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John Markoff: Hi. My name is John Markoff, and, uh, this is, uh, an event for the … an interview for the Computer History Museum. I’m speaking with Douglas Engelbart who invented the computer mouse and much of the other technology that went into today’s … that goes into today’s personal computers. I wanted to begin, um, by asking you about growing up in Oregon, and, um, my memory is that you grew up on a farm. Um, was it close to Portland?

Doug Engelbart: It was very, very small. It was just in a small farm area and, uh, where everybody had other jobs, uh, and …

John Markoff: What did your parents do?

Doug Engelbart: Well, my father, uh, uh, had developed a radio shop. He was a trained electrical engineer so very early radio, he, he said, “I can capitalize on that.”

John Markoff: So you were growing up outside of an urban area, but yet your father was a technical person.

Doug Engelbart: Yeah.

John Markoff: You … That’s the best of both worlds.

Doug Engelbart: Well, the problem is he died when I was nine, and up until then, he’s working very long hours in the Depression time to make things hold together.

John Markoff: I see.

Doug Engelbart: So I didn’t get any technology from him.

John Markoff: You didn’t grow up amongst the test, the tubes or anything?

Doug Engelbart: No.

John Markoff: No? Okay. How close to Portland was your, was your home? Was it Portland was the big city or was it …

Doug Engelbart: Oh, yeah, we were about three or four miles outside the city limits.

John Markoff: I see. Oh.

Doug Engelbart: But it was a beautiful area, beautiful creek running right through our property and into 90 acres of untouched forest that was our backyard and, uh, and so that creek and that forest were terrific. And it was on a dead-end curvy road so it was very quiet and private and …

John Markoff: And always raining.

Doug Engelbart: No. I remember two or three days [00:02:00] with sunshine. (laughs)

John Markoff: (laughs) And, um, after your father died, your mom stayed on the … You, you stayed in the same place. You didn’t move. Yeah.

Doug Engelbart: No.

John Markoff: Um, did you have any interest in technology while you were growing up, before you left home?

Doug Engelbart: Well, I, uh, I liked to do a lot of things and I would invent things like … And then I got interested in, in, uh, making a rope and, uh, so I found out that the gunny sacks that our grain came in to … or our cow feed came in, uh, was strand by strand that I could pull the strands out and tie it and make a very, very long string, and then I would double that and twist it up and then double it again; it would make a rope. And then I would twist that up, and I ended up making a rope about 40 feet long, it was strong enough to her- … hold my weight. And I would use that for climbing trees, and, um, and, you know, different funny boats.

And, uh, then one day when I was about 13 or 14, I found a, in an abandoned barn nearby, I found an abandoned car that just intrigued me very much. It had a brass radiator and kerosene parking lights and, uh, it was a 1916 model T Ford.

John Markoff: Oh my, god.

Doug Engelbart: That’s even older than I am, see. (laughs)

John Markoff: Did you make it with … Did it work or did you make it work again?

Doug Engelbart: Yeah. Yeah, I, I bought it for $10, uh, and, uh, hauled it home [audio glitch 00:03:37] home and spent the next year or so taking it all apart and getting it finally working. So it was just …

John Markoff: Do you remember roughly how old were you when you did that?

Doug Engelbart: Oh, 15. It’s like we could drive on our back roads without licenses. (laughs)

John Markoff: But then you had a car to go to school with too.

Doug Engelbart: Well, that was even [00:04:00] old in those days, it didn’t have a … It was the year before they started at- … automatically putting on electric starters on cars.

John Markoff: And so you had to crank-start it?

Doug Engelbart: Yes, right. And then the electric, the headlights worked off a magneto so the faster the engine ran, the brighter the lights would get. See? And, uh, it was a, it was just a beautiful, little, old car and that, anyway.

John Markoff: You went to Corvallis, a universi- … The Oregon State University to, to college?

Doug Engelbart: Yeah.

John Markoff: And what did you study?

Doug Engelbart: Well, I, I studied, I took … There was an engineering student aiming for electrical engineering, but the main reason was the war had started when I was about 16, I guess, World War II, not the Civil War, and, uh …

John Markoff: (laughs)

Doug Engelbart: (laughs) Then, there was a lot of talk about this secret thing called radar and, oh, the Navy had a program; they would train people to ta- … maintain that. So it sounded so dramatic that, uh, you came into the classroom and they locked all the doors, then they took the, the textbooks out of the locked … And then you had your class and then you put them all back in the vault and locked it up before they let you out of the classroom. And that just sounded so much, so that’s why I started, I said, “Well, I think I’ll take electrical engineering because that would be it.”

John Markoff: Do you think there was any connection between your dad’s profession and your interest 10 years later in study? Was there a link at all or it was …

Doug Engelbart: If there were any, it would have been a negative one because when I was 10 or 11, I remember noticing the textbooks he studied in and looking at them and saying, “Oh, god, you're too much for me.” So … But it was that, that the secrecy of radar and the fact that I probably was going to get drafted, so I did get drafted and then I had that training, so I got into that Navy training program.

John Markoff: How many years did you go to school before you were drafted? Did you …

Doug Engelbart: It was exactly two.

John Markoff: [00:06:00] Ah, I see, so then you were drafted and you were sent off to operate radar systems in the Pacific.

Doug Engelbart: Well, I, I had a year’s training first, all the basic training in all the kinds of equipment and the maintenance you had, and, uh, then you get to be a certified electronic technician.

John Markoff: Okay.

Doug Engelbart: And, uh …

John Markoff: You told me a wonderful story about shipping out to the Pacific.

Doug Engelbart: Yeah.

John Markoff: Tell me the story of, of, of … This was, this must have been ‘45, 1945.

Doug Engelbart: It was spring, and that’s when I finished the training, and, uh, (clears throat), so they loaded us up on, on an old converted freight ship converted to a troop ship and, uh … The San Francisco Harbor, but it was just south of the Bay Bridge in there. And, uh, we were all kind of nervous because we were going to go invade Japan, and there were soldiers, marines, sailors mixed there, and the boat backed out and trundled along underneath the Bay Bridge around towards the Golden Gate and out to sea.

And we just got part way past the Bay Bridge and, uh, the captain came out on the bridge and looked down on us, “Japan just surrendered,” he shouts. Oh my, gosh, you could just see. Then suddenly all … uh, every, all kind of … What is it? Propriety or something leaves us. We all said, “Well, for Christ’s sake, turn around.” (laughs) And he goes like this and … But anyway, it was a very different trip, so.

John Markoff: And I remember you hearing, you hearing the sounds from San Francisco as the people began celebrating as they went …

Doug Engelbart: Yeah.

John Markoff: … out on …

Doug Engelbart: Whistles blowing and …

John Markoff: Yeah. Um, you had to go to the Pacific anyway. The war was over.

Doug Engelbart: Yeah. You can imagine that they could not, couldn’t just stop everybody where they were, and so 38 days later at about 10 miles an hour, we got to the Philippines [00:08:00] and …

John Markoff: And your job was a radar, radar operator.

Doug Engelbart: No, a technician that would be maintenance. So it wasn’t just radar. Radar, radio, sonar, teletype, any kind of communication electronics and, uh …

John Markoff: Okay. An, um, you were a reader by that time, a voracious reader? You, you liked to just sort of bur- … burrow into … was … I mean …

Doug Engelbart: Well, that’s what I discovered. I had been a reader and curious way back. Then, in early years of college, I found a library and the stacks and how they were tolerant enough to let me go roaming in there. And I just did read a lot and … huh.

John Markoff: So you found a reading room while you were on … It was a small island, right? Where, where …

Doug Engelbart: Oh. When we first landed in the Philippines, it’s what they called a receiving ship, even though it was a camp in the jungle (laughs), right on the edge of the jungle in the island. And, uh, they dumped the shipload of people there and then you get assigned to different places and, and traveled from there in small groups to different assignments. So, uh, that one was, it was right on the edge of the jungle and, uh, interesting, but I discovered the native Filipino hut on stilts, thatched roof and everything that had a sign on it that said “Red Cross Library.” And, uh, you had to climb up the ladder into the nice, clean floor, about maybe 15 feet across, circular like this and books and magazines. (laughs) It’s funny, so I started camping out there, you know, a lot of time there. I think I was there about four, five days or something like that, but, uh …

John Markoff: Oh, so this was new, this was right after you … It was early on.

Doug Engelbart: Just when we got there.

John Markoff: Okay. Yeah, interesting.

Doug Engelbart: And so that’s, that’s when I found that LIFE Magazine [00:10:00] article that was sort of a takeoff of what Atlantic Monthly had had some months earlier, uh, that was Vannevar Bush and his Memex description.

John Markoff: And this was a machine that was … There weren’t really computers at this point. But this was a machine that was an information retrieval machine?

Doug Engelbart: Yeah. He … A microfiche, uh, just a small size, uh, hunk of film that you can move and view and stuff and each one of them has center frames on it, etc. So he said what each one should do is sort of have what would be the equivalent of a link today is, you know, it’s referring to some other one of those fiche and they’d like to have a mechanical thing that could go get it for you from the list. (clears throat) And it was never built, but that seemed intriguing. But that didn’t surface for me … Let’s see. That was 1945.

John Markoff: It was five years later. I thought …

Doug Engelbart: It was 15 years later.

John Markoff: Oh, it was 15? Okay, we’ll, we’ll come to that. You also mentioned … So, um, the idea of, the idea of hypertext. You stumbled across the idea of links and the abili- … the ability to, to the … But you also … I also remember you found a magazine article, and I don’t remember the details, but it was about sort of making something with your life.

Doug Engelbart: How to make the most of your life.

John Markoff: Yes. What was that article? That was …

Doug Engelbart: Oh, that was a book.

John Markoff: A book. Tell me a little. I mean but it had an impression on you.

Doug Engelbart: Oh yeah. That’s, uh, I’ve never heard about, you know, trying to talk about how you can plan and etc. And, uh, you know, just totally the … There was no professional discussions that I heard at all among my neighbors or anybody about planning careers, etc. And, uh, especially during the Depression when jobs are scarce. Most people were just happy to have steady jobs. And, uh, so I didn’t [00:12:00] have any great thinking about that, but I found this book in the library in the … where I was stationed in Manila for the year, and, uh, so the library there too was almost never anybody else in it (laughs), so I probed a lot.

So that was one of the books I found, and it was, it was just one of the cheery kind of things about advice of how to tune your life and think positive and try for things, etc. But it somehow impressed me so much that, uh, it led me astray. I stole the book when I left. (laughs) But I didn’t feel very guilty because almost no one was ever in the library. (laughs) And, uh …

John Markoff: You, you came back to the West Coast and you finished your college degree in, in Oregon.

Doug Engelbart: Right.

John Markoff: But now, when you went to Berkeley, did … No? You … Oh, that’s right. You … Before you went to Berkeley, you came to California?

Doug Engelbart: Yeah. I, uh, I just happened to take a job offer down here in the Silicon … San Francisco area at the Ames Aeronautical Laboratory. And, uh, you know, various people had come from different companies, etc. to give talks and, and try to, uh, enlist graduating, graduating students. And so I had been signed up to go to General Electric back East, and then this fellow came from the Ames Laboratory here to talk about what could be done there, and, uh, then I remember how much fun it was in the San Francisco area because my last seven months of training were on the Navy, with the Navy owned Treasure Island at the time. And, um, so I thought, “Gee. That’s fun. That’s right near Stanford girls.” (laughs) So, uh, for some reason, I signed up to come down here.

John Markoff: Now when you went to work, um, at Ames, [00:14:00] um, you ended up supporting the wind tunnels. Is that right?

Doug Engelbart: Yeah. Um, I thought I was coming to work in the instrumentation development group, but I got sort of waylaid as I first came in. See, the Greyhound bus I was on stopped at the stoplight (laughs) at Moffett Boulevard and 101. (laughs) I’m laughing now because it was not a freeway, so I trundled up there. And, uh, so it wasn’t long before this talking guy came and, and, uh, intercepted and, and talked, talked me into, “Oh, it’s much more interesting in this other group. You know, we take care of the wind tunnels and all that.” Well, it was an education. Uh, so I was there three years before I got my … whatever it is.

John Markoff: The … Oh, I see. So before you decided that you needed to, to move on and …

Doug Engelbart: Before I got the, the big turn on, uh … I don't know. What, what do you call it? Just …

John Markoff: A vision, in- … insight, uh …

Doug Engelbart: Well, the sequence of them. First, first soon after I got engaged, I suddenly realized I didn’t have any goals professionally. Here are all these interesting goals about getting married and a family. And, uh, uh, so the day I realized that was the Monday after I got engaged, driving to work. Oh, I better get goals that worked. And for some reason, what flashed in my head that just changed my life forever was, “Oh, goal. Hey, that’s interesting. I’ve never thought about having a, a real goal professionally.” And that’s how naïve country boy. And so another naïve country boy’s thing that what came up when I said, “Oh, that sounds good. Let’s grab that as a goal.”

And the goal, I, I … Just was welded in my mind because it says, “Hey, why don’t I pick a goal that will maximize the benefits my career will have to mankind?” [00:16:00] Just your 25-year-old country boy, I don't know where it came from but it was just so clear and, uh …

John Markoff: You were still at Ames at this point.

Doug Engelbart: Yeah.

John Markoff: Okay. [crosstalk 00:16:12] You were driving to work and … Were you … You weren’t living in Atherton by that time. Where did you live at …

Doug Engelbart: Oh, I, I was renting a room in, in Los Altos.

John Markoff: Okay. You were engaged, but you, you guys weren’t married yet.

Doug Engelbart: Oh, I’ve been engaged for two days. (laughs)

John Markoff: (laughs) Okay. I want to go backwards for a second because there’s, there’s something I wanted to, to ask you about in terms of the way your thinking evolved. Um, you told me about, um, uh, your experience in the wind tunnel or seeing how they developed stuff in the wind tunnel. And you, you basically came in contact with the idea of scaling, and there was a word you, you used that it was used in terms … And I had forgotten the word about they were interested in scaling down … They were interested in scaling up. Um, and there was a word that described that, an engineering term. Do you, do you remember?

Doug Engelbart: Well, the, the dimensional analysis, they call it, and scaling and then there are some … You can put together different factors, you know, how many feet per second you go and how many second for this or that. And if you juggle them so that this array of terms, all the dimensions cancel out, they call it dimensional, dimensionless number. And it just turns out in a funny way that, uh, if any other thing you make has the same, you know … That that dimensionless number changes, that’s what’s going to give you in that scaling. But, but, um, it just, it just came into my mind of you can test this little piece of a wind foil, air foil and a wind tunnel and translate that accurately to what it’ll mean in the big wind tunnel which just changes, so.

John Markoff: Yeah. Okay, I’ll come back to it, but I realize I interrupted you because you had a series of insights. One was that you needed a goal, [00:18:00] but there was another one.

Doug Engelbart: Yeah, the goal about (a) how, how does, how does your maximum … How can you maximize the benefit your career will have to mankind? Which, uh, you know, how do these … Not just as, as, a real sign of how naïve country boy, things I’ve never quite gotten over (laughs), but, uh, uh, oh, well, what, what are some of the really big challenges mankind has that if you can really help that, you’ve really contributed.

And this got me into starting and looking in the library and things about big, tough, complex goals and such, you know, like, hey, the, the, uh, malaria problems in some tropical areas where you’ve got all places where everybody is so beat down by having malaria all the time. Oh, you could drain the swamps. Oh yes, but how do you get the money to do that? How do you coordinate it? Well, then if you drain the swamps, I realized one day the, you know, that, uh, they stopped being sick all the time. Well, the population will probably grow faster and exceed them … sustenance capability of the land.

And, you know, it’s just not simple, and that’s what just dawned on me one Saturday, all these problems are very big. Oh, and they have to be dealt with collectively, and we’re not getting smarter collectively enough to handle these big things. Oh, (clears throat). Oh, maybe … Oh, and then suddenly, the idea of a computer and the electronics that I had learned with radar and sonar of screens, how electronics can make things draw on the screen, and in fact how the electronics in a radar can respond to the use … the operator.

Oh, well, if a computer, all they knew about it is they can punch cards or print on paper, well, then, certainly I just knew instinctively you can make electronics to put anything you want on a screen. And if they can [00:20:00] read punched cards, they can certainly read what a human does and it just, you know, I just knew instinctively that you could make it so you could interact with one, and somehow that just came to a picture of, boy, that’s what I could go after.

John Markoff: And did you frame it with the idea of augmentation at that point? That, that …

Doug Engelbart: No, it took, it took years to, uh …

John Markoff: So the idea was there, but to actually get the structure.

Doug Engelbart: Well, it was going to augment. It was going to be able to do these things and like, oh, and the same computer complex, you could tie a number of these, uh, dem- … workstations together and you could collaborate, and, uh, oh boy, let’s just go. And then, then I realized it would be handy to have some research, you know, talents or training. And, well, I should go to graduate school, and, uh, the Berkeley had a research project that they were building an experimental computer, uh …

John Markoff: But it was, it was … You already had the idea of the system you want to build and so you needed skills and that you knew that they were working on a computer project and that was … became the place to go to …

Doug Engelbart: Yeah. That plus how do you do research? You know, the whole thing about equipping yourself to be able to be qualified to do the kind of research.

John Markoff: Um, you … Tell me about meeting Ballard. Um, your …

Doug Engelbart: She was a girl that (laughs) …

John Markoff: But you … I remember, uh, you told me at one point that when you were at Ames, a lot of times, you would just go over and hang out at the library at Stanford. You weren’t a real social guy. Um, probably the stacks at Stanford libraries were not the best place to meet young women.

Doug Engelbart: Yeah. Well, I, I was … Got to thinking I’d like to meet women. I, I, I had an interest in, uh, soaring, soaring planes. So I started going with a group and meeting with [00:22:00] them that were learning how to do that. And then one day, I suddenly realized there’s nothing but men in here. (laughs) So then I, I asked the guys at, at work, well, where do you go to meet girls? Well, see, they were … Most of them are married. They didn’t have all that many ideas, except one of them mentioned that well, he, here’s that … In the Palo Alto City Center, they have, uh, folk dancing classes. Oh, and I just pictured something that turned off, so.

But anyway, I went over there one evening and stood there and watched an intermediate class and it just intrigued the hell … I, I was very clumsy and bashful and I, I couldn’t do ballroom dancing effectively with just a [serial 00:22:44] sweat. But I watched what all these people were doing. Oh, boy. And so even though they were in an intermediate class, at the next break, I scooted out there and grabbed a woman who was started … Well, I, I had never done anything like that (laughs). So I began to be a regular at that, and, and, uh, that’s where I met Ballard and [crosstalk 00:23:05].

John Markoff: That’s right. So you, you moved to Berkeley. Um, you got a PhD in electrical engineering?

Doug Engelbart: Yeah.

John Markoff: Okay. But it was basically, um, the design and, and research leading to com- … computer systems.

Doug Engelbart: You could take the computer option of doing research and talking about that and, um, and I happen to remember some strange bistable phenomena in gaseous discharges like neon tube or something that you could install … You put a radio wave, radio wave, cross it like this and, uh, and that’s the way we would tune the transmitters. You know, the brighter that light … You hold that up near the antenna and the … As you adjust the power level, the brighter it got, the more power out there. Then, I noticed one day that also [00:24:00] as you backed it down, it would stay lit at a lower, uh, voltage level than it took to get it going. Oh, you know, at that intermediate stage if it were lit, it would stay lit. If it weren’t, it wouldn’t get lit.

And so I thought, well, that would be an interesting thing in the computer world of another bistable sort of phenomenon. And so I built shift registers of little, little patterns of glow, no-glow, would just shift around that tube. But it’s far too clumsy and slow for (laughs).

John Markoff: [crosstalk 00:24:35] Um, and yet it led you to your … Didn’t it lead you to your first sort of business venture?

Doug Engelbart: Yeah.

John Markoff: So you, you were an entrepreneur. That was sort of a sidetrack but yet, you, you wanted to do something with the technology. Was that …

Doug Engelbart: Well, it turned out there were some fast-talking patent attorney that I happened to bump in when I was at school or like that and said, “Hey, you could get these things patented.” So 13 or 14 patents came out of this. You know, you can almost build a whole computer with these little gaseous plasma things. Um, but it, it just … You know, then there was the chance. He said, “You know, you could actually start a business and have this goal. And one thing you could do is make very interesting kind of signs for people because they could have these neon tubes around like that and the little glow-no patterns would move around them so you could have just very interesting things.” So, okay, but I was … I, I wasn’t destined to be a businessman or something, so the [packers 00:25:44] we had pulled out after about four, five months, and …

John Markoff: Yeah. There were some San Francisco store owners, weren’t they, who ultimately invested in the project? Wasn’t it one of the retail stores in San Francisco? The, the family?

Doug Engelbart: Yeah. I can’t remember now.

John Markoff: But it, [00:26:00] it went nowhere. When it didn’t work out, what did you decide to do next?

Doug Engelbart: Oh, then I, then I decided I really liked to get in just doing some real research and get going after the computer things I wanted. And so, uh, um, I had, I had been doing this while I was still teaching. I was an acting assistant professor at Berkeley after I got my degree for two years and, um, so something that happened in that environment too was very telling. Um, because Ballard and I continued folk dancing and, and we’re getting acquainted with university people, and one time there was a party one Saturday that, uh, one of the guys, friends of ours, he was an as- … an associate professor in economics or something, but just very nice people.

So after the party, I was helping him clean up and he happened to say, “Well, what’s your special interest, Doug?” You know, because if you're in that university position, this is what you have to be doing, and I started telling him and he slowed down his work and finally looked at me and says, “Well, um, you are aware, aren’t you, of how promotion is handled in universities?” Naïve country kid shines through again and says, “Well, um, no, not really.” (laughs) Uh, so he explains to me about peer review and that you get promoted by writing papers that get submitted and accepted in the best journals. And the peer review decides, you know, your peers review it and that decides what gets in. He says, “So I can tell you right now. If you keep talking like you are now, you’ll be an acting assistant professor forever.”

John Markoff: (laughs)

Doug Engelbart: And, uh, I, I just really … Suddenly, I got it. But the funny thing is then I thought … [00:28:00] We thought of coming down the univers- … Uh, Peninsula to get some jobs. Well, there was no Silicon Valley, but there was a Hewlett-Packard, and, uh, we had used their test equipment in the, in the Navy, so I knew about their story. So I went there and, oh, these interesting things I had done for my thesis work intrigued them and such. So, boy, he offered me a job in the research and, uh …

John Markoff: Now, you, you met with both Hewlett and Packard. It was a small enough group that it was, it was David Packard who offered you the job, wasn’t it?

Doug Engelbart: No, the, the head of research.

John Markoff: Oh, that’s right. Um …

Doug Engelbart: Barney Oliver.

John Markoff: Barney Oliver. But at some point, you had discussions with Packard.

Doug Engelbart: Yeah.

John Markoff: Yeah. And I remember Packard said … Didn’t Packard tell you, “You could keep the technology that you” …

Doug Engelbart: This … What just happened, he was such a straightforward guy. I just happened to say, “Well, I’ve got this problem. There are quite a few different IT inventions I’ve had for my thesis work that I haven’t patented yet and … But I know when I go to work for you, I’ve got to sign over all the patents. So what do I do about that?” He came out just instantly with thing, “Well, I’ll tell you. How about this? For the first six months, everything you can write disclosures on will be yours, no matter whether you thought of them at our place or before. After six months, they’ll be ours, whether you thought about them before or after.” And that just impressed me so much, just the honest, straightforward kind of way to do it. I just never forgot that, and, uh …

John Markoff: So they offered you a job.

Doug Engelbart: Yeah.

John Markoff: Uh, and you didn’t take it.

Doug Engelbart: Yeah, because …

John Markoff: Tell me. Tell me what happened.

Doug Engelbart: Well, I was driving home then all excited and by the time I got up here by Redwood City or something, I thought, “Oh. Wait a minute.” And I stopped and called Barney Oliver up and I said, “Oh. Um, I forgot to check on something that I’m totally committed to working with computers and so I’m assuming you guys will get to be working with them soon, so I just wanted to check on that.” And so it’s just [00:30:00] maybe a check. And he said, “Oh, sorry, Doug. Not a chance.” And, uh, so I said, “Okay. I guess that closes off our deal.”

John Markoff: Yeah. What was the next step? So you, you were still looking …

Doug Engelbart: [crosstalk 00:30:14] I tried Stanford and wrote them a letter telling how I could … I knew how to, uh, conduct laboratory and some classes and basic digital technique and learning and such. And, uh, the dean of engineering who was a very good guy and such wrote back a letter saying, “Well, thank you for your interest in Stanford, but I must say we’re a very small university and we have to specialize in highly academic topics, etc. for our research world. And, uh, since computers are only a service activity, we don’t contemplate ever having computer classes and design classes or whatever.” And, uh …

John Markoff: Do you remember if that was Terman or Linvill? Do either of those names ring a bell?

Doug Engelbart: Oh, sure. Uh, they both ring a bell, but that wasn’t …

John Markoff: Either?

Doug Engelbart: Uh …

John Markoff: Okay. So, so Stanford wasn’t going to be a computer, um, research organization any time soon.

Doug Engelbart: Either. Yeah, like, like Berkeley.

John Markoff: So where did you turn next?

Doug Engelbart: So then I went to Stanford Research Institute which later changed its name to SRI International. And they, they had the job at that time of actually developing a computer for the Bank of America’s use, and, um … But it was … So that sound promising, but, uh, again, this time, uh, I happen to … The first one I talked to at SRI was somebody who left Berkeley before I had by a couple of years, and he never found out what my driving interest was, and, uh, so he, he asked me. “Well, I guess I’ve never found out.”

And I started telling him that he went, he started looking in shock and he says, “Have you talked to anybody else?” “No, you're the first one.” “Well, I advise you. Don’t just tell them about your [00:32:00] patents and your research and don’t talk about that computer stuff because, uh, that’ll turn, turn people off. And then you get hired. You get to be here and have a chance sometime to get the support.”

John Markoff: Yeah. So they did offer you a job and it was with which group?

Doug Engelbart: That wasn’t with a group. It was just plunking at a laboratory (clears throat) and sort of like then you scout around to see, uh, who would be interesting … you know, who would interested and interesting. And, uh, so I, I … They, they weren’t interested in the, in the … Building the computer for the Bank of America didn’t really appeal to me, but, uh, then I met Hugh Crane and his magnetic logic things.

John Markoff: So this was a group funded by the Pentagon. They were hopeful about, uh, the development of magnetic logic technology for whatever reason, military reasons or …

Doug Engelbart: (coughs) I am not sure who funded them because this was considerably before, uh, what’s now the Information Processing Techniques Office got established in ARPA. And, uh …

John Markoff: Okay. But these could be the building blocks. These could have been the building blocks for computers of the future. That was one of the ideas possibly.

Doug Engelbart: Yeah.

John Markoff: Okay. Yeah.

Doug Engelbart: But they, they’d be quite slow and, um, so I helped with that and then …

John Markoff: You developed some, some innovative magnetic, um, devices, right, at, at this group? Um, switches or …

Doug Engelbart: Well, the first thing they’re having were just shift registers. You could shift bits down a long chain, you know, whole pattern and, um, and they were multi-aperture devices, uh, a large toroid with small holes, [00:34:00] you know, bump around the small hole in the … It case it goes around.

John Markoff: Yeah.

Doug Engelbart: And it turned out that you could put current through there. It would lock, lock out the magnetism that would go around and, and, uh, then if you pulse that hard when the rest of it collapsed, that would make enough of the signal to transmit it to the next one, thing of this sort. And, uh …

John Markoff: It was while you were working with this group that you went to Philadelphia to, uh, a meeting of, um, the International Circuits Conference. You traveled with Hugh Crane. This must have been 1960 perhaps, to give a paper about the idea of, um, I think it was called similitude. And it was about scaling. It was … You were putting some ideas together, ideas that you had …

Doug Engelbart: Well, when, when I was going around doing that, I came to SRI in 1957 and, uh, so I was kind of hoping there’d be a chance to get into something with more active computer things. But one day I happened to be talking to a, a program manager, research manager, uh, in the Air Force and, uh, I just happened to tell him about the interest I had gotten about the similitude, this scaling issue about airplanes and that, uh, uh, it’d be very interesting to study that for electronic components too because, you know, if you just make things smaller and smaller, they just naturally get faster.

So I got a grant to do that, so, uh, then I, I did enough in that to kind of find much better ways to explain it and, um, why a device that this size would probably stop working if you make it 1/10th the size. [00:36:00] And, um, that’s generally because some of the phenomena that you're harnessing in there are affected directly by the linear measure of something. Others are affected by the area and others by the volume. Of course all those change, they, they don’t change at the same way as it’s changed the scale. And so, uh, a phenomena that worked together this size would stop being able to latch together in this, but new phenomena could be found.

And, um, so I just thought, “Oh, that’s terrific because knowing that, that, uh, the, the speed increases as well as the density of the things like that. So boy,” I just said, “That, that’s extremely important for the computer world because if we’re talking about things I’m hoping for, it’s got to be able to get faster and more, more powerful computers.”

John Markoff: So you had proved to yourself that there was going to be enough computing power to build the kind of machine that you wanted to build.

Doug Engelbart: It just seemed inevitable right now.

John Markoff: Yeah. So you stumbled across the thing that would become known in 1965 or much later but you, you stumbled across Moore’s Law or the, the, the scaling process.

Doug Engelbart: Well, yeah, not the law about how much it’s going to change, but yeah.

John Markoff: The, the underlying phenomenon that would be codified by the industry. Um, so who at SRI sort of, uh … Did you … You bumped into who let you begin to work on building a machine to augment human intelligence? Who? Wa- … Was it outside or was it inside SRI that you got the ori- … the original support?

Doug Engelbart: Oh, outside. (laughs)

John Markoff: Okay. But Charlie Rosen was sympathetic to your ideas, wasn’t he? I mean he, he was helpful, I, I think, I remember …

Doug Engelbart: Oh yeah. Yeah.

John Markoff: In terms of funding or …

Doug Engelbart: Well, just, just encouragement.

John Markoff: Yeah.

Doug Engelbart: He couldn’t give me any funds or something.

John Markoff: Yeah. It was … Was it the Air Force first who was your first funder?

Doug Engelbart: Yeah. Um, it was called Air Force Office of Scientific Research, [00:38:00] just, uh, sort of one-man … or four-person office. Uh, and, uh, it just, it just happened that, uh, he was a wild-eyed enough character that he thought, “Well.” I, I just said, “I, I want to write a study about what’s the chances of … and what’s the payoff potential for interactive use of computers? And, uh, so he, he gave me some money to do this study, enough so I could just start sitting down and, and working and, uh …

John Markoff: No computer though. You were, you were working entirely with ideas.

Doug Engelbart: Oh, there was … Weren’t computers available. That’s … Um, anytime. Anyway, so I was just stubborn enough that that’s what I’m going to do and even when the … that kind of money didn’t quite reach what it would take to support me fulltime, the institute had what they called the internal R&D where they would use overhead money to sponsor something that would hope to develop into a prog- … funded program. And, um, so I kept plugging away and, uh …

John Markoff: You wrote some papers.

Doug Engelbart: Yeah. And, uh, and, um, I wrote one about scaling before that on that other one. Uh, and so I ended up with this one sizeable report after about a year and a half or more. So in the fall of 1962, there was a quite large report. It was called Augmenting Human Intellect: A Conceptual Framework. And, uh, just hundreds and hundreds of hours of painful, trying to get … carrying it through and such, [00:40:00] but, uh, out of that came a real, a real difference from the people whose terminology was oriented about automating our jobs, computer automating. And, uh, I said, “Well, gee. It’s more than that. It can change the way you work and think.”

And so I pulled up this term, augmentation, and, uh, realizing how much else changes besides the artifacts we bring in. And, uh, I tried to explain to people. “Well, do you think that, uh, elevators just automated everybody’s ability to get up to the top floor, seventh or eighth floor and that was all?” No. Look what happened (clears throat). Buildings … whew … way up and then air-conditioning had to change, and, oh, population density or office business density. Well, that changes, you know, the commuting in and out had to change. Just huge amount of changes. And, uh …

John Markoff: The ideas were there. Who gave you the money to actually begin to implement them with a computer?

Doug Engelbart: Uh, the first, a guy who’s now a historic figure, uh, he was, uh, an engineering-oriented guy from the MIT area and, uh, MIT and Harvard. And he had written a book called Man-Computer Symbiosis, a, a paper.

John Markoff: Uh-huh (affirmative).

Doug Engelbart: And, uh, so he was trying and ARPA brought him down to help set up the first Information Processing Techniques Office, so he set that up. And I was right there with proposals, so he …

John Markoff: This was J.C.R. Licklider.

Doug Engelbart: Right.

John Markoff: Yeah. And, uh, that allowed you to acquire an early small CDC machine. Was that your first?

Doug Engelbart: No. There were, [00:42:00] there were a sequence of different machines, but that one had a very small one, uh, but it turned out that, uh, you know, you know, even when I talked about paradigm, I haven’t yet, but the paradigms that made it hard for me to stay in university because who, who’s going to work with computers interactively and so on like this? So the paradigm thing was just so prevalent and really impeded me immensely for decades.

John Markoff: Did you know at that time that you needed to break out of paradigms to begin thinking of new ideas?

Doug Engelbart: Oh yeah.

John Markoff: So that was part of the, the, this research struggle right from the start.

Doug Engelbart: Yeah. When doing that long study about augmenting human intellect, this, this came out quite clearly and, uh, and I found a book that described the name of what paradigms were, etc. I can’t remember the author. I’m sorry.

John Markoff: Yeah.

Doug Engelbart: It was very important. And, um …

John Markoff: This wasn’t The Structure of Scientific Revolutions. That came later, didn’t it? That hadn’t been written but when you were …

Doug Engelbart: Uh, so anyway, the, the paradigms that’s sort of like this paper about augmenting human intellect just seems so outlandish or out of this world to the administrators at SRI that, uh, when the first money came to me to do that, they, uh, politely told me that they’d promote me to be a senior research engineer and said I ought to write more things like this, and they put John in charge of the project because he was a computer programmer and knew how to do things like …

John Markoff: John was one of the first people who worked for you or … Who’s …

Doug Engelbart: No. It, it … [00:44:00] I, I was moved aside and if I ever tried to talk to them, I would get scolded. “Leave them alone. John knows what he’s doing.” I would just … It was just a, a parody on …

John Markoff: So how did you get out of that?

Doug Engelbart: Well, that went (laughs) and Licklider came to, to visit. I was, I was so naïve I didn’t think of complaining to him or something about what happened. Uh, and I … You know, for years, I still am too naïve about the politics of all sorts of organizational environments and, uh.

John Markoff: Did Licklider introduce Taylor to you or did Taylor find his way to you in …

Doug Engelbart: I found Taylor. He was working for NASA.

John Markoff: That’s right.

Doug Engelbart: And then told him about ARPA and Licklider and, uh, so then he went over there later but, uh … Anyway, when Lick found out, you know, he sort of closed down that, that project and it wasn’t until another time, it was too small a computer that we had to … It was … We are like the client that would work with a time-sharing computer which was under development down in Southern California (laughs).

John Markoff: But this was … You had … That was where you started the online system. Uh, you were doing the original development down in … The programming was being done down in Southern California because that’s where the computer was.

Doug Engelbart: Well, we could program and [crosstalk 00:45:31] like that. But, but that thing just … That computer was never work- … would … was always crashing (laughs), so that one didn’t work. And, uh, then we got, uh, then we got a, another one that was big enough to start doing it, and that’s the one where we put the display on it and, uh, I got the money to do a research project on trying to test the different kind of display selection devices, [00:46:00] and that’s when I came up with the idea of the mouse, which got added into the other devices we were testing.

John Markoff: And this was ‘63, ‘64?

Doug Engelbart: Yeah, late ‘62 and ‘63.

John Markoff: Yeah. So it was … What drove you to the mouse was how to interact with the display.

Doug Engelbart: Yeah. It was just while we were getting the different devices and then I happen to remember sketching up some ideas like that that was the first mouse and, and, uh, Bill English was setting up the engineering for this. And we had to make our own computer display. You couldn’t buy them and, uh, I think it cost us $90,000 in 1963 money.

John Markoff: Did the technology come from the radar world? Where did you get the components to build it?

Doug Engelbart: Well, people had been talking about doing that, so we just had to build it from scratch.

John Markoff: Yeah.

Doug Engelbart: Uh, and the way it, way it was, is it would move, move the curs- … move, move the beam and write the characters. It wasn’t nearly enough storage capacity to have pixel.

John Markoff: So you built … And you had at that point, were you developing your own character generators as well?

Doug Engelbart: Yeah.

John Markoff: That was the architecture.

Doug Engelbart: The writing of that. So that took a, a hunk of electronics that was about, you know, a table this size and about six feet by four feet … or three feet by four feet full of electronics that was a display driver (laughs). And, uh, so then the computer display, it looked pretty good.

John Markoff: And I’ve seen the pictures. It wasn’t square. Your first display I believe was a, wasn’t it a round screen? Didn’t you …

Doug Engelbart: Oh, oh, sure.

John Markoff: Yeah, because they weren’t square screens.

Doug Engelbart: Right.

John Markoff: Yeah. (laughs) You told me once that …

Doug Engelbart: But anyway, that’s what we then had available to use …

Speaker 3: Hang on a second, guys. One second.

Speaker 4: [00:48:00] Uh, Doug, you're playing with the microphone again.

Doug Engelbart: Oh.

Speaker 4: [crosstalk 00:48:05] The cord.

Speaker 3: Just be careful at the top.

Speaker 4: Yeah, just be, just be careful. It, it was thumping into the audio, so. (laughs)

Doug Engelbart: (laughs)

John Markoff: Okay. Shall we start again?

Speaker 3: Yeah.

Doug Engelbart: Is this too much detail?

John Markoff: No, this is great. This is, this is … I want to get all the detail I can. So don’t worry. I’ll, I’ll … Um, you told me once about the, the, sort of the thought process that you led directly to the mouse. You were at a meeting, and I think you said you were a little bored and so you were just sort of daydreaming?

Doug Engelbart: That’s the second stage. The first stage was years before when I was a senior in college and, uh, uh, I took the power option instead of the electronic option because I had a lot of electronics (laughs). And so we were doing these tests on big, heavy generators and everything like this, and, uh, then you have to plot the data and then there’s some point in there in which the data plot makes a closed loop and you have to figure out what the area under is. So there’s a device that you get that’s … It planks down solid and it’s an elbow like thing with a pointer at the end. And, uh, a little round sharp-edge wheel like that and another one at the elbow. And when you go around this thing, the change in how much those wheels turn, uh, you can use those to calculate what the area of … No matter what the, the shape was.

John Markoff: Right.

Doug Engelbart: And I asked the, the, the instructor, “Well, how does that work?” He said, “Well, all I know is that those wheels like that, if you had access like that, they’ll only roll along this direction no matter what. If they do like this, they’ll only roll as far as you went in that direction.” And, uh, so it was during some kind of a conference in which I was bored that I thought of that and got my little notebook and says, oh, you know, if you put two of them together like this, one would be telling you how far this way and the other this way. And that’s all …

John Markoff: To capture the movement of the XY axis. [00:50:00] So you just compressed that into a box basically, and that’s the computer mouse.

Doug Engelbart: Right.

John Markoff: That’s great. So …

Doug Engelbart: So Bill, I told him to sketch that for him and he built the first one.

John Markoff: You went to the machine shop and they built a, a wooden box.

Doug Engelbart: Oh, no, this was …

John Markoff: Even before?

Doug Engelbart: It got … Well, it, uh, you design it so somebody has to do mechanical design drawings to tell a machine shop what to do. So there’s a mechanical draftsman kid that was doing that. And, uh, he happened to say, “Oh, I’m a, a, I’m a … My hobby is wood, wood carving. I can make a case over it.” So that’s how that got there. And, uh, all we were doing is testing the select so one button, red, and we didn’t think about it but the cord came out this tail end so sitting there. And somebody … And we still don't know who among the five or six people involved in designing and building and setting up the experiments, etc. and tests and training the subjects and so on, somebody in there started calling it a mouse because I don’t think about giving names to things like that. And, uh … But, uh, so this is … So no one, no one knows. So it’s …

John Markoff: Lost in history.

Doug Engelbart: Yeah, lost in history.

John Markoff: And, um, the first one had one button, the very first one you built. But what, what was the right number of buttons? Did, did you think about how many buttons you wanted after you built the first one?

Doug Engelbart: Yeah, right.

John Markoff: And what, what was your thought process?

Doug Engelbart: Well, all we could get on. I could only get three in there the way it was designed, so that’s (laughs).

John Markoff: More would have been better if you could’ve …

Doug Engelbart: Yeah.

John Markoff: Yeah.

Doug Engelbart: Because, uh, I don't know how Steve Jobs says one button or something like that, but you’ve got lots of action here that you can do, and, uh, that … It just seems silly of me not to use that.

John Markoff: So if you could be more [00:52:00] powerful, if you could have more power in the hand, that would be, that would be ideal.

Doug Engelbart: Well, this is, this sort of … And it gets into that paradigm situation again of, of, you know, what’s easy to learn? See? Versus what are you capable of doing? And you could learn. When you learn, it’ll be easy. And if, if you just realize how many things you do that, that when you're born aren’t conditioned into that … You know, just all kinds of skills that … Take for granted.

John Markoff: Yeah.

Doug Engelbart: And, well, typing …

John Markoff: Yeah.

Doug Engelbart: … and things. So, so I would just saying, sure, this opens up the interface at something in which we’re exploring capability and, uh, let’s go after capability. And this, I was just sure that every knowledge worker in the future was going to be working this way. And, uh, well, we can talk about that.

John Markoff: Well, but you … There are a whole bunch of little pieces here, big pieces. Um, another device you developed was a chord key, keyboard. Um, it turned out not to be a success in terms of acceptance in the bigger market but it was a way that you were experimenting with breaking down paradigms.

Doug Engelbart: Well, it’s just a way to improve capability because if you're using the mouse, you can’t type and, uh, so that leads to the thing of all the point and click, uh, uh, uh. And to me, that was like pigeon English, you know, uh, ooh. And, uh, so the actually command language we developed was just saying I wanted the … We’ve got a bunch of verbs. You want actions you want to do on a bunch of different kind of objects, what then … designated by nouns.

John Markoff: Right.

Doug Engelbart: So we, we had that and then with the absolute minimum number of keystrokes to set up any command, like just D-W [00:54:00] would flash up delete word. So you hit D-W, click, click, the word is gone. C-W, I want to copy the word. Click, click, it gets copied. Replace the word … or a whole paragraph, a sentence, just all kinds of things. Visible string just meant, you know, it would be a word plus any punctuation or something. So we ended up with many verbs and many nouns that, uh, if somebody came and looked at that, oh. But it’s just like you're learning an extension to your natural language if you come in to some new kind of environment. Uh …

John Markoff: By this time, you had begun to build the online system.

Speaker 3: One second. We need to change [production talk 00:54:46].

John Markoff: Sure. Got you.

Speaker 3: Good. [production talk 00:54:50]

John Markoff: Yeah.

Doug Engelbart: That’s a par- … paradigm issues we had … I, I, um … Somebody. Let’s see. About the time where, where you did your mouse thing at Xerox PARC and that, uh, I was at the history museum for some reception they had. And I met a guy who worked at the, at National Science Foundation. And I didn’t know him. I just got to talking and found out he did. And, uh, so I said, “Well, I wonder. You know, I’m not in university and I’m pretty old.”

Speaker 3: [production talk 00:55:43]

Doug Engelbart: I got to talking with him. So, uh, he called me up later and invited me to come at the end of the month to talk to the staff at NSF.

John Markoff: Did you do that recently?

Doug Engelbart: Just the end of this month.

John Markoff: [00:56:00] Oh, you just, you just went?

Doug Engelbart: No.

John Markoff: Oh, you're just going?

Doug Engelbart: No. You know, at the end of August.

John Markoff: Oh, okay. Oh, great. Well, that’s good.

Doug Engelbart: Yeah. So it’s just like, hey, [crosstalk 00:56:07].

John Markoff: Excellent.

Doug Engelbart: And so a big thing I want to get to them, a lot of examples of the paradigm issue.

John Markoff: Yeah. So, um, where did the idea of bootstrapping come from? As part of the augment system, the idea of being able to, to sort of build the system and then build on top of the system and then continue that process. Where did that idea come from?

Doug Engelbart: It, it came out of the … Two things, that the model of how we augment ourselves. We already are augmented, and it’s a huge amount of things more than just the artifacts we employ, all the skills and the methods and the language and customs and the organizational structures and all, all kinds of things that are like this that they all … The artifacts are just integrated in. And there’s no way you're going to make some huge change in the capability of an organization by just plugging in some new line of art- … artifacts. And so that, that just got to the point of saying, oh, the only way you're going to do it is by helping facilitate the evolution of that whole thing.

John Markoff: And was that approach sort of, uh, in process in the first half of the ‘60s as you sort of …

Doug Engelbart: That’s …

John Markoff: It was clear in your mind that that’s the way you would evolve the system.

Doug Engelbart: Right. And then, then in the early ‘70, what I need … You need to get real people, not just the research kind of guy, the real people involved. So we set up an arrangement and DARPA let us … ARPA let us go ahead and, uh, start selling NLS usage as service over the ARPANET.

John Markoff: Right.

Doug Engelbart: And, uh, this was going out great. We actually had the way to, to cultivate their usage and start helping facilitate their evolution, and what they need [00:58:00] is the way it changes the tools, etc. and …

John Markoff: But before you did that, you built this system. You had a display, a computing device, a storage device, a sophisticated software system that allowed you to do, uh, text editing and hypertext. You had all of the ingredients of modern personal computing. Um, you showed it to the world for the first time really in 1969.

Doug Engelbart: ‘68.

John Markoff: Was it December of ‘68?

Doug Engelbart: Yeah.

John Markoff: It was, it was at Brooks Hall in San Francisco. It probably is the most famous computer demonstration in history. How did it happen? What led to the demonstration?

Doug Engelbart: Well, it’s, uh, this, our NLS system was getting more and more interesting and useful, and, uh, it just occurred to me it still is very hard to tell any of the colleagues out in the world that we’re computer-oriented people what we were doing and why. And so it’ll be great instead of just giving a paper at a conference is to demo it. And we had the kind of tech- … technology on hand that could do that. Uh, because I, I found out that the telephone company was actually in the business that they would lease, set up and lease for you video line links. So we had two, two links, one-way links going from San … from SRI up to the city. And, uh, then we had to build a modem …

John Markoff: To carry the data.

Doug Engelbart: To … So that we could run it from the city. And you couldn’t buy a modem, so Bill English and Jeff Rulifson put together a modem. And, uh, uh, then Bill English had happened to … have been very active, he and his wife, in amateur theater and so he knew how you had to direct and run things. And, uh, so he, he not only arranged for the communication up there [01:00:00] and all this, but then he built a, uh, a platform about this high, uh, that was covered with canvass where he sat there with the two feeds coming up like this, but also then the feed that would go up to the projector and …

John Markoff: The projector was just a remarkable device. I mean it was … The screen was huge by, by … The only way they can make screens in those days of that size was with film, but you were doing video projection.

Doug Engelbart: Well, we just happened to stumble some months before that because we never could have done it without that and something … I think it was called an Eidophor.

John Markoff: An Eidophor projector.

Doug Engelbart: Right. And it … The phenomena by which it made … That modified the light, it sort of had a mirror that was coated … A mirror surface was thin film of mercury, and it was in a vacuum, and the electron beam could go there like this. It turns out that that charged density on the surface of the mercury would deform it a little bit like this, and that was all it took to bend the light as it come down and it would then go through a grading so that which was bent would be darker at that point and stuff like this. But it was just a magic thing. It was something by six-foot high and three by two feet or something like this, on wheels.

John Markoff: With an arc light as its light source, right? That really bright arc light source.

Doug Engelbart: Yeah.

John Markoff: Yeah.

Doug Engelbart: So, uh …

John Markoff: So you sat up on stage. You had the keyboard, the chord key set.

Doug Engelbart: And the mouse in it. And, uh, it was all on a kind of molded, uh, thing fit on a chair with a swivel that it turned out that Herman Miller furniture company, uh, the designer there got really interested in what we did, so they built those chairs for us. (laughs)

John Markoff: You know, I talked to them about it about two months ago. They’re still very proud of the fact that they helped you.

Doug Engelbart: Oh, really?

John Markoff: Yes. And they have pictures. I should send you the picture. I have a [01:02:00] picture of you consulting with a Herman Miller person about the design of … That they still have in their archives.

Doug Engelbart: Oh, that’s terrific.

John Markoff: I’ll send it to you. But anyway.

Doug Engelbart: Oh yeah, that was, that was really something. So, uh, anyway, then, then Bill English also had an audio line going back down to the peninsula and, uh, and he’d be telling people … I wrote the script, script for it all and that, and that included people from the lab tying in and doing things, and Bill was … Then, we had volunteer people with … We borrowed the video cameras that made the (laughs) … Generated the displays for our people (laughs). They were very great fix-up, but, uh, the … So it was just so much leverage temporary put together things that it could have crumbled during the time.

John Markoff: You had an audience of about a thousand.

Doug Engelbart: I don't know literally how many.

John Markoff: Some of the best computer scientists in the country. People before that didn’t think of computing as interactive, and you showed them …

Doug Engelbart: Well, if they did, they, they had a very different idea from what I had done. And, uh …

John Markoff: This was really the first public demonstration of the kind of interactive computing that we all take for granted now.

Doug Engelbart: Yeah. And, and more that we’re doing things there that just totally got cut away because they didn’t have paradigms.

John Markoff: Yeah.

Doug Engelbart: You know, while we had hyperlinks going but hyperlinks, all kinds of … between everything and everything. You could link to anything.

John Markoff: Yeah.

Doug Engelbart: And the hyperlinks that we … Now also all kind of optional viewing. So one thing is wide view and I clip paragraphs so I only show the first three lines for instance. And so on the next line would be the, the long, ugly link kind of thing. You wouldn’t see that. So if you said jump the link, the system would go looking [01:04:00] downstream for the link and take it. So that’s how we changed. Almost every scene was just jumping on links around inside that and with different views, and we had graphics working at the time, you know, can make that map for instance of, you know, how I’m going to get home this evening (laughs) after all the shopping for my wife. And, uh, so …

John Markoff: What do you remember about the, uh, the audience reaction when you finished your demonstration?

Doug Engelbart: Well, uh, during the demo, the lights in my eyes were so bright I couldn’t see the audience. I just had to know they’re there. And so when all got done, I, phew, boy. So I was unstrapping myself and getting up and the lights went out and I saw everybody was standing up, applauding wildly, and I thought, oh, phew, just feeling so lucky that we got through without crashing.

John Markoff: (laughs)

Doug Engelbart: And, uh …

John Markoff: That’s neat.

Doug Engelbart: But, but it was a strange thing. There was a lot of excitement, and the next day, you know, we had the stuff on another room and people could come and see and we could show them …

John Markoff: Yeah.

Doug Engelbart: … the live demos. But, uh, it’s just like, oh, all that excitement. After that, it’s just like nothing happened in the world.

John Markoff: Well, let’s, let’s, let’s talk about that a little bit, because, you know, in a way, let’s talk about the future and sort of what got lost and what still needs to be done. Um, so there were some ideas that got taken away and they turned into commercial products, whole industries, but I think I’ve come to understand your feeling is that something didn’t get taken away.

Doug Engelbart: Oh, boy.

John Markoff: And tell me about what still needs to be done.

Doug Engelbart: Well, I think the focus needs to be on capabilities that you can derive and take the business of, uh, cost of learning and set it aside until you assess the values [01:06:00] of the higher capabilities you can go after. Whereas it, it seemed like there was some level like this, I don't know how it got set that early ‘70s, just got to be easy to learn, and, uh, with all due respect to all the human computer interface guys, that just to me has just been a deno- … Uh, I point out to people. Hey, we’d all be still be riding tricycles if that’s …

John Markoff: [crosstalk 01:06:22] big adult guy in a tricycle or your other interesting way of getting this idea is about taking a pencil and attaching a brick to it.

Doug Engelbart: Yeah.

John Markoff: And how ineffective it is with the brick on the end of it.

Doug Engelbart: Right.

John Markoff: So your argument is this original idea you had about machines that augment human intelligence, we got trapped on the curve somewhere and it flattened out.

Doug Engelbart: It was somehow the automation idea got in there and then during the early years, it was office automation; the real user is the secretary. Therefore, you have to make it easy for her to learn, etc. And I kept trying to say, “No, the real user is tomorrow’s knowledge worker.” (laughs) You're a nice guy, Doug, but, uh …

John Markoff: So how do we get back on the curve? So I understand your principle. Um, you know, somehow we go off the curve. You think we could continue to build more powerful tools that would get us back on this …

Doug Engelbart: Absolutely. And there’s a … A big part of that is, uh, the paradigms about, hey, uh, one, one thing is the “book,” book paradigm that that’s just built into everybody’s sort of parad- … paradigmatical (laughs) outlook is. That’s the way you read and study and you say, “Well, no, wait. That’s just the way an artifact that they call printing and such produce things that would help you do that.”

John Markoff: Yeah.

Doug Engelbart: We’ve got brand-new set of artifacts now, so let’s change our paradigms. Let’s say what we can do. And so that’s what I started doing in the ‘60s. I’d say for one thing, [01:08:00] you don’t want to be able to jump around. So not just a link pointing to another document, but I want to, I want to jump, oh, I want to jump … There were just a huge number of jumps, you could just say what you wanted done. I want to jump to the next chapter. I want to jump back to the rig- … origin. Oh, then you start saying the different views. You know, one line only. I want this.

And the optional views just kept growing and growing and the kind of moving around you could do … get- … getting more flexible because your jumping and viewing was, well, then, also, since you can address anything so flexibly for a jump, you can also address very flexibly for any editing you want to do. I want to move this chapter to follow this chapter in this other book. That’s just one command: Move branch.

John Markoff: So the tools are, the tools are just … They got stunted somewhere along the way. The, the original model was to have tools that people might … It might be hard to learn, but once you learn them, you would be so much more powerful.

Doug Engelbart: That’s right. To look at capabilities, see, and so nobody ever did.

John Markoff: Yeah.

Doug Engelbart: They just, uh, uh, pooh-poohed it. Sort of like in that ‘68 thing, it, it … A funny thing happened that early this summer, there was a, a European conference, computer-based conference, they called it Reboot, and it was trying to sort of restudy some of the older things that had done. And so for one thing, they got the 90-minute video. We happen to be lucky enough to record that ‘68 demo, and they showed the whole 90 minutes to everybody there. And all of the, the results that they had were just, uh, you know, just raving remarks of like, you know, we’re still not able to do a lot of those things.

John Markoff: People are still surprised. Well, one of the things … I, I, I didn’t want to end without noting and asking you what your memories are. [01:10:00] You know, today’s internet started with the ARPANET and the ARPANET started with two nodes, and one of them was at … in Southern California, and the other one was at Menlo Park in the, in the Augment Project. So I think that’s important, but what I think nobody knows is that, you know, the, the modern internet is built on these things called ref- … request for proposals, the whole, the standards effort. And if you go back and you read RFP number one, um, the original ARPANET was built to make the use of NLS, the online system that you designed, uh, remote use of it possible.

So your NLS system was I, I think the first killer app … It was supposed to be the first killer app for the ARPANET which became the internet. And do you, do you remember that discussion? What led to them wanting to, to use NLS in that way? Or to … Was it the idea to make it more …

Doug Engelbart: I don’t think it was quite that direct. It was, uh, at the, at the event was a meeting of all the principle investigators ARPA had in the computer domain. I think it was the University of Michigan, I think. And, uh, that when Bob Taylor and Larry Roberts, the two guys running that office, told us all that they were going to go ahead and put together this network on a brand-new mode of doing a network. And, uh, boy, I just right away thinking about the excitement about the collaboration you could do like this, but all they were talking about is sharing resources. If I have special data, you can get access to it. If you have special computer processes, I can send stuff there to get it done actually.

And, uh, for me, I looked, hey, this is great, but there was a, an interaction that went on then. Two guys sitting next to me, you know, big shots [01:12:00] and little, small egos, of course, but, um, you know, so one of them turned to the other and says, “What do you have in your computer that I could use?” You know, it was, you know … The other guy, you know, just as quick-witted said, “Well, don’t you read my reports?” And this guy gets some … And he gets back with a killer, “Well, do you send them to me?” Knowing that guy has no idea where his reports go. And they both realized that’s never going to get any place, so they turned together to talk to Taylor and Roberts to say, “Well, how are we going to know what’s on everybody else’s computer?” And it just appeared right then that that hadn’t really been thought through.

Well, I had been sitting there, thinking, “Hey, that provides a tremendous way for communication and the whole thing.” And so I volunteered to start a Network Information Center there and serve it, and that’s, that’s sort of why they put me … my computer on early. And so that, that worked and ran for quite a few years.

John Markoff: And as it turned out, a couple of dec- … decades later, it changed the world. This has been good. Thank you for the stories.

Doug Engelbart: Oh, but … (laughs)

John Markoff: We could, we could go on for the rest of the day.

Doug Engelbart: Yeah, right.

John Markoff: There, there are a lot of them. But thanks.

Doug Engelbart: Yeah, that’s good.

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