would purr, not an LCD screen, but that's where the idea came from and it was the last day of Toy Fair.

Brock: The virtual pet is a really interesting framework for it because that's kind of what the proof of concept was there. I was wondering, I was thinking, the question I had is like how should we properly think of your concept for Furby, and I was thinking, is it a low-cost interactive robot, I was like is that a way to describe it, which I guess fits with the idea of a virtual pet but it's interesting that that was the inspiration, a kind of more fully articulated version of that idea of a virtual pet.

Hampton: Yes, that's what led to the idea. Now, here's what's important about when I started thinking about Furby, Furby was originally a fur ball, that's where the name Furby came from, it was like a little ball of fur and you would pet it and it would be like a little balloon that would change a little bit and it would change and it would purr. I'm going like-- I talked to Cindy and I talked to the kids and it looked more like a Tribble.

Brock: Yeah, that's exactly what I was going to ask.

Hampton: I'm heading down the wrong path there. I had to think about-- okay, so here's something else very, very important, fundamental, there are a lot of dogs and a lot of cats that don't have homes, I didn't want to displace dogs and cats. The other thing is I couldn't make something that looked as good as a real-- everybody knows what a real

dog does and everybody knows what a real cat does and no matter what I did, no matter how good right then, it would be not good enough for me, it wouldn't be a success.

I had to create something that didn't exist, that people didn't know what it did and they didn't have a preconceived idea of what it should or shouldn't do other than that it was alive. So I tried to create a life form actually and I tried to create a life form that would seem like it was a friend and that it was evolving because of your interaction with it and that it evolved later, you know, with other things, not the original, well in some ways the original evolved based on your interaction with it, that was the concept.

I had to make it like no teeth because teeth look scary and make more of-- but not a sharp beak, to me it should look smart so it should look more like an owl potentially, a little smart but it should have fur because that's kind of like a teddy bear, it shouldn't break the play pattern so then Furbish and don't make it interrupt the child. It doesn't lead, the only time it ever led anything is that if it sat long enough to almost go asleep, it would say I'm bored, "Boring," or, "Pay attention to me," basically to prompt the child to interact but I never tried to guide the play.

Brock: In the same way that you used kind of the techniques of magic and activating people's inference engines with various aspects of Furby, was that also at play in how you began to think about making it adaptive or how it would evolve over interaction, was that another magic trick or how did you create that?

Hampton: Right. So things that are alive to me just like your best friends and your-- they evolve, they change, it's dynamic, that's part of life and so to create the illusion, you have to have it evolve in some fashion, so the evolution of Furby, at the time I didn't think of about it popping out of an egg and evolving in that way but it learns English because of you, because you spend time with it. You are a caretaker so you bond to this because it relies on you. Now what I didn't want to have happen is Tamagotchi, if you didn't take care of it, it died.

Brock: Yeah.

Hampton: I didn't want to go that far. And the other thing is I remember being in meetings later and there would be an attorney that who would pop out a Tamagotchi and go, "Sorry, sorry, got to feed it so my kids at school couldn't play with these anymore and I don't want it to die." So Furby doesn't die, it got sick, but very much there was a whole system of evolution and it was shown by the vocabulary, it was also shown by how often it would do things.

So for example-- oh and by the way, what's interesting is because at the time it was released, Tiger didn't know what they had because what allowed for the success is I was left alone. What I learned at corporate Mattel is an inventor would come in with a product with fully good intentions, it ended up being designed by committee and it would change into something nobody liked anymore. So Furby succeeded in large portion because they trusted me, I developed a trust and they left me alone enough for that to happen.

So what was interesting is they had them out as they were showing them, as they were released and they were going like, "I can't get him to do anything, all he's doing is sneezing and coughing." I said, "Well you have to feed him." "What, you have to feed him?" I said, "Yeah, if you don't feed him, he gets sick."

Now you know who figured this out intuitively, children, children said this to me, "If you don't feed him, he'll get sick, so I'm going to feed him and then he won't get sick and if he gets sick, he'll make these other Furbies-- " they knew it intuitively, but marketing didn't know it. "What do you mean, I got to feed them?" "Yes, you got to sit and feed them." "I don't want to sit and feed this thing," right? So they learned to feed Furby and then Furby would get better and then Furby would want to play but then Furby played for a while and the illusion was what I was counting is motor movements and so I knew that if the motor moved back and forth, it was this kind of movement and I could count-- so the more it talked, the more you played with it, the more it talked and if it talked it evolved and the more you had the motor moving, it slowly evolved into the Furby language, it was tables that filled in.

And if you didn't feed it enough, it got sick and all it would do is complain about being sick but it never died. And on power up, it randomly selected a name like Toh-Loo or A-Loh and that was the name of-- so the Furbies would have different names. Yeah, so there was something else that you had talked about and…

Brock: Well let me take you to a different question. You have a very limited amount of time in which you need to develop what you're going to do, you get this idea and within how many-- well the development of Furby took place over what, the next seven months or something like that?

Hampton: Okay, so I can help with that. So I wanted to do something that seemed alive, I brought on a mechanical engineer to help me with mechanics and over the next six weeks, there was a very primitive mechanics that could show that you can move-- and under my direction-- so in the movie special effects industry, they have cams that move, it's an old technology and it can move eyes and mouth and all of that, okay, but I had to have one motor or it would cost too much at this time.

So what I had come up with is an idea to make cams that would move forward and backwards under computer control and seem not like it was repetitive, I learned it because of puppeteers and my experience with puppeteers. So a puppeteer, this is the idea, remember I said nothing goes unused or-- when a puppet stops talking, his mouth is closed, he doesn't sit there like this[6] so that's neutral. So if I go from neutral and I go one direction, I can do certain movements and if I go the other directions, I can do other movements but if I put another neutral over here where it's closed then I can come this way or this way on the cam or from this point in the cam, this way or this way or from this-- so I can get what appears to be random motion on one cam. So that was very much-- and it was patented and that was what was different.

So the mechanics that was developed initially didn't go into the original, there was a lot of problems with the mechanics, we had somebody that was released from the original development-- so more to the point, over about a six week to eight week period of time, all we did was do a mechanics that just showed more than one movement off of a motor and then because of my work with LPC speech and because of the globe and because of other things, I had an idea of attaching a low cost processor 6502 derivative, a 6507 with memory on it and attaching it to an LPC chip so I could show that two low cost chips processors in the cost range of around for both of them 85, 90 cents could give us thousands of words of vocabulary and that's all we had.

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[6] [Interviewee's note] I held my hand to represent an open mouth.

And I presented the concept, the concept was presented to Worlds of Wonder who had done Teddy Ruxpin and they wanted the idea but they thought it was only for girls and they wanted to do a whole big focus and testing that would take about six months and here I am going, "We can't do that, Tamagotchi's going to release, it's going to be either a big hit or it's not, we can't delay this by-- " I thought everybody was going to be on my heels with versions of Furby after they saw Tamagotchi, that didn't materialize that way but I thought we got to get-- so we said, "No, we can't wait that long."

Presented it to Gibson Greeting oddly enough, this is not known by anybody, Gibson Cards, they were being-- the family was trying to revitalize it and they were starting other departments and they said, "David, we'd love it but we're not going to be in the position of doing anything with this for about a year." And then a friend, who ended up becoming a friend, a guy named Richard Levy, was known in the toy industry for licensing products and so he got me introduced to Roger Shiffman of Tiger Toys and Randy Rissman and we had a rather odd meeting-- so Richard called up the people that he knew in the industry and said, "You got to just see this." "Oh, I'm in a hotel in wherever and my back is killing me and I'm kind of all-- " but anyway we had this interesting meeting where I went to the hotel room with the guy that had done the early mechanics and we gave a presentation and later he admitted it was like the most remarkable thing he had ever seen.

So we waited for a bunch of the holidays and then we signed a contract in like November of '97 to make a prototype by January for Toy Fair. Yeah. So that's a whole interesting story in itself. So it was a six, eight week time of flying around, just did the bare minimum, I spent about $1,600 dollars at the most because I said, "Don't spend a lot of money, and if no one's interested in the concept, slide it, move onto something else." Yeah, and that was Tiger Electronics.

Brock: And to have a prototype for the show, I would imagine it would have to be a fairly sophisticated prototype, it's not going to be like a board with the chips, it had to be…

Hampton: Yeah, interestingly enough, the mechanics was in a very difficult position and so this story has never been talked about anywhere, I was sitting in the hotel room trying to get something put together for Toy Fair that opened, I was there Friday, Saturday, Sunday trying to get something working for the Monday opening of Toy Fair. Richard brought in a couple of people from mechanics and they just put a bigger motor on this, I didn't have time to get the electronics into the toy which was the plan, the mechanics was just behind for a whole bunch of reasons that I didn't have control of.

So we got enough working that it said like 15 phrases, you touch the back and it was a very crude prototype and the electronics, I had to run a long cable down and tether the electronics because I never had time to get it to fit into the-- because I had never had the mechanics until-- a real interesting story and there's a whole lots of things tied with that, all kinds of things. But anyway, got enough working-- oh, and so they're going, "Okay David, there are going to be cameras to take a picture of this," and as soon as the cameras got in the area, it didn't work and they were going, "You got to do something." And it was only rub the back, it purred, feed it, you know, it did like-- there were 15 phrases and it did like six things, it was like-- as far as I was-- it was really a dysfunctional Furby but it showed enough.

And so it's the oddest thing and they remember it, I ran into the room where everybody was eating their little lunches and stuff and they had some aluminum foil and I just grabbed a role of aluminum foil and wrapped it around all these cables and stuck a pin into the ground of an outlet and grounded it, it shielded it and when the cameras showed up, it started working enough. And everybody just was screaming and yelling and it's just like this turmoil. And it's just like, you know--

Brock: Because at Toy Fair is where--

Hampton: The orders were placed!

Brock: --the orders from the retailers, which will decide if you go into production or at what scale you go into production. So, it's a real do-or-die moment.

Hampton: It is absolutely do-or-die. The other thing that is very interesting is-- I didn't know at the time, but contracts were being signed on Sunday night, so that they would steal the limelight of the opening of Toy Fair that Hasbro was acquiring Tiger Electronics.

They didn't even know what Furby was at the time, because it was just being shown. But Randy Rissman, the president of Tiger, was saying, "This is going to be, like, your big bonus in buying Tiger." He had great confidence in both me and the product. And, so, it was announced Monday and Toy Fair opened and they took enough working stuff to get a million orders for Furby from Toy Fair.

Brock: Which is maybe four times the minimum run for a product of this type as you're saying.

Hampton: Yep.

Brock: So, from the orders, a great success.

Hampton: They set-- yeah, cautious success, because they knew they didn't have a product yet. So, the real development of Furby started in February and that's-- now here's-- I told you there's dozens of ways that Furby failed. I don't think-- Tiger was great to work with. I don't know that they had the resources to throw behind the mechanics that needed to get done for the real Furby. Hasbro did. And there are some brilliant people that were able to get the mechanics done. So, I had to do develop the real electronics, work with them on the real mechanics, and start writing code in February, and all of this was released in July. So, these things in the Internet that talk about "nine months of development cycle and--" no, no, no, no. It was five months really.

Brock: Wow.

Hampton: And from the original model, Hasbro has said the faceplate remained, nothing else. You know? So, it was hectic to say the least.

Brock: So, when you say it was released in June, it was released to manufacturing?

Hampton: Yes, July-- actually, the code-- yes, the code was released-- I may have said to you-- but it was July, the code was released for manufacturing. The mechanics was released a little bit before that, because they had to start doing the tooling and the goal was to do a late release. Because, normally, you would do releasing-- you'd be start shipping toys in June and July, because there's the six weeks on the boat and all these-- and there's cube size and how many in a cube and how many you can ramp up, and all these details. But we did a-- released the code and the mechanics was already getting released, because to develop the code, as I mentioned, I had to have six to eight models that were running for six weeks to eight weeks during that process of the puppeteers doing their work and coding the data structure. So, it was all done and the code was released for them to start the final-- making units, do a pre-production run, then start running units for release in October, which meant they had to pay premiums for shipping and they had to pay premiums for-- so, it was really a break-neck pace for all of this.

Brock: With the orders coming out of Toy Fair and the kind of royalty arrangements that you had made, did you-- could you feel a sense of relief then about the pressures that had caused you to push for the project? Like, was it going to--?

Hampton: You know, that's a really interesting question, because I have this personality flaw, I think, and what it is I had been in business long enough and had various jobs where a company went bankrupt owing me money. My wife and myself never counted the money until the check cleared. I'm going to tell you something else that's interesting: Randy Rissman, the head of Tiger, who then was bought by Hasbro, had great confidence in this and so much to the tune that he had set up the manufacturing of four and a half million units when only a million was actually ordered.

And he did something he had never done before. He said to me, "David, in the 17, 18 years," he's never had an inventor come in, do the costing, do the hardware, do the software, set up production. He said, "This is going to be a success for you." Now, this is in-- months before all the royalties were reported, because I was supposed to get paid, like, January, probably the first time. He wrote me a check for $100,000 and gave it to me. My wife and myself had the interesting reaction in retrospect: We didn't go out and celebrate, we didn't go out and have a steak dinner, we opened up a savings account and put it in and just put the check-- because we-- I treated it like that may be the only check that we get. And you know what? That is close enough that we will pull off the surgery. And that's--

Brock: Well, that must have been a great feeling to be able to do that.

Hampton: Yes.

Brock: I mean, it is-- the plan working, the plan working out, but, of course, the market reaction is-- well, please, describe the market react--

Hampton: Well, in my contract there's a clause that talked about how much we wanted them to spend on advertising budget. They later quickly came back and said, "We don't need it. We don't think we need to spend this money." So, the product blew through the roof. Instead of the million, they shipped four and a half million units between October and December of that year. And, yet, at the same time there was some behind the scenes grumbling and news reports. It was like, well, they had held back on production, so that it would make it a more successful product.

Brock: Scarce.

Hampton: Yeah, and scarce and all. That never happened. And, ultimately, the first time around, by the time I added-- we added the Japanese language and Italian and French and Spanish and we-- and then Furby babies and so on and so forth, the first go-around was 48 million units. And then the next unit was another-- give a total of about 68 million units worldwide.

Brock: Forty-eight million.

Hampton: Yeah.

Brock: And then 68 for the follow-on.

Hampton: The total.

Brock: Oh, of the total--

Hampton: Yeah, so, the total became 68 million. And then later we were hearing numbers between-- because they did the Furby in all the languages and then the Furby baby in all the languages. And I was involved in all that. Then Hasbro did another release with my technical consulting, although sometimes there's more or less of that. And they released a Furby that didn't do quite as well. They released another Furby in 2012 that did very well again. It had a LCD display and face. And then they re-released the product again in 2016, I believe, but last time I heard, it may be-- I don't know exact numbers, but something like 72 to 75 million worldwide.

Brock: Collectively over all of that.

Hampton: Yes, mm-hm. Yeah.

Brock: And have your-- certainly, your intellectual property, but your patents and designs, and all of it have been relevant throughout that entire--

Hampton: That period of time.

Brock: --that entire run. You haven't-- in other words, you didn't have Hasbro acquire all of that.

Hampton: That's correct, but this is where Richard, who happened to be somebody that knows the toy industry even better than I did, is important. And, so, here's what happened. In the verbiage of the contract, although we brought the name Furby there, because they put-- this was Tiger did this, because they put so much money and advertising behind it, they own the word Furby. So, even if patents expire as long as the-- and Furby is considered the second-most, worldwide recognized brand for toys after-- now, see, we'll have to figure out if you're supposed to keep this or not.

<laughter>

Hampton: But after Barbie, Furby is recognized-- you can go to the Greek Islands, you can go to Thailand, you can go to India, you can go to China, you can-- and "Furby". So, it has value. So, as long as they call a product, patent or not, part of the Furby brand, the contract has me getting paid royalties.

Brock: That's wonderful. Congratulations!

<laughter>

Hampton: Yeah, thanks.

Brock: And I would love to hear you reflect on-- it's almost like Furby became a cultural craze. You know? I don't know what the right term for it-- it became a cultural phenomenon, that's for sure. Could you just-- I would love to hear your reflections on, you know, why you think it became so.

Hampton: In one fashion, I'm willing to take credit and in the next way I'm going to remove me taking credit, because here's what I believe happened. Well, now, the phrase Furby, because in one fashion, some people's love of it and other people's not caring for it so much, is Furby talked a lot. And, so, they referred to politicians or movie stars that were very, very chatty as like Furbies, you know?

But here's what I think: The magic act worked. Here's what happened, I personally believe-- you couldn't ask for anything better-- people added their own imagination to the toy and it made it become better than what I had created. They became part of it. There's a couple odd things that happened. So, normally, you design a product and you expect a certain number of rejects, of things that are sent back. Furby had the lowest for the complexities of an electronic product, like itself, that they had ever experienced in the history of Hasbro. And, so, they had a hotline. If you had trouble with a Furby.

And, so, here's what started happening, "Well, you know, Way-loh, his ear's not moving so good." "Well, you know, send him back and we'll give you a new toy." "I don't want to send back Way-loh. He's kind of cute. I'll keep his little ear that doesn't move so much." So, they were keeping droopy eyes or an ear that didn't move because they had bonded with Way-loh or U-tye or whatever their Furby name was.

There were people that called and said, "He's not working anymore." "Okay, did you change the batteries?" "Oh, I forgot he's got batteries." I got wonderful letters from-- now, it came to Hasbro and a few of them got channeled to me. And one was for a school for the unsighted in England and they said, "Did you develop this toy for the unsighted children?" I went, "I'm sorry to say I didn't specifically" because they can interact with it and they love it. And I had letters from five or six family members that had someone with autism and the child talked for the first time and related with Furby. How does it get any better than that?

Then there were reports from a couple, you know, people in the Hollywood area that after their little rendezvous where they had a few drinks and a nice dinner, they went to sleep and Furby woke them up when their curtains were on fire, "Ah, bright light! Ah, bright light!" So, we had the-- and then we had the NSA-- and, ultimately, you know, the guy that had it banned from military installations, years later I met him at a conference thing that I go to. He

goes, "Well, you know, I'm the guy that banned it." I said, "Yeah, yeah, thanks for that. It was a lot of free advertisement--"

<laughter>

Hampton: --so, "but you could've talked to me about that. It doesn't really learn and repeat things." But, yes, it really just took on a life of its own and people-- in fact, there was-- and I've forgotten the name of the group, but they were just avid Furby collectors and they took what they called Uncle A-loh and they sent him from the U.S. to, like, Italy. And then the person put stuff on him of being on vacation to Italy and mailed it to France. And, so, he went all the way around the world and when he came to California I hosted Uncle A-loh for a while and took some pictures and sent him on his way. That's the kind of stuff that was just going on.

And I could have never, ever predicted that or expected any of that. But, again, I think the main thing is that I didn't project what I want Furby to do with you. I wanted Furby to be what you thought it was, what you inferred it did. He-- I mean, I had somebody that said, "Hey, thanks for--" because he said, "a-loh" instead of "Elohim"-- instead of little words. He says, "He really helped me get through my--" when you have your bar mitzvah.

Brock: Oh, yeah.

Hampton: That age--

Brock: Yeah, preparing to--

Hampton: Yeah, yeah. All that preparing.

Brock: Yeah.

Hampton: He goes, "And Furby helped me do that!" That's like, "Wow, I don't know how he did that." And I heard these stories. And you know what else is really, really great fun is they were all happy. They were all good news. They were all, you know, autism and unsighted. And I mean, how does it get any better than that?

It is just-- it's just a privilege to be a small part of that. And, again, it was the imagination of those that became attached to Furby. There was a pool-- I didn't participate in betting on Furby-- but of what was the largest group of buyers. And, initially, people thought, oh, it would be girls eight to ten or seven or whatever. Number one: Women from 45 older. I heard about parties where 45-year-olds were sitting on the ground with their Furbies talking to one another, but they collected them, because they wanted the one with the polka dots and the one with the stripes and it took over that whole thing of the Beanie Babies or the--

Brock: Oh, yeah, yeah.

Hampton: Yeah, that whole collecting all the-- so, they were one of the largest. Young women in 18s to 23 was another large market. And, interestingly enough, of course, girls and boys. And then I heard a story of a father that says, "What'd you buy my son?" "It's a Furby." "Furby's a doll. I don't want my son having a doll." So, he took the

Furby and put it-- "You sit over there." Well, Furby sat there for a while and he got bored. He says, "Ah! Me bored!" You know, whatever. Right, so the-- he goes, "What?!" The father picked it up and started playing with it and they couldn't get it out of the hands of the dad and he bought the kid a new, like, Furby. So, I keep hearing all of these during those-- during the period of time from '98 to 2000-whatever, you know, '01, '02, '03, '04. So.

Brock: Well, it's fascinating to me to think about the longevity of the toy, you know, more current releases and, certainly, there's been a lot of development in electronics since you first created a Furby. But in terms of, like, an interactive robot intended for entertainment, I could be wrong, but to my awareness, there isn't-- there hasn't been a successor that has been as successful.

And maybe it's precisely about what you are talking about; it's not so much-- it's the appropriate amount of mechanics and electronics and compute and programming to do this magic trick, more so than anything else. So, maybe it's-- it's less about-- you know, certainly you were doing a lot of tricky things to make Furby have the performances it does at a certain price point with a certain technology, but it's almost about your-- what's fascinating to me to think about, it's more like your design approach about evoking other people to project and imagine and relate to the device that seems critical or else we would have seen somebody come along with Moore's Law and all this other technology and have something kind of that would have surpassed it in the category.

Hampton: I believe it's a combination and you-- one of the strongest things you've discussed already and here's the combination. As far as the technology goes, there's a lot of things that have happened that I've never discussed. For example, how do you get the battery life-- how do you get the battery to last so long? It's not supposed to last so long.

There's a trick where when Furby wakes up, he wakes-- Furby can dance, so he tips from down to up. I measured the duration of time that it takes. I calculate battery life-- there's a look-up table. And what happens is there's something called pulse width modulation, where you can control the speed. Well, what happens is I wanted the Furby to operate down to 0.9 Volts per cell. That's considered a dead battery in the toy industry. And the toy needed a certain number of hours to be acceptable in the toy industry and there was a lot of concern early on. But by doing pulse width modulation, I basically keep the battery low when the batteries are new and, so, everything works at the lowest battery power. And there was a lot of things done to just achieve that hardware-wise and software-wise. And as the batteries die, I use-- I turn the pulse to the higher voltage for longer and, eventually, when the battery's around 1.1 to 1.0 Volt per cell, I don't use pulse width modulation. And it also synchronized-- keeps the mouth synchronized with the speech. So, there's all of those kind of details and using the puppeteers to make it match. Here's something else that happened: When Furby also was showing up, there was a little trick that was done to get two motions for one. There is an eyelid that moves. And the eyeball, because of friction between the eyeball and the eyelid, kind of either leads it or recedes it depending on the motion. And it makes it look alive. Well, the tolerances weren't tight enough and the eyeballs were just dropping. And it looked like this.[7] You know, just like-- he looked dead to me. And there was a discussion where they're going, "We don't have time. We can't fix it." I said, "I'm sorry, if you don't fix the eyes, you don't have a product."

Brock: Yeah.

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[7] [Interviewee's note] I dropped my gaze down and stared forward.

Hampton: "It doesn't look alive." And it was a big-- I was so worried, I stayed up all night. I'm going like, "How" because they said, "No, we're not doing it." I said, "Do I pull the license? What do I do to get them to take this seriously?" And, so, I called Randy at, like, five in the morning my time, four in the morning-- like, seven or eight Chicago, whatever it was, and he says, "No, David, we're taking care of it." Well, after that I heard, "Well, he looks at you. He looks alive."

So, it's all of these details, combined with allowing the inference engine-- it's-- in large portion you are correct: Allowing the imagination of the person to take over is a big part of it. But there were so many aspects of this that toy companies don't have the stick-to-it-iveness to do all of the disciplines involved in the mechanics and the programming and the production costing. I'll give you another example, little did I know there would be 68 million Furbies. But, like, for example, in the U.S. most engineers say, "Oh, a low-cost transistor is a 2N-2222." That's a garden variety. But you pay a premium for that, because that is not only a switch, but it's an amplifier. So, if I go get an 8050 transistor out of Asia that's not an amplifier, but I use it in saturated mode to turn on a motor, I don't have to pay that little premium for testing the 2222 as an amplifier. Because the 8050, I'm not going to use that amplifier; why pay for it?

Brock: Right.

Hampton: So, I went through all of it and then did all of that kind of hardware design to make it low cost. The other thing is I purposely made-- the toy originally came out between $30 and $35.95 and that's what—$29.95 and $35.95-- it could go as high as $39.95, but the point is that's what I said it would cost.

I did not want to have haves and have-nots at Christmas time, people that couldn't afford it. And, so, a lot of these products start crossing into a hun-- like, Aibo. You start talking, like, five, six hundred dollars, $1,200. It's no longer something that a lot of people can share and participant in. So, and timing has to be right. That Tamagotchi, I have to say, must have really helped the way I was hoping. Yes, and my wife and myself were just talking about it in the last couple days, because I kept expecting the next greatest and biggest and better and-- you know? And I thought I would have led this, like, revolution of really fun, great, creative, interactive toys. It just never materialized. And you're right: It's 21 years later.

Brock: I wonder if it's in part also due to-- well, due to the rarity of somebody being involved in this business who is like yourself. You know, it's hard to find somebody who integrates these domains, you know, who had the experience of doing kind of like the deep costing, down to "Maybe we're just going to use a switching, non-amplifying transistor."

Hampton: Yeah, a tenth of a cent.

Brock: You know, down in a very deep fashion. Also, uncompromising about these trade-offs, the droopy eye, the problem with the ear. You know, I am wholly ignorant of-- I hate to say it-- of the toy industry. But do you think it could also be that the structure of the industry does not afford participation somehow by a creator like yourself who would embody all these disciplines? Is it rare-- are people like you doing what you did rare 20 years ago and perhaps rarer today? I just don't know.

Hampton: Thank you. That's very kind. It's a-- that's very insightful, because it's a combination of things that you just talked about. Because I'm going-- like, I know some really bright people and I go to this-- and now it's more publically made aware of—the Asilomar microcomputer workshop, some of the founders of the industry, you know. And the first computer chip and designed the 8051, you know-- and I'm going like, "How do I fit in with all of this and what happened?"

And there's some people I consider way-- much brighter than I am. And they were very, very kind-- because when I talked-- and I've gone to this meeting for, like, 25 years. And, finally, they said, "Dave, how many people do LPC speech," or whatever. You know, I said, "Really high quality, low data rate?" I said, "There's about 12 people in the United States that really are known for doing," you know.

"How many people have had experience with puppeteering? And how many people have had experience with production costing at a toy-- and how many people have this experience and that experience?" "David, that's why you were able to do Furby. Don't belittle that combination of talents that allowed it to happen." The other thing is you cannot-- it's just-- whether it's luck or fate or whatever you want to call it, Tiger being so busy that I was left alone. So, to have one person do the concept and all of this, is unheard of.

Brock: Okay.

Hampton: And Hasbro, I love them dearly. They, in large portion, allowed the success of the initial Furby by this mechanics team that they brought in-- Peter Hall and-- oh, names! There's just a name-- a list of people that ultimately went and a combination of talent that allowed the mechanics to get done. But for the most part, at Mattel and at Hasbro things are designed by committees.

Brock: Yeah.

Hampton: So, everybody wants to put their little stamp on it or their little thing and then it dilutes the concept. I mean, for example, I love what they've done with the latest Furby, but personally I don't care for taking what's supposed to be a life form and tying it to an iPad.

And an iPad-- now you're focus is now on that iPad and there's little eggs hatching and little games playing, but now it's not Furby anymore. So-- and I'm not a real strong-- of, like, getting the intelligence from somewhere else. I've stopped that multiple times. I want it to be all embedded and, so, that if you take it to the beach or you take it to McDonald's, it doesn't all of a sudden get stupid. It's the same character that you've got attached to.

So, I think there's a combination of a successful toy product. And I think there's huge industries and huge opportunities in this whole deep learning and maybe senior care robots and all of this stuff that's going to be happening. But that's not the toy industry. The toy industry is very, very particular of what-- consumers are very particular where they spend their dollars. And there's a lot of areas of they can spend their dollars. And video games has changed the toy industry much to their chagrin.

But by being left alone-- and my vision was able to be implemented. I think that is the rare thing today. I think that-- don't get me wrong. There's great products like the Apple phone and design-by-committee kind of works in a way.

But you also don't see the strength of an individual; of a solid, unified thought; the hardware taking pla-- sorry, the mechanics, and the hardware, and the software, and the magic act, and-- yeah! Gee, how much be-- how more fortunate could I be?! And, you know, the long hours-- this is something else that was not known is that once it took off, I felt a commitment to Hasbro, because they had helped me succeed. And for the period of time between 1997 and 2001 with all the Furby languages and all the Furby babies, I worked in excess of for most weeks over 100 hours a week.

Brock: Oh, my gosh.

Hampton: It was one person, you know, spearheading all that. And--

Brock: But also keeping that kind of cohesive concept, the commitment to sorts of quality that you want-- or attention to detail rather. You know, I imagine it was-- it sounds like a lot of work, but it's also keeping it together.

Hampton: No. And, you know, I learned-- see, I've had all these experiences. At Mattel toys, I worked on the See 'n Say. And who I worked with was the voices of Mickey, and Donald Duck, and Disney characters. And I learned this really well. Now, the Mickey I worked with, he's probably retired now, looked like a football player, you know?

Brock: Oh!

Hampton: He was a big guy. But-- and Goofy was there. And, boy, that was a hard one. But they would have three people from Disney and he'd go, you know, <high-pitch voice> "Hi, I'm Mickey!" or "Mickey!" and they'd go, "No, Mickey wouldn't have said it like that. Say it again." So, they'd have so tight the control of the character of Mickey.

Yes, I did that. I did that with the language. The first Furby, I did that with the language. I did that with what he would do and what he didn't do. I did it with the QA. I did it-- yes. And I learned that because of Disney. And if you have a character it has to be true to itself, because as soon as it falls out of character, it doesn't seem believable or real anymore. So, yes.

Brock: Well, we only have a few minutes left available to us and I just wanted to talk about just sort of what this experience has meant for you since. And it seems like you wound down your business in 2003, at least as it had been formulated. You know, what has-- what has-- could you just briefly describe, you know, your life after Furby, if you will--

Hampton: Yes.

Brock: Or life with Furby is maybe more appropriate.

Hampton: Well, no, you know, it's in-- so, when I talked about my first experience with a job out of the Navy and I said they fell in love with something so much that they held onto it forever. Maybe this sounds odd, but Q*bert I let go. And Furby-- this was 21 years later, I let go. People talk about it, people still, you know, contact me about it,

search me out and all that, but as much as possible-- look, it was a huge opportunity, a huge success, but I don't-- I hope there's more.

Brock: Yeah.

Hampton: I want to move forward. So, what I've been doing is for a long time after-- I got away from electronics, because I had been doing it from the age of seven intensely until the age-- until the year of 2003 and a little bit too intensely between '97 and 2003. Furby was 2001. There were some other projects in there.

But, anyway, the point is-- in 2001, I got a pilot's license and I did aerobatic training and I got an instrument rating, and I flew four or five different kinds of airplanes, all different kinds of complexities and some for aerobatics and some for travel and some for just sheer joy. I studied violin, studied cello, oil painting, doing experiments with artificial intelligence and music creation. Of course, I'm doing it-- it's not something for a product, because I'm too late to that party. There's too much of that going on already. Therefore, my own interest. I'm doing a very, very small version of AI that interacts-- so, you analyze a song, create templates. And, so, there's a verse, there's a chorus, there's a bridge, intro-outro, and then do a program that analyses verses and do a program that analyses choruses, not try to do this big-- I'm a single person-- try to do this big program that analyzes everything and creates a new song. And the goal is not for a computer to create music. I have no interest in that. I have the interest in a computer helping assist in the creation of music as kind of knowing some music theory or taking a bunch of songs of a certain type and doing a weighing system and then I can say, "Well, here's my chord progression." So, if it's more of a flavor of the Beatles tune or if it's more of a Hotel-- you know, like, The Eagles or whoever and adding that little variation to it. I'm interested in those things.

I'm interested also in mentoring and I help teach English for second-language students and math and science and try to help them find what they're interested in. So, I stay busy doing things that are not necessarily for a commercial product, but I have no intention of stopping anytime soon. I don't see that. Retirement for me is having the time to do exciting things that I'm interested in doing. And, you know, it is a challenge because in this day and age right now, there's insurances and bills and this and that and house maintenance, you know, all those things that are distractions. It's hard to still have enough time in our busy lives to do those things that interest me.

And I have this other thing is if I do something, I want to do it really, really well, and I want to-- I love being involved with it at such a level. This happens more with programming and with right-brained things where you just lose the awareness of your body and you exist and you're aware of the thought and the creation. And that process is just a wonderful, wonderful experience. So, oddly enough, that's the long answer for-- as much as possible, this has been a wonderful opportunity and very exciting to re-live this, but I haven't thought about it for quite a number of years. Yes.

Brock: Well, it sounds like a wonderful period of time to be able to just follow your curiosity and to be able to do exactly the projects that you want to do now.

Hampton: Yeah, thank you. Thanks.

END OF THE INTERVIEW