Oral History of Charles (Charlie) Bourne

Interviewed by:
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Marc Weber: I'm Marc Weber of the Computer History Museum, and I'm here today with Charlie Bourne, who's a pioneer of computer applications, primarily around online information retrieval. And I thank you so much for doing this. It's September 8th, 2015. So let's start by saying what is your full name and when and where were you born?

Charles Bourne: Well, I was born in San Francisco, September 2nd, 1931. I was given my father's name Francis Xavier Percy, II. That was changed later when my father ran out on my mother at a very early date, and when she remarried years later I was renamed by my stepfather after him, as Charles Percy Bourne, II. I carried the name Frank for quite a while, but then I later changed it to Charlie. So now I'm just simply Charlie Bourne.

Weber: And tell me a little bit about your family and childhood.

Bourne: Ha. Well, it started by my father deserting my mother when I was very young. This was in 1931 during the Depression. She then became a single parent. Very difficult to find jobs or find work. She couldn't afford to keep me for very long, and so at age two or three or something like that I was given up to a Catholic orphanage and I lived there for the next, oh, six years or so until my mother remarried and settled down and took me home again, and my life started at that point. I grew up early in the Haight-Ashbury district of San Francisco, and then my stepfather got a job in Los Gatos teaching at a boys' school, private school. Did that for a while and then the family, which was just the three of us, bought a farm in Los Gatos. A 22-acre farm, apricots and hay. And lived there for a short while. But very soon it was the start of the Second World War. In December, 1941. Threw the family sort of in turmoil. My stepfather couldn't, wasn't physically able, to join the military, so he went to work for an iron works in Sunnyvale. And then he went up to work in Alaska on the ALCAN Highway and the pipeline, and some other activity. And then saw fit to bring my mother and I up to that neighborhood as well. So in my seventh grade, I guess it was by that time, we were all up in Whitehorse, Yukon Territory. There was no family housing available, and so I was farmed out to a family in town. The family happened to be a Royal Canadian Mounted policeman, and that was kind of interesting. He looked over me, and arranged during my summer vacation of seventh grade to go to work in a shipyard in the town of Whitehorse. I worked there as a cook's helper for a while, and then I was assigned to work on a paddlewheel steamer that ran up and down the Yukon River. And I did this work there, again, as a cook's helper, running up the river and back. And that was a really interesting Huck Finn kind of time. And a year later we moved down to Anchorage, Alaska, spent a year there and then pretty soon the war started to wind down, and we came back to the farm in Los Gatos.

Weber: And had you been interested in technical things?

Bourne: Not to that time.

Weber: Not particularly.

Bourne: No. It was mostly outdoors that was of interest.

Weber: And cooking or… No?

Bourne: Cooking was just a job. Nothing there. I got back to Los Gatos and it was time then again to find some work that was interesting, and so in that area, that included, as a youngster, sixth, seventh, eighth grade, freshman, high school, picking apricots and prunes. And that was work and that was interesting and good to do. Continued on that line and my stepfather left. And so my mother was alone again, and she pursued her work in retail sales and marketing. That left me alone for some time, again, with other people or, yes, mostly with other people. And during my high school years then, I again worked at picking apricots and prunes, working in the fruit dry yards. And then in the junior, senior years, in the summer, I worked at the canneries in Sunnyvale or Mountain View.

Weber: You went to high school in Los Gatos.

Bourne: Went to high school in Los Gatos, right.

Weber: Which was mostly fruit orchards at the time.

Bourne: Yes. It was a quiet town. It's not the big village that it is right now. And I kept that up. And then it was time to finish high school. I graduated from high school. I had very little counseling with regard to college activity and no role models <laughs> in the family to work it out. And so I expected to have to work and make some money to save to go to college. And so I worked as long as I could after graduation in the cannery until the cannery shut down for the summer. I went up to the city to join my mother, who had gone up there. And through the help of some of her friends I got a job working at the San Francisco Chronicle. And so I was an office boy, a clerk working on the Chronicle, trying to work and save some money to go to school eventually. While I was there, one of the men in the office who was a Marine officer, said, "Why don't you join the Marine Reserve and make a little extra money and have some fun during the summer, and it'll be a kind of fun thing to do?" And I said, "Sure, why not?" So I did. And that was in early 1950. And just a few months after I did that, the Korean War broke out and I got pulled to active duty. And so that brought me into active duty in the Marines in early 1950. The Marines put me through boot camp and decided that instead of going directly over to Korea I'd be more useful if I were to receive some training in radar or radio repair.

Weber: Why? I mean, was that…

Bourne: I guess it was their <laughs> idea. They asked me and, as they did ask everybody, "What would you like to do? Here are our job specialties. Here are the things we can offer." At that time I had wanted to go to school to be a physician, an M.D. And I looked over and the only things I could see were chemical warfare and something else. And I chose those. And they said, "No. You're going to go to radar school or radio school." And they sent me down to, well, Camp Pendleton for basic Marine Corps training. And then basic electronic school at Treasure Island for 10 weeks. And then radar, radio repair school in San Diego for another 10 weeks. And then most everybody got shipped out to Korea at that point. They said, "No. I think we'll send you to the Great Lakes Naval Base to be-- you've collected enough of the electronics, we're going to send you there to be an instructor at the basic electronics school at Great Lakes." And so I went to the Great Lakes. And the people at the school at the Great

Lakes said, "No. We don't put instructors to work until we send them through instructor training school." So I went through another several weeks of training at that, and then got assigned to teach basic electronics at the Great Lakes electronic technician, or basic electronics school.

Weber: And where was that?

Bourne: At Great Lakes-- oh, outside of Chicago.

Weber: Okay.

Bourne: Yes.

Weber: Suburb of Chicago.

Bourne: So I worked there in that capacity until the Korean Armistice came. And at that point they gradually let all the Reservists out of active duty and sent us back home.

Weber: When you initially joined the reserves, it was more than you bargained for to immediately get called up, I'd imagine.

Bourne: Absolutely.

Weber: Yes.

Bourne: But I don't regret it a bit.

Weber: Sure.

Bourne: I found it a very helpful experience. So after--

Weber: And what had been, prior to that, what were your favorite subjects in school? Anything related to…

Bourne: No. There were all the science subjects. Physics, chemistry. But also Latin and English and all kinds of things that were supposedly prerequisites or required for Berkeley or any other college once you got there. So it was not a liberal arts training as such. It was kind of a science bent to it.

Weber: I mean, that's the path you had gone on in Los Gatos.

Bourne: Yes. And did very well in school. Was happy with that. But when I got mustered out I came back to California by way of San Diego because I had friends who had been mustered out and were already established there. And they said, "We've got a good job working for Convair Aviation, and I think they could probably find a place to put you there if you like." I said, "Fine. I'll take it." And I then went to work for Convair Aviation as a special courses instructor because of my teaching experience and enough electronics to make it work. My job there was to teach navy crews the care and maintenance of the Terrier anti-aircraft missile. And so was very happy doing that. And all of a sudden I had a job and I

had a job with a suit. I wasn't picking fruit or working in a kitchen. And making a modest amount of money. So I did that for a while, and while I was there, the head of the department said, "There's a job for you if you want it, teaching in one of the community colleges close by." And so I said, "Yeah, I'll take that." It was only $3.50 an hour, but it was something, it added up. But later I thought it was unusual to have a high school graduate teaching in a community college. But that, that was something I did. I also then hooked up with a fellow in town, San Diego, who had a TV repair shop, but also worked on communications systems for all the big tuna boats that ran out of San Diego. And so he put me to work modifying old war surplus radio direction finders to be suitable for use on the tuna boats so that they would have a capability they'd never had before. So I did that as well. This went on for well over a year. In the meantime I had been courting a lady that I had known from my school days up in Treasure Island in San Francisco. And we married. And we had been looking for schools to go to and the choice came down to U.C. Berkeley, because it was hometown, home area, for both of us. And that led me to start school at Berkeley. Initially liberal arts but then converted over to engineering.

Weber: What made you switch?

Bourne: Because I didn't really know the lay of the land or what protocol was or what you're supposed to do. Had no counseling for anybody just going to school. So did that fairly quickly. Again, looking at the financial aspects, I needed to work. My wife worked. I needed to work, and I worked wherever work was available. I worked in San Francisco at the Teamsters Hiring Hall, hiring out for day work, working for Bekins [movers] or for unloading freight cars or something like that. I worked during the summer at some of the electronics firms down on the peninsula, Lenkurt, and others. My junior year of of college, I worked as an engineering aide at SRI (Stanford Research Institute). And I worked every Christmastime at the post office carrying mail around town and making deliveries. And about that time when I graduated I had interviewed with a number of organizations, and SRI was the one who made an interesting offer and who knew me from working the summer before. And the fact that I had gone through engineering school, electrical engineering, with their new option for computer work. I studied and programmed both analog and digital computers as part of my work going through Berkeley. This is very shortly after Berkeley had moved on from being a school with just two options, either power engineering or electronics, and started this new computer option.

Weber: And Harry Huskey was one of the professors?

Bourne: Yes. Harry Huskey was a professor in my Logic and Programming class. And that was interesting. It was also an event that should go down in history as one of the earliest uses of a PC. He was consulting at that time for Bendix computer, and he had in his study at home a Bendix G-15 computer, which was a computer about the size of a large refrigerator. We had programming assignments for the campus computer center, a big IBM system. But we also had an opportunity to go up and use his small PC <laughs> that he had. Yes. So he was one of my instructors. Doug Engelbart was another of my instructors. He was a very helpful and very likeable guy. This was 1957.

Weber: What course did you take from him?

Bourne: His was a basic electronics. All the X's and O's of basic electronics work. But I also worked with him on a special studies, individual studies option. And for that option he was the one who got me interested in information retrieval activity.

Weber: How so?

Bourne: He said, "Well, do you want something to do? Here's something you might try. I think you'll find it interesting." And he said, "There's always the problem of trying to find a needle in a haystack." And so this is what we call information retrieval, and there's lots of different ways to do it, but let me give you a problem and you'll have to work out some of the details. What I want you to do is take this stack of," I forget, "several hundred abstracts of articles about electrical engineering, and I want you to use this as your database. I want you to build an index to it and I want you to build a searching device or mechanism to find the information that you're looking for. And this won't require any expensive equipment. We're going to use, instead of the edge-notched cards, that McBee company and other people were using in a commercial sense, we're just going to take a pack, a box of fresh, clean IBM cards, and for each of the column positions, we're going to mark it at the notch, the outside edge, with the coding that you're going to develop. And the notching is going to be done with a hog-ear notcher, and the searching of the edge-notched card is going to be done with a knitting needle. And so this is going to be a low-tech solution. But you're going to have to devise the scheme of coding to go around the card. And to do that you're going to have to look at all these articles and you're going to have to say, 'Well, if I'm confined to 50 spaces or something like that, if I want to make a system of just putting things into 50 different shoeboxes,' you better decide by looking at all those records, what are the 50 different shoeboxes you're going to have?" And so that required thinking about how you go about developing the basic indexing scheme that you have in mind. And so I did that and pasted each of these abstracts onto a card and did the coding with a template around it and punched it and did proof of concept by <laughs> needling it in front, with him as a witness. He was happy with that, and that was my first exposure to needling and noodling. That went well.

Weber: And was this--

Bourne: Doug even invited me over to his house one weekend to talk about it. And to see the work, some of the work that he was doing at that time. He was developing some neon tube shift registers with some outside private funding. No other instructor had done anything like that in terms of inviting somebody, some student over on a personal basis. So I got to meet his wife and his kids in diapers at that time. So that was good.

Weber: And where was he living then?

Bourne: Where is…

Weber: Where was he living at the--

Bourne: Oh, in Oakland.

Weber: Yes. But this, the retrieval work, was not part of what he was officially doing at Berkeley, or was it?

Bourne: No. No. He was officially teaching the assigned coursework. He was an associate professor at the time. But he started to hear that as long as he was pursuing those notions of the augmented intellect, that he was not going to advance in the school. And so shortly after I got hired by SRI, and was working on projects, he joined SRI. And we worked in the same lab together. We had another opportunity to work together…

Weber: Oh, but talk about your move to SRI, what you were doing then.

Bourne: What did I do at SRI, at then?

Weber: Right.

Bourne: I started fairly quickly on some immediate Department of Defense projects. There was a situation where the Air Force had a very large file that they were keeping track of and had about three million records and were getting something like thousands-per-day output in response to searches. They weren't happy with it and they wanted to replace it with something else. And my task was to write the specifications for a new system to replace that. That was an information retrieval system, but it was microform. There was another project at about the same time, again for the Air Force during a time of cold war in a very strong phase. And this particular venture that the Air Force had been running was to collect, abstract, and translate essentially all of the Soviet Bloc open-source literature that was relevant to the Air Force interests. So this is a large volume of material, basic chemistry, aerodynamics, production activities and whatever. And I was to provide recommendations for an automated system to replace that. That was a project! I did a project for the Navy Research Lab in which the effort was to build up an inventory of electronic signals, radar signals, radio signals, signals that would come from any kind of a missile, any kind of a navigation system, any kind of a radar system, and build up an inventory of these signals to describe them by frequency, pulse width and other characteristics, and then put this in a form that could be stored shipboard, along with some tags which indicated the source of the signal. Was it a long-range radar, was it a navigation signal? Was it an anti-aircraft missile? And then have a threat level associated with each of those kinds of descriptions so they're onboard the ship. If you received any of these signals you'd immediately get a display of the extent of threat that that signal posed to you so that you could then take whatever action was needed. That was another project, and that was a database building and information retrieval task.

Weber: And all these were for which group at SRI?

Bourne: The Computer Techniques lab.

Weber: Okay.

Bourne: The lab that I was in.

Weber: And who were you working for?

Bourne: I was working for, in many cases, Roy Amara, as the lab manager. A couple other projects along that line were efforts again for the Air Force. In one case I was the project manager for an effort to plan, develop and implement a reconnaissance data handling system, a ground data handling system for the Air Force. This was a project that planned and arranged for the development of the airborne data recorders to capture the information that they were collecting. And bring it down to the ground on magnetic tape where it would be then processed by this ground-based large computer system. This was an effort that went over a two-year period. We chose the computers developed the specs for the files, and for all the processing that had to take place for it. That was another major project which was of the nature of developing computer-based systems.

Weber: And this was all which years, from the…

Bourne: Oh, '58 to '63, something like that.

Weber: And you also had done something with MOBIDIC?

Bourne: Yes. But let me finish with, no maybe I shouldn't finish with my partnership with Doug Engelbart, about that same period. Shortly after he got there it was the age of Sputnik [October 1957]. And there was a lot of people running around saying, "How'd this happen to us? We were supposed to be first in space. Why did the Russians get ahead of us on this?" Well maybe it's because they had a centralized Sci-Tech information system and maybe we should have a Sci-Tech information center, a national center, national oriented, and Doug and I looked at this issue together and wrote a paper on that issue. "What has to be thought about? What has to be done? Is it worth it?" We did that paper, at SRI, early in that stage.

Weber: Sputnik's earlier, but the reaction to it was- but was the Soviet system, do you know, well how they did that work, presumably not computerized.

Bourne: No. Nobody was computerized in those days. Nobody could afford the storage cost.

Weber: So they used microfilm or paper based?

Bourne: Paper files in some cases, paper abstracts, which were sorted in some sequence or some general order and copies made for requesters, so that went on. I interrupted you.

Weber: Oh no. MOBIDIC has just-

Bourne: Oh, MOBIDIC. There were a number of projects that we did that were Techno-Economic studies, they were like, "is this product worth taking to market? " And so, MOBIDIC was one of those. This was a Sylvania product, a mobile computer made for the Army, that would contain all necessary or available Information about the battlefield. And they had built these, the government created them for the Army and now they came to SRI to say, is there a market for this? And so, that's where SRI had a strong Economics Department and so using the combination of technical people and economics people, was the way this was usually handled. And so the particular issue here was, is this a viable commercial product? And that's what MOBIDIC was about. We did the same kind of thing for a couple of British

computers for ICT [International Computers and Tabulators]. We did the same kind of thing for National Cash Register, I believe, to look at a PCMI [Photochromic Micro-Image] Capability. And this is the sunglass material that darkens up as they get more light; they had the thought that this chemical compound could be used in such a way as to go from light to dark very quickly and be a binary device used in some way by computers.

Weber: Temporary stored memory, basically.

Bourne: Yes. Shift registers and things of that nature. And the answer was no because it was an organic chemical and it had fatigue issues so that after switching 300 or 400 times, it stopped working, or some number like that. It just wasn't reliable. So that was another project. I looked at several other products from RCA and Magnavox which were components, usually they were magnetic strips, magnetic cards, often as a piece of stiffened computer tape as if it were an IBM card, that could be machine-handled, wrapped around drums and read and used in that way, storing a whole lot more data than an IBM card.

Weber: And the data was stored on a magnetic medium on the card.

Bourne: Yes. Same as magnetic tape only in individual pieces of film, of tape.

Weber: Were there holes as well in order to route initially?

Bourne: No.

Weber: How was it sorted? It was reading-

Bourne: Data was stored on the chip, the card itself. And the cards through machinery, something like the check readers that you see and use today, wrap the card, and magnetically with heads, read the data on the card as it went by. It had all the coding information on the card with the data. You could even put video on the card and have coded video and do things like that. Magnavox, for example had a whole suite of equipment developed and operated to demonstrate that you can build up this database of cards.

Weber: Audio. Video. Pictures.

Bourne: Yes. Whatever you want.

Weber: So why didn't that go through?

Bourne: It was just so much more expensive than was likely to be able to be picked up by anybody as a customer and-

Weber: It was computer controlled.

Bourne: Yes.

Weber: And let's say that it read a video file, obviously, it's not a computer interpreting it but it would send it to a player of some sort.

Bourne: Yes. Or send it out to be copied and passed off to the customer, who would then take it to a separate station to play it there.

Weber: I mean it's a retrieval system where you would search for something that might take a while before your request is fulfilled.

Bourne: Sure. It was nothing like an on-line search system.

Weber: And by the way, you mentioned the checks. You did work on ERMA [Electronic Recording Machine Accounting] early on, right?

Bourne: Yes.

Weber: Talk about that. Was that when you first arrived at SRI?

Bourne: Yes. I did that as an Engineering Aid.

Weber: Oh that was your summer for-

Bourne: Yes.

Weber: Yes. Talk about it. Because I've interviewed Jack Goldberg, from the History of ERMA.

Bourne: Yes. Worked in the same lab. I worked with him on that and other projects. My job during the summer was primarily to maintain the correct temperature of the computer. They had a large compressor and water chiller in the garage next door to the lab where the computer was built and was operating and was being tested, and they ran chilled water in pipes into the computer and had it routed all through all the bays of the computer, and blowers in the computer to keep it cold. There was such a heat load within that machine that they had to run the water down to 33 degrees or something very cold, where it would almost freeze up in the pipes to get enough heat transfer out of the machine. And so I was constantly modifying the vanes and the routing and the mechanics of cooling this great big machine, and it was primarily what I worked on.

Weber: Describe what it looked like, physically.

Bourne: Oh. Large racks, six foot racks with covers on them as I recall, maybe not covers, just kind of filled up this large room that was being used.

Weber: How long was it?

Bourne: The room was actually a, leftover hospital barracks or patients' room or something like that. So I'd be guessing, it was maybe 30 feet across the room and then down quite a ways from that, offices around the side of the room, very little in the way of input-output equipment. They were using

modified calculating machines, manual calculator machines as part of their input-output terminal equipment as I remember. That was a long time ago, yes.

Weber: And then being able to do the Optical Character Recognition they were working on then.

Bourne: That was done in a separate lab and that was very interesting work. And they tried initially to do all kinds of other schemes, but the thing that worked best was the magnetic characters and magnetic printing because any Optical Character Recognition [OCR] approach ran into trouble with the workers who came into the bank with a check all crumpled up and grease-stained and whatever, and OCR just didn't have the rigor that magnetic reading did. But that was another major effort and for check imprints and for the American Express cards also imprinted that way. I don't know if Jack told as many stories about the project or not, but the one that comes to mind is that when customer checks or customers' deposit forms eventually come to be used by the banks, somebody, some customer, cleverly put their input run deposit forms into the form holders in the banks so when people came in to deposit a check, and pulled out a deposit form from the bank's box and wrote their name on it, whatever money they deposited went to somebody else's account. And that was just the kinds of things that we appropriately didn't really think about and work on ahead of time. It's my understanding that the bank had in mind that two of these machines would be enough to do all the work they needed for California, one in the north and one in the south. They knew ahead of time that they were never going to get ahead of the growing number of checks that were being written, that there weren't enough bank tellers to solve this problem and they had to do something else, but two machines is what they had in mind. When it finished it's test stage, I believe they then called in GE who provided one of their commercial machines to do that for them. I think that's how that project ended up.

Weber: And what was Jack like to work with and to work for?

Bourne: He was a very competent and very experienced Research Engineer. I didn't work that much with him.

Weber: Feel free to go back, I sort of took you on that detour.

Bourne: Well there were other manufacturers of image equipment. AMPEX, for example, made computer tape for video and to store video on, and they had in mind using their videotape which was something like a four inch wide tape with images scanned across the tape, they had in mind a commercial market for this video file. They sold at least one system to Southern Pacific Railroad and I did consulting on that and possible expansion to other applications. They had in mind, large files, fingerprint files, for example, where you would just have a large collection of fingerprints and you could search on that tape for matches to a set of prints that you had in mind. That never got very far. They sold one system to Southern Pacific to use to store their waybills and to keep track of where a particular shipment was as it was coming across country and what it's expected arrival time would be, and they made some use of that and got some publicity for that. But plans that they had for things like title insurance company files, didn't go very far. There were only a number of little problems like, you couldn't keep reading that image over and over again without getting some degradation of the image. Furthermore, these reels of tape that had to be mounted and dismounted on the readers, because you

would have a lot of tapes for the organizations that are operating it, that got to be tough on the staff, because these tapes were 20, 30 pounds or more, something like that. And to mount them and dismount them and to do that all day was just a tough job for somebody to do. So a lot of these little things just kind of made it not a very good approach and it never really gained very much traction. But I spent some time on that.

Weber: Do you remember the name of the system?

Bourne: It was AMPEX Video File.

Weber: And the one with the magnetic cards?

Bourne: Magnavox MagnaCard and there were others, but I don't remember all the names. That was some time ago.

Weber: And to give a background to the problem is we're solving, so where most places that would look at these kind of systems, obviously they are using paper, but were they using any kind of card sorters, or was there any automation to the way they were doing?

Bourne: There were. There were in a few cases. There were mostly an IBM card approach.

Weber: Not a computer?

Bourne: That's right. Just the IBM card approach. These were large IBM card files; these could be a million cards, very large files and in some cases, there could be a Filmsort card; this would be an IBM card with a microfilm insert in the middle of the card.

Weber: Like you showed me the other day?

Bourne: Yes. So it would include coding and the film image. Typically used for engineering drawings by the aircraft manufacturers and a number of other people. So in those days the only real solution for a large file was either paper or microfilm. The master file in the U.S. Patent Office had maybe four million patents in it by that time and they were all stored in "shoeboxes" or equivalents by subject category. And the categories would be changed continuously to reflect new stuff coming in, but it was a manual search and there was only one master file copy available. There would be one backup, archive copy, and that's how the file was handled. Or it was a microfilm file. You had some searching devices for microfilm ranging from the slow Recordack newspaper files that you see still in some libraries today for small files. But other systems proposed for large files had small film chips or other pieces of film that would be moved around by machine. That was one approach that was taken. But nobody could really afford or think about using computer storage. Database costs were just too high.

Weber: And the microfilm, automated microfilm, there were commercial systems that did that?

Bourne: Yes there were. And some of them were high speed roll film and some of them were chip systems. Eastman Kodak made a very large system with pieces of film called a Minicard system. And that was used by a couple of government agencies but didn't go anywhere really commercially.

Weber: And you say chip systems, you mean?

Bourne: There were several different chip systems.

Weber: Well what's a chip system?

Bourne: Oh, they use a separate piece of microfilm as a chip and you move this chip around and read the coding on the chip. And then make a copy of the chip to go out to the client.

Weber: So when someone made a request of a particular document, how would the system find it?

Bourne: A couple of different ways. In some cases, the clerk would be sitting at a motorized microfilm reader and winding down with a kind of an accelerator pedal to alphabetic order or some other kind of sequence, zip the film quickly past to the point where it looks like, "yes this is the report that this person is looking for and so I'll just hit the print button and pass the copy off." Or it could be a computer search where everything is on the computer and you point to a document number of something, but you then have to go to an external file of documents by document number to pull up something that you're looking for.

Weber: And you worked on several of the systems like that?

Bourne: Yes. It's the only scheme that you had in that particular time window.

Weber: In the use of like things like the Navy Bush Rapid Selector that would go for a statistical machine, none of those will ever become commercialized seriously?

Bourne: No. No. There are a number of spin-offs but most of those were limited in number and never really took over in a big way. It wasn't until computer searching really started to take over in the early sixties and it was still limited to serial searching on computer tape.

Weber: Meaning batch process.

Bourne: For the most part. Yes.

Weber: You would load in an…

Bourne: Yes. You'd mount a tape and you'd key in or enter with cards, your search parameters, and the computer would go and do the Boolean search or string search and find what you're looking for, or not find it, and print out the results of it. And if you wanted to be efficient, you would batch those searches together and wait until you had 10, because going from beginning to end of maybe 10 tapes would take up so much machine time, you wouldn't want to do that for each search. You would do it in batches.

Weber: You would be doing a search on 10, essentially you would be doing 10 different searches-

Bourne: Simultaneously.

Weber: Running the same tapes, right. So it doesn't print out the results.

Bourne: Right. So it's not the not the immediate on-line search, but it's a whole lot better than doing it manually.

Weber: And how long would it take, physically to do a typical search?

Bourne: Sometimes three to four hours. But it would be just one of the jobs in a Computer Center and you have all kinds of other jobs stacked up, so who knows what priority it had and how soon you'd get it.

Weber: So could you describe, maybe pick a particular system, what would the process be from beginning to end to do a search?

Bourne: Well if you're someplace that knew what it was doing, you'd probably have a library staff skilled in the procedure, in the techniques and one of them would sit down with the client and would say, "What is it that you're really looking for? And Okay, you want that data from just the last three years? Okay. And you want what kind of material? You want just journal articles but not technical reports? And not film or anything like that? Okay and the subject is? The brittle properties of this particular new aluminum alloy? Okay, well that means I've got to look up in the tables and see the proper name of this new alloy that has just come on the market. Do you have the name of it? Yes, you have the name of it? Do you have any sample articles that, this has been done, or you've seen this before? Yes, that's great, because that will give me some idea of the technical terms that are being used." Okay, then after that kind of a search interview, you have this background data to say, "Okay, we'll look at the table of subject headings and terms that go with this file, I see we need to use these three terms to describe the alloy and we need to use these terms to describe the brittleness character and we have these other conditions about what kind of material and what time span or whatever, I'll key all that up in the search form that's already documented to already show what data fields to use and whatever."

Weber: So then it would be the Librarian that would do that?

Bourne: Yes.

Weber: Enter the search-

Bourne: Yes. It would not be the customer, the eventual customer. So that would be done and probably keyed up on a form by itself.

Weber: Keyed up, meaning?

Bourne: I enter an IBM card, most commonly. Come back in three hours or check, call downstairs and see if it's ready, or we'll let you know, or whatever, that would be a typical operation.

Weber: But the librarian would actually create the form, but then wouldn't it be a computer operator that would enter it in?

Bourne: Yes. But it would just be like a pack of cards as for any other job shop.

Weber: Okay. So that was for a number of years any sort of batch search would follow that format?

Bourne: Yes. Right.

Weber: And then obviously, the typical size of the data, well then it could be searching a fairly large-

Bourne: Sure. You'd just be running a whole lot of tapes until the databases and the memory capacity got large enough to put them on discs, put the file on a big RAMAC or something like that.

Weber: So if you could talk about your early work on those kinds of systems, I know there was the one you did with Doug that used, when you were doing the on-line, you did the specifications for the on-line search system?

Bourne: Yes, for Doug Engelbardt. Prior to that I'd worked with him in '63 I think it was, to help develop the specs for his project's database. What was going to go in it? What were the data elements to be used to describe different fields of data? And I did a literature search for him in May 1963 to find all the user requirements studies that were relevant to his project. And then for the project that he actually gave me, I had watched him develop his online support system and by this time I had been familiar with essentially all of the major serial search systems and all of the computer systems all around the world; whether it was microform or serial computers searching. I knew the kind of searches and the kinds of things that you'd want to do and not to do. And starting in May 1963, I wrote the specifications for the system, and I had a very good programmer who worked with me by the name of Len Chaitin, who did all the programming. And the notion was to provide computer searching remotely from a terminal, with the database and the search system available remotely, over communication lines, hundreds of miles away. And that's what we did.

We developed a system in which a CDC-150, I believe, was used as a terminal for keyboarding, input, and output. Telephone lines were used down to System Development Corp. (SDC) in Southern California and the computer used was the IBM SAGE System Computer, a very, very large, 75-ton computer built for the Air Force Air Defense System. It was known in military and defense circles as the AN/FSQ-32 computer. And this Q-32 computer was used because Doug's project was being sponsored by J.C.R. Licklider of ARPA who also had a connection with the Q-32 project at SDC and arranged for us to have time on that machine because it had the necessary input-output communications equipment and capability and a time-share capability so that it could do the kinds of things that would permit SRI to store its search programs and its database on the SAGE system on a test basis and search it from SRI in Menlo Park. And that's what we did. We implemented and demonstrated that, at the end of 1963, and Licklider said, essentially, "Well, that's proof of concept and we don't need to go any further than that, so we'll just terminate that part of the project now and go on to other things." That work was really

significant because it was the first demonstration anywhere of remote on-line interactive searching of text or bibliographic data.

Weber: And what the test?

Bourne: The test was to sit up in Menlo Park and think up questions and key them in and get an immediate response back.

Weber: What was the test data? What was the core aspect?

Bourne: It was data from the AHI project records.

Weber: So what kind of material do you remember?

Bourne: It was Project Memos, like, "I talked to Lieutenant So-and-So at Meyers today and he said he'd like to be here for the briefing," and so on. Or, "this is what we should do on the next phase to get ready for that demonstration on the 19th." Or, "here are the comparing features of this possible piece of equipment versus this other piece of equipment." So it was simply the kind of documentation that any engineering project would have.

Weber: You were searching on keywords not on full text?

Bourne: Full text.

Weber: Oh really?

Bourne: Yes. Any character string you wanted.

Weber: And with Boolean search?

Bourne: Yes.

Weber: And what was the Search Interface that you were using on the terminal? The computer and the terminal?

Bourne: Just, it was a simple language to sit down at the CDC Machine and key a search for "apples and oranges." Something like that. Not too elegant. It was not as much as we would like. We wanted to include truncation searching and a number of other features that we didn't have time to do.

Weber: Do you have any documentation of the syntax or any of the code?

Bourne: We wrote a fairly complete Project Report that went into the ASTIA System, Defense Documentation Center, which I haven't looked at for a long time, but it was as complete as seemed appropriate at the time. [Ref. Charles P. Bourne. "Research on Comptuer Augmented Information Management." Nov. 1963. Report Nos. ESD-TDR-64-177 and AD-432 098. Electronic Systems Div, AFSC.]

Weber: And this was an act of SAGE Computer or just the same model?

Bourne: No this was the SAGE System.

Weber: Right. But was this particular computer an operational SAGE Computer? Or was it-

Bourne: They were in development. So they were in early phases of a time-sharing system and in active development. So it was not being used to see who's coming at us now.

Weber: So it's still being tested.

Bourne: Yes.

Weber: And that's how you got some time.

Bourne: Yes.

Weber: Do you know if they used the SAGE Computers for other projects like that?

Bourne: I don't know of any other. I'm sure they did.

Weber: And the year was approximately?

Bourne: '63.

Weber: And so that, well, I think I'll just go on-

Bourne: Let me continue the story with Doug. We both continued with SRI for seven years after that. I had been involved in some professional Society activities during that time and the professional society that I spent the most time with was the American Documentation Institute. And we were one of the four AFIPS (American Federation of Information Processing Societies) professional societies that hosted the Spring Joint Computer Conference and the Fall Joint Computer Conference. And in 1967, I was the representative of my professional society (American Documentation Institute), working with three other people, one each for the other organizations (Association for Computer Machinery, the IEEE or IRE, and another organization) and who together had the responsibility for developing a portion of the technical program for the 1968 Western Joint Computer Conference in San Francisco.

So as part of that planning meeting, I said, "On behalf of my Professional Society, I think I can get Doug Englebardt to make a demonstration of his system, which a lot of people would find interesting and that would be our contribution to the Joint Computer Conference. " They said, "yes, fine, go ahead." So I talked to Doug. I had recently left SRI but I talked to him and I said, "Would you be interested in making this demonstration? It would be a good place to show." He said, "Sure. Sure. That sounds good. I'll commit to it." And so he did. And that's how he got to make the Mother of all Demos. I was the Session Chairman at that presentation and it was a pleasure to sit there and watch that happen. But that was my last activity with Doug. I just wanted to close that thread. **Weber:** But there were more than, what I was still not clear, he gave that demo, was it multiple sessions where he gave that demo?

Bourne: He gave it at other meetings and maybe multiple sessions.

Weber: But this was where, physically, though?

Bourne: San Francisco and I think it was in one of the major auditoriums, Civic Auditorium, I think it was.

Weber: Or Brooks Hall?

Bourne: Brooks Hall, yes.

Weber: And, okay, so that's skipping ahead to the end.

Bourne: Yes.

Weber: I mean I think we're roughly in the beginning of your involvement with searching on-line. On-line retrieval.

Bourne: Yes.

Weber: And in your book, you talk about a number of different systems. But I assume some of them either you didn't know, or you knew very little about at the time, right? There were several people doing different efforts. But how many were you aware of? Was it kind of a growing area of interest?

Bourne: Well I didn't really get into any commercial on-line search systems until about '76.

Weber: Oh, but I mean early on, when you were working say on the test with SAGE, that's one of the very first or the first.

Bourne: Yes.

Weber: But within a couple of years, there were other people experimenting with interactive search?

Bourne: Right.

Weber: But were you aware, you had kind of moved on at that point?

Bourne: No. I'd kept aware of all of them.

Weber: Okay. That's what I really want to know. Was it a group of people that were interacting about that?

Bourne: They were in touch for the most part. There were several who were much more active with publishing and giving demos, Western Reserve University for a while and MIT, these were all the research people with physical and financial support to do what they were doing, and also a number of

the Think Tanks, SDC, Rand, Mitre were all involved in doing demonstration work of one kind or another, yes.

Weber: And mostly for military?

Bourne: Yes. To a large extent, or in support of government activities, sure.

Weber: Because the budgets involved were so huge, I mean it was not, it was only that kind of budget that would make it practical.

Bourne: Yes. There were a few non-military funding sources like NSF or Council on Library Resources, they would fund activities like this, but funding was primarily federal.

Weber: And you, when you went off to the start-up about ’65 or so?

Bourne: No, early 1966.

Weber: Okay. We’ll talk a little bit about what you did between ’63 and moving forward.

Bourne: There were a number of studies of national systems that I worked on. For example, the National Academy of Sciences study of national issues associated with the Biomedical Research Community. What are the information needs of the Biomedical Researchers? And what kinds of things should they be receiving? I did the same kind of thing for the Atomic Energy Commission for a population of some of their special researchers, i.e., “What are their information needs?

I did some work on database building. One of my early examples would be for the Food and Drug Administration. They had a concern with those little pieces paper that go into those little boxes of retail medicines. They had a central file of one each of those package inserts in paper form, but no other source for copies around their Washington offices. They had a difficult time providing copies when asked for a copy, because they didn’t have copies of all of the ones that they should have. So I arranged to get a contract to build a central database of all of those product descriptions. I got copies of all of the individual sheets and then built a CDC-INFOL computer database of this material, and I believe a microfilm database of that collection for the FDA so that they could sprinkle reference copies around their Washington offices.

There was also a lot of talk in D.C. at that time, ”Why do we keep repeating the same kind of study in different places? This is so redundant! So wasteful! We ought to do something about it!“ So I got a contract to pull together and assemble a directory of all Federally-funded research during the most recent year that was related to the subject of Information Sciences. This was any research project on page reading, character recognition, artificial intelligence, automatic abstracting, whatever. We arranged for the feds to require every research-funding agency to provide a copy of their project descriptions if it had a relationship to Information Sciences. And we took that information, keyboarded it and provided a printed directory of that information and also a microfilm copy of the database itself. We did that. That was part of our database building activity.

There were a number of other projects that largely slip my mind. Some of them were catalog files. I worked for the Library of Congress in 1967 to do a Time and Cost study for them. “What are the costs for them to produce a library card, a Library of Congress Catalog Card in machine-readable form,

because they were planning to do that. The cards were always available in paper form, but they wanted to do a magnetic tape distribution service and so they started up that kind of a production process and they asked me to do a time and cost study of that operation. Then after a few years they did provide machine-readable copies of their catalog cards on demand to a lot of libraries around the country and around the world. My time and motion studies at Stanford were being put to good use.

Weber: Because they were distributing human readable or machine readable cards?

Bourne: Well they continued to distribute a large number of human-readable cards, but this was to be entirely a machine-readable card distribution service, so that you could receive the tapes on campus for all the newly-issued LC Cards and match those records up with all your new book acquisitions for your library and say we don't have to keep ordering cards anymore. We'll just copy out the LC Card Number printed in the front of each of our new books, because nearly every one of the new books that gets published now has their number pre-assigned by LC for the publisher and printed in the front of the book. So the Acquisitions Librarian could look there, pull the number, build a list of such numbers, and then periodically arrange to have the individual catalog records pulled off the tapes by the data processing staff, add their own local information (e.g., branch library, shelf location) and print the combined record information on your own card stock. It can be a great time saver for large libraries, if you have the volume and data processing capability to support it. And you can also use that computer tape as soon as it comes in, to run a Current Awareness program, which uses stored subject interest profiles of the faculty members which say for example, "I'm in biochemistry, and if you find any new books with these LC Subject Headings or title words when you do your scanning of the most recent LC tape, send me a copy of the records along with our library location and Call Number and I'll go have a look at it. And that's a useful service. So the system that LC had in mind, the production and distribution of machine-readable library card records was a very positive thing for the national library community.

Weber: So in the early '60's computer utilities were, you were saying, not yet commercial ventures?

Bourne: True.

Weber: So talk about what they were. What was going on?

Bourne: Everything was pretty much one-off. Individual organizations were either trying experiments to solve their own internal technical library problems, or they were working on developing some technology like a question and answering systems or different ways to structure files, different ways to use different equipment, some attempts at photodisc memories. Yes, it was pretty much lots of individual exploration.

Weber: But the idea later became Computer Utilities. I mean, you could rent time on someone else's machine for technical things but not for information services.

Bourne: Computer utilities would generally not store a database at their own option and expense. They wouldn't say, wow if we put an Engineering Index database on tape, maybe there is a big market for if and people will pay us to search it. That really didn't happen in any big way. It didn't take off. There were some search systems provided by the government, for example the National Library of Medicine

would make its files available, to a certain extent, but that really didn't take off until early 70's, late 60's, that kind of time.

Weber: And LEXIS when did that start?

Bourne: LEXIS came, I believe in the 70's. Yes. And then later on their newspaper service, NEXIS.

Weber: And there was a medical database fairly early on.

Bourne: That was a large database from the National Library of Medicine and it was called MEDLINE. It was called MEDLARS while it was a tape service and then MEDLINE when they made it available on-line. And they made it searching on line by using a couple of external hosts to begin with. But first, the library engaged SDC in 1969 to provide an experimental online retrieval system called AIM-TWX to enable the Library to test the feasibility and use of such a service.

Weber: And do you remember roughly the time period?

Bourne: NLM inaugurated the retrieval program, called ELHILL, as a service in June 1970. As many as 18 searchers could use the system simultaneously.

Weber: So certainly in the early 60's all of this was quite far away.

Bourne: It wasn't there. Yes.

Weber: And you also went to, didn't you get a Masters at Stanford in this period?

Bourne: I did. I got a Master's Degree in 1963 at Stanford in Industrial Engineering.

Weber: Why did you feel that, that was worth doing at that time?

Bourne: I just felt if I had a more formal background, I'd be more useful. This was in the Industrial Engineering Department. This was where people were being trained to design work, to design factories, design processes. I started using the computer as a mechanism to improve operations or organizations. So this was a time of engineering economics, optimization, and solving what turned out to be classic repeating problems such as the Traveling Salesman problem and how to make sausages from many different components at different prices, just optimization activities. The kinds of thinking that went on to be used for real problems, like Airline Crew and Staff scheduling. How do you schedule all the people on the ground and in the air to run an airline in an efficient way? That all became part of what you learned then in Industrial Engineering.

Weber: So you saw it as an extension of Information Retrieval?

Bourne: Yes, because of the ways it could be used. This Masters degree was a perk provided by SRI. They would pay for your part-time schooling at Stanford to do this, and so I did this over a couple year period, just taking courses in the afternoon at Stanford and it all added up for a degree in 1963. There was one other 1963 project that I think was kind of interesting, and that was a part of my professional

society activity in which we were planning and working on our annual meeting of the American Documentation Institute (ADI). There was always the question of, why can't we get our Annual Conference Pre-Prints out in time for the conference? Get them out ahead of the conference instead of afterwards or not at all. And so we said, Let's do it this year. Let's make a point to do it. And we happened to have as the President-Elect and a member of the Publications Committee, a fellow by the name of Pete Luhn from IBM to take the lead on this. Pete was a very prolific inventor, the guy who probably had the most patents of anybody at IBM, and he set about planning how to do this. He arranged to save all the Monotype typesetting tapes used to set the papers for the conference, and then put that data on paper tape and run it through a photo-composer; and thus we did the first set of technical articles ever composed by computer, and maybe for other publications as well. He arranged, with great difficulty, for the conversion of the approximately 30-channel Monotype typesetting tapes to the essentially 6-channel tapes readable by the IBM-704. That was an early thing that I took some pleasure in working on. Okay, I interrupted you.

Weber: No. No. Just your Masters and then is there anything between that and the work you did for the CIA?

Bourne: The CIA work went from '63 or '64 to '67; I worked on a personal contract basis for them and actually spent one summer at Headquarters working on some of their projects. That was very interesting. It was during the time of the Cold War and some of our specific actions in Cuba. The Agency was in the process of redeveloping and expanding their whole central information system and so I worked, for example, on a review and study of their Document Delivery System. This was an operational central information facility or central library with millions of records, hundreds of thousands of output records going to analysts every year, and a very large input stream. So what can I recommend for a good upgrade of their Document Delivery System? What's available in microform or other mechanisms to provide a faster, cheaper, more responsive Document Delivery System with turnaround times for information requests with very, very high speeds, and things of that nature? It was an effort to look at a possible new indexing system was going to be used for their collections. And along with a new indexing system what do you use for an input transcription system? If you are going to take a large number of input records, how do you get those into your computer file? And so I did associated time and cost studies of paper tape, computer terminal input, and page reading equipment as competing systems to get all this data into the file systems.

Weber: And page reading equipment is for automatically reading?

Bourne: Yes. It would be used with input data sheets, pre-coded, for data fields in which an indexer looking at a document, usually a paper document, would say, well here's author, date, and source, and here's the content and it's about these kinds of things and whatever, that would be put on a pre-formatted input sheet, and the input sheet would be read by a page reader. At this time there were no page readers on the market except one.

Weber: Optical character recognition.

Bourne: Optical character recognition. And this I think was Kurzweil, I'm not sure, but none had been delivered yet anywhere. There were a couple of other suppliers that were getting ready to do this, but

the study indicated that the page reader was the way to go and so the Agency got one of the first ones and began using it and that was a success story for them as an early user, which was a pattern in behavior for them.

There was also a study of, if we're going to have these large machine files, what's the best mechanism for look-ups for reference query, or information look-ups. And, so it was again cards, paper tape, other printed forms, or online to the computer from terminals inside the computer facility, or CRT displays and keyboard for queries; and that was a very early use of online to computers for reference look-ups of one kind or another. That was another one of the studies.

Weber: But this was studying, real experiments using those?

Bourne: Yes they had to use some test subjects and computer terminals at SRI, to really turn out some sample speeds of how fast you could do this with on-line terminals.

Weber: And what system was being used for testing?

Bourne: Just a very simple table look-up and database query system, and several different keyboard operators.

Weber: But did you create the data for that or you were using something existing?

Bourne: No. We used an overseas gazetteer, an existing gazetteer in machine-readable form, to look up place names and write them on a form. And that's how that part was done. And that turned out to be the fastest way to go. And that was another early implementation of technology.

Weber: That's the one where you said it was two and a half times faster.

Bourne: Something like that, yes. Another major study was where the Agency had a very extensive translation workload, they were translating a lot of Soviet and other foreign language material. They needed to find a way to do that faster, and cheaper. And they had looked at machine translation as a possibility. And that looked intriguing to them and they were going to try a sample implementation in their own facility. So they had arranged to accept an offer by IBM to put in an IBM machine translation system. This was a fairly large computer system and a large photodisc storage system, and input-output equipment to take paper tape and stenotype tapes, and process these, and provide a rough, pre-edited translation into English. I was tasked to evaluate the system: should the agency acquire it or not? I was given this task before they got the equipment. And so there was an effort to do a time and cost study of their current translation mechanisms with in-house translators, with contract translators, and to measure such things as the manual time involved and the elapsed time involved, to get the translation done, and to set up the mechanism to continue to collect that kind of information, along with information about the contractors on the outside who did some of this translation work. And then compare that with the operation of the IBM system, as it went into operation and was used over six months or a year time, something like that. That was a significant effort because it was probably the first time that anybody had done a meaningful examination of machine translation in a production environment. The Air Force was doing it for some of their Soviet-bloc technical publications, and they

provided a fairly crude output, but they did publish it and make it available. And this project went on for some time. So those were some of the things that I remember from working with the Agency.

Weber: And how practical was machine translation at that point?

Bourne: It wasn't as good as their current schemes.

Weber: Sure, but I mean, but was it, it was worth continuing with?

Bourne: No it wasn't.

Weber: Right.

Bourne: So they sent it back to IBM very quickly. Oh those were interesting, very interesting times. I felt proud and glad to be of assistance in those settings.

Weber: And you spent time at the headquarters?

Bourne: Yes, I spent a summer there.

Weber: And what was that like?

Bourne: It was good, it was interesting. Very dedicated people, very good to work with. Yes.

Weber: And they were processing huge amounts of information.

Bourne: Oh yes.

Weber: More than on. How would that compare with big commercial or other government operations? Bigger?

Bourne: It doesn't really compare. One other project I worked on there was their mechanism to collect a lot of data in Europe on a current basis. They would, for example, monitor the Moscow press on a daily basis and send forward transcripts of what was said, and that would be processed and reprinted in the States as an open-source publication, the Foreign Broadcast Information Service, and copies provided to all the major libraries and other government agencies. So the Agency had a lot of Teletype tape coming in from overseas with all this data on it from many different places. The project that I worked on was to do some initial work on computer processing this teletype tape to make it more meaningful for computer input and computer processing. These were really long data streams with all kinds of data identification and separation codes and common household traffic between Teletype operators and Headquarters. We did some pre-processing to remove non-relevant material and replace the data codes with tape formatting or text.

Weber: So it would read the teletype tape, and then the program would do all those transliterations.

Bourne: Yes. Clean up, take out the non-relevant stuff and.

Weber: And then output it to a printer?

Bourne: Well at least the computer tape, yes.

Weber: Right. But ready to be printed.

Bourne: Ready for some further processing. We just brought it to a point to show feasibility, and that's where we left it. Okay I think that probably does it for the agency work.

Weber: And then is when you went to the startup, right afterward right?

Bourne: I started the Agency work at SRI and continued it at the startup that I went to, and then I continued it on my own after the startup folded in early 1970.

Weber: Right. And the Library of Congress, ERIC was the?

Bourne: No, ERIC is the U.S. Office of Education product.

Weber: Oh okay.

Bourne: USDE produces the ERIC database.

Weber: But when did you do consulting?

Bourne: I started consulting with the ERIC database when I was on the faculty at Berkeley.

Weber: Oh that's much later, sorry. Sorry, now I'm mixing up. MARC was the Library of Congress right?

Bourne: Yes.

Weber: Which is my own name I should remember it.

Bourne: MAchine-Readable Cataloguing.

Weber: But that's one of the first things you did with the startup though.

Bourne: Yes.

Weber: So is that a good thing to talk about a little bit?

Bourne: It was pioneering at that time because not many people in the library field were using machine-readable data, and this was something to get them started. Some of them had their own versions and formats for catalog records. This [MARC] was also the development of the national standard for a machine-readable catalogue record, and that was important to a lot of people.

Weber: I know that punch cards got big in business use obviously 100 years ago, but didn't companies do any, like for their internal documents or libraries, didn't they do some machine-readable version of cataloguing?

Bourne: Some did but very few. First of all, the people in the libraries didn't generally have the knowhow or background to either write the programs or to go to their computer center and say I'd like to have…

Weber: But I mean pre-computer, back when businesses were using punch cards for a lot of other business kind of information, I mean they would be, some of them tracking contacts and things like that right?

Bourne: Still pretty limited, and still pretty much beyond the scope of typical libraries.

Weber: Okay. So the library within the company would not be connected to that part of it?

Bourne: No.

Weber: So this was really pioneering with MARC.

Bourne: Sure. Sure. And some of my work for LC involved going around to a number of the libraries throughout the country who were in that pioneering loop and were getting test tapes from LC, and I was to find out how they were using them and what changes to make, things of that nature. So as my career went on and on, I got more and more involved into the formal library world as well.

Weber: Right. What led you to move to a startup first of all?

Bourne: What every red-blooded American kid wants to do, have his own company or be part of a company, and because the head person who was putting this together was a guy that I'd worked with for years at SRI. And I knew him to be very competent and very energetic and thought he would make it a go. But it ran into some difficulties finding projects in the Los Angeles area where he was working.

Weber: Oh right, because you were the representative here.

Bourne: Yes, I was the head of the office working out of Palo Alto and it was a different lifestyle. At SRI, when an engineer or a chemist or whoever it was, did a project and wrote a project report, it was always the project leader [and sometimes other project workers] who wrote the report. So everybody had to write the reports. But they were always reviewed by an editor, somebody who was a professional technical editor. That was extremely helpful in the sense of providing me with ten years of tutoring and looking over my shoulder and saying that, "oh you shouldn't have done this here, it's better that this remark go back closer to the front, and this is not the way to really put this table together, this looks better this way," and whatever. So there was a lot of tutoring and learning how to do good technical writing. It was also a great tutoring activity for learning how to do proposals and make presentations, and do things like that. So SRI was a very great learning experience.

Weber: And so this played into the consulting you were doing with the startup you were with?

Bourne: Yes. It helped a great deal.

Weber: And then you went off on your own as a consultant.

Bourne: Yes, I left the startup after four years & then I ran my own individual consulting service for a couple of years. Then I had an offer from Cal Berkeley, to go to work for them. That was very attractive, very appealing, and so I did that for the next six years. And then I went to Dialog for another 15 years and that's where I finished my professional career. That was early '90s. I'm surprised I remember so much of this.

Weber: You have a good memory. But you said something in your interview with Michael Buckland about Xeroxing a fried egg, could you just explain? The process of xerography on a fried egg.

Bourne: On a Friday?

Weber: A fried egg.

Bourne: Oh a fried egg, yes that was an example of the far-out work that SRI did. They did early work in xerography, and as an example they showed how they could simply lay down an image, like a Xerox copier, on a freshly fried egg. Or an apple. They are some of the things you see in practice today, where it doesn't have to be a piece of paper or on a smooth surface. There were a lot of interesting things done at SRI. Early development of shaped charges for the military. A lot of work went on there. SRI was the one who chose the location for Disneyland in Pasadena.

Weber: Anaheim.

Bourne: Anaheim, yes. A lot of interesting projects at SRI. I remember one other project, if I can go back to an early DOD project during the Cold War. This is the time that people were planning air raid shelters, and possible nuclear exchanges with the Soviet Union. And one of the projects that we had, that I participated in, was a national for damage assessment program in the government – a mechanism to know how badly we're hurt if there's a nuclear event. To do that, we really needed to make and maintain an inventory before any such event, so that we can know the location of all the airfields, shipyards, ports, hospitals, military bases, etc., so that if we will have a nuclear event, we'll know what assets are being impacted. And to do this you need to have a national network of nuclear event detectors. So that when an event goes off and you very quickly get an indication of a blast in location and yield and you transmit that information automatically, to a central location. Or if your continuing signal disappears, you should take it as an indication of a blast. And at the central system you correlate that location of that blast with the assets that you have in that area, and you mark them off your inventory of what you've got. And if you do this for all your reporting stations, you get a summary statement quickly, very quickly, of what kinds of assets you have left, and are you in a position to continue? Not only does the central location have real time information about the blast, but you also have real time weather information from each of these locations, so then you can also compute blast and radiation fallout patterns, and again, project how far the damage ring has gone, and add that to

your inventory calculation as well. That was an example of the kinds of processing and the kinds of projects that people just hadn't done up till that time. It takes big computer power, big files, and file processing capability and telecommunications networks to do stuff like that. But that was going on at SRI in late 60s, that kind of time. I just remembered and just wanted to throw that in as an example of another very interesting SRI project.

Weber: Oh yes, they're huge. Huge range too. And you did work on ERIC around that time right?

Bourne: ERIC is the name of a database of education-related publications produced by the U.S. Office of Education, and it was made available for computer searching by them. Early in that process, in 1970, they arranged a service and support contract with Lockheed Missiles and Space Co. which had developed an online file searching system, which they called DIALOG, to mount that file on DIALOG so it would be available for searching online remotely, by people in O.E's Washington, D.C. office or in other offices around the country. So the ERIC database was one of the first files that DIALOG made available on its proprietary search system.

They did the same thing earlier in 1968 with a $180,000 development and service contract to provide online search service for NASA and its database of journal and report abstracts. That information was to be made available to NASA audiences and for other interested parties around the country. Lots of sci-tech organizations were interested in that information. DIALOG first made it available in 1966 for just a couple of hours per day, and then later, DIALOG convinced NASA that they ought to be allowed to make it available to people outside of the original audience that NASA had in mind, and that Lockheed ought to be allowed to charge a modest fee to those outsiders for the use of it. And that was the beginning of the DIALOG online public use utility service file searching and business model.

After that start of the DIALOG online service, they then looked for other databases to make available; that included Engineering Index, Physics Abstracts, some biomedical files and a scattering of other smaller files. That was happening in the early 1970s. I was at Cal Berkeley at that time, working as the Director of the Institute of Library Research, a university-wide research facility. I had offices on three campuses, and was reporting to the University President's Office. I also had a post in the Berkeley School of Librarianship as a faculty Professor-in-Residence and taught the School's library automation classes. I did all that for six years. But the university was running through some budget problems, and gave notice that they were not going to continue with this Institute, and so I started looking for another job.

Lockheed and DIALOG was close to home, a quick and easy commute, and I was familiar with their activities. I had done some work on a project basis for them while I was at the Institute. With OE support, we had done a critique of the DIALOG search system. We had also worked to develop methods of instruction in online searching. We developed an online laboratory at Berkeley to teach library school students how to do online searching. This was the first time this had ever been done anywhere. And we helped set up a similar lab at Syracuse University's Library School because of some friendships and similar interests there. We also developed, and wrote a lab manual, a laboratory course manual, with exercises and instructional material, for the students to use to learn how to do the searching. That manual was adopted by DIALOG and used by DIALOG for a number of years afterwards. That was a kind of a novelty and a bit of an innovation.

Weber: When that course was developed, I mean how many online services were there to search at that point?

Bourne: There was Dialog as probably the major one. There was System Development Corporation(SDC) in Santa Monica with their ORBIT search service. Just to be fair or nonbiased, we also wrote a lab manual for them and their system. But they said no thanks. They chose not to use it. And it was about that time that I continued my discussions with the Head of Dialog. He made an offer for me to come work for Dialog and I said yes, I would do that, because they were close by, in the Stanford Industrial Park on Hanover Road. And there I worked on Dialog issues, largely promoting and working to license databases to put on Dialog. At that time Dialog maybe had, I think it was less than thirty databases, and we continued to grow and add databases in different subjects, different fields, and had several hundred available online by the time I left in early 90s, yes.

Weber: I mean it started more scientific-technical, but how broad did it become?

Bourne: It was initially sci-tech, and there were three of us who were the product managers for the next 15 years. I had almost all the sci-tech files and the newspapers and humanities. One other fellow had the chemistry side and another person had the business databases. So that's how things were split and managed, it grew to become a couple of hundred databases.

Weber: Early on who would a typical user of Dialog be?

Bourne: A major corporation would be a typical customer. It would be a Bell Labs, a large chemical firm (most of the large chemical firms were clients), any of the major engineering firms (e.g.General Motors and any others that you'd likely name), and federal agencies as well.

Weber: And was there a dedicated terminal or they could use any terminal?

Bourne: It started with terminals that used a dial-up modem to put a telephone handset into in order to connect to a conventional local dialup line to a data communications service telephone line.

Weber: Oh it would not work with a modem.

Bourne: Yes it would work with a modem, but usually via a telephone handset cradle, not by the direct cabling we use these days. Or you could take a conventional telephone handset and stick it into a modulator, demodulator modem. Or it could be a very specific modem device plugged into it, with its own screen or whatever, meant to be used as a terminal device.

Weber: But there was no Dialog terminal that you sold or anything.

Bourne: No.

Weber: No, like Nexus which did its own, yes.

Bourne: No, Dialog didn't do that. The communication speeds at that time were 15 to 30 characters per second. They were slow. so searching was done in a way that optimized the use of your connect time, because you were being charged on a connect time and output record basis.

Weber: And what were typical charges?

Bourne: In 1977, Chemical Asbtracts (2.5 million records) was $35 per connect hour and 8 cents per full record printed offline. Engineering Index (565,000 records) was $65/hour & ten cents per full record. The charge would generally depend on the file and the royalty fee, if any, that the database supplier charged.

Weber: I mean it could be quite different depending on which database you were searching.

Bourne: Yes. Some of them in the pharmaceutical or finance industry could be 100 dollars an hour. Or in some of the patent files, they were very expensive. Professional society files were generally lower cost and government files might be provided at low or no royalty fee.

Weber: So then Dialog would still charge ten or 20 just for the access right?

Bourne: Yes, some base to recover our costs. We had variable computer costs associated with the size and frequency of updates of the database. Or, if somebody insisted on a high royalty, we would charge a high royalty, or a high price, because we wanted to split that royalty or make sure that we're not just acting as the platform for them to make all the money they wanted. They'd have to share the pain of any decreasing usage if they increased the price of the file or the royalty and so on. So there were a lot of issues involved in how do you set the price for the file. And many of the suppliers would change the royalty every year, they wouldn't provide a long-term contract, they would just say well, "we'll see how it goes," and then they would just announce they wanted a particular royalty. And we'd negotiate or not, depending on how badly we needed the file to satisfy a particular population that we were serving. So it got to be fairly contentious after a while.

Weber: But that was a lot of your job – renegotiating these deals.

Bourne: Yes, sometimes the initial licenses & renewals every year, and we had annual meetings in London every year, to meet with our overseas suppliers who came to the annual International Online Conference, at that time.

Weber: Sponsored by Dialog?

Bourne: Yes. And at that time we'd often have separate meetings with ten or 20 suppliers to negotiate while we were there. And all this time also there were other commercial online services coming on stream, and provided competition for us by putting up files on their system that we had on ours, and undercutting us on price and, or providing competing features or whatever.

Weber: You know I was going to ask, with these databases were you usually trying to get exclusive distribution rights?

Bourne: Absolutely.

Weber: But what percentage would you have that let's say?

Bourne: Well, as a commercial venture, we were always trying to maintain a reasonable profit while experiencing a moderate growth rate of the venture.

Weber: If you had ten databases, would most of those be that you were the exclusive distributor for?

Bourne: We were initially, but then as the other commercial services came online and provided some competition for files that we had, they would accept a lower royalty, or do some extra advertising or something to make their service more appealing, to make it interesting for the database supplier to go onto their service as well as ours. Yes we first ran into that with a startup service called BRS, in which they undercut our pricing very significantly, because they were just a startup and they were using leased time on some other commercial company's computer center, and doing everything on the cheap, and became very successful because they took over the current operations of a university system that was offering a search service but decided to get out of it, because they weren't making any money or breaking even or whatever. So this new service came on and was a very effective competitor in the beginning with the inherited customer base and low cost structure. It was bought up by another commercial firm and continued to be successful.

Weber: Was this all coming from one central computer or was there a network? As time went on Dialog had its own network right?

Bourne: Dialog servicealways came from one central computerfaculty that grew and grew. It started in Palo Alto in the Lockheed Missile and Space Company lab offices on Hanover Street, until eventually they moved over into the Stanford Industrial Park at a different location. They had their own big computer center and some separation from the Lockheed overhead and management constraints. They started out fairly small with computers, and every Christmastime, every end-of-year time, they would upgrade the computers, and add another 20 or 30 disc drives, and it just got bigger and bigger, and the computer system got bigger and bigger, and it grew and grew.

Weber: How many users at the peak roughly?

Bourne: Oh, I'm guessing ten or 20,000, something like that. About the time that I left. And that's up from maybe 100 when I started there.

Weber: 100 users?

Bourne: In the early stages yes, just with those first thirty files.

Weber: How much would an average user spend, or what sort of revenue was this total?

Bourne: I don't know what a typical user would spend. It would depend on the subject field. I do know that they once offered a $15/hour discount for a guaranteed $3,200/month minimum billing. I think they were lucky to get a million dollars in gross revenue in the first few years that they were operating. But they had the comfort of being part of a larger organization that could take that. It was always an effort to do things on the cheap, it was quickly and easily and everybody had a lot of work to do.

Weber: I did skip a little bit over Berkeley. Tell me about the online catalogue, and that was for the UC library system right?

Bourne: There wasn't an online catalog while I was there.

Weber: But that was being developed right?

Bourne: It was being developed slowly, but there was, in order to get expanded remote access to the Berkeley and other campus library holdings, a printed catalogue was produced.

Weber: But it was a computerized production of the printed catalogue.

Bourne: Yes, it was the world's largest book form catalog. Copies of all the catalog cards for a recent five-year period (1963-67) coming into or created by the Berkeley and the other eight campus library systems, representing 798,000 different titles in Roman alphabet text, were converted into a computer tape form by typing the individual cards onto paper forms and using optical page readers to convert them to magnetic tape. The tape records were subjected to some programmed quality control checks, sorted into appropriate Author, Title, and Subject Heading sections, and then run through the photo-composition, printing, and binding processes. The data was printed in book form and made up in sets of 47 volumes. These sets were made available to each of the campuses, the State Library, and maybe a few other places. It was a large data conversion effort; they hoped to do more of that, but didn't' have the funding for it at the time that I left.

Weber: But maybe I'm not understanding the basic goal, I mean why take card catalogues records and turn them into a book, why not leave them as cards?

Bourne: The thought was that it would provide broader access, there would be a lot of people buying this set of catalogues. And the 47 print volumes would be easier for other libraries to house than the equivalent collection of catalog cards represented by their equivalents.

Weber: Different than a huge cabinet full of cards.

Bourne: Over 1.1 million catalog cards were collected and processed.**Weber:** Impractical to duplicate.

Bourne: Yes.

Weber: Okay, so distribution was the main reason.

Bourne: Yes.

Weber: So putting the catalogue online happened after you had gone to Dialog.

Bourne: Yes. Right. It required a very large investment that UC management wasn't willing to make at that time.

Weber: Talk a little bit about the emergence, if you can, of just computer utilities and other online services that people could buy time on. I mean there's both information search and beyond, what were

the other things that people would be paying for to do over a terminal? I mean they could rent computer time, they could run their own, I mean did Dialog see itself as part of that same larger industry or not?

Bourne: No they didn't. They just had enough to do to continue to keep up and grow in the way that they had been. The Lockheed Research Lab in the beginning that sponsored the Dialog program also had another online service, provided on a commercial basis, and that was flight planning or scheduling for airlines, or private pilots, that would provide the information on-line to let you make a flight plan and give you the route that you wanted from here to Cancun, or whatever you had in mind for your private flights for a given aircraft type and load. It would give you the fastest flight or the cheapest flight, or the most gas-efficient flight. That was a commercial online service where you, from whatever location, could key in and say I want to go from here to here at this time and these constraints and I have this kind of plane and let's see what you can provide in the way of a flight plan. And that was a very successful online service or activity for them. I don't know how that grew or whatever happened to it but it was something they were interested in.

Weber: And CompuServe, I mean I know there's the consumer information services later, but starting in '69 I think CompuServe sold some sort of services, timesharing services, but were they in the information business at that point or not?

Bourne: I'm not sure what they had for a database, what they used. One of the earliest of the sort of online search service was a service in France that was called S'il Vous Plaît(SVP) and it was a telephone service, you'd call in from a bar and ask who was the soccer champion in 1921, and they would give you answers to the questions fairly quickly. And that went on for years and I don't know how it ended up, but that was sort of the basis for some of the early Google type services that you have now.

Weber: Do you know when that was, S'il Vous Plaît?

Bourne: That was, I think in the 50s, way back.

Weber: So they were obviously not computerized at the other end.

Bourne: No, I can imagine they would have just banks of directories and annual yearbooks and things like that. They charged a fee.

Weber: Sabre was obviously one outgrowth partly of SAGE as I understand it, the Sabre Reservation System.

Bourne: That's possible, I don't know if that's true or not.

Weber: What I was wondering was that seen as a model at all for kind of distributed…

Bourne: I don't think so.

Weber: …information, I mean it was not.

Bourne: No. We in Dialog had an audience. Initially it was professional librarians, they were the ones who knew and used and appreciated what we provided. We later expanded to the end-user type audience, and even provided some of our databases on CD-ROM for people to search on their own machines. We pretty much stayed in our own little playpen.

Weber: And the business model was that of a subscriber, there was no minimum number of hours they had to buy.

Bourne: Correct.

Weber: So they just used it as much or as little as they wanted.

Bourne: Right. They just drank from the well, as much or as little of whatever product they desired.

Weber: And they were billed monthly or?

Bourne: Yes.

Weber: And you said there was a charge for time plus the quantity of information.

Bourne: Connect time on a file-by-file pricing, plus a file-specific output charge (for prints and types) plus a Tymnet or Telenet per-hour connect time communications charge.

Weber: Okay.

Bourne: Users were billed for output records either typed online or printed offline and mailed to them, and different prices for different kinds of output records, or parts of records. If you wanted just a publication title, it's a minimum charge, if you wanted a whole citation and abstract as an output record it would have a higher cost.

Weber: How much roughly?

Bourne: Oh, maybe a penny for some, or ten cents. It got to be much more expensive for some of the proprietary files like patent documents, or the latest article about a biochemical product that just came to market. Data about new products, things that a company's marketing department or trademark department had patent protection on, that kind of information was very valuable to clients and so, it would have a higher royalty and price associated with it.

Weber: So the total cost of a search might be mostly, it varied wildly, some you might pay mostly for the time, some you would pay mostly for the results.

Bourne: Yes.

Weber: And did you have a way to, it would present you with results and you could at that point choose which ones you wanted to actually get delivered right?

Bourne: Yes. Right, you could do that. And pricing was new to a lot of the searchers who were searching online for the first time, and there were some nuances that they didn't really appreciate. If you didn't terminate your search, the clock would keep ticking, and your charges would continue to come up, and so there would be calls to DIALOG customer service from time to time from clients saying, "my boss is going to kill me, I got this bill for 600 dollars, and all I did was a simple search. I didn't know you had to turn off the, terminate your search, I thought you just turned off the terminal and that would do it. But no." And so there'd be an appeal process and some people would have to pay and some wouldn't, it was a new shopping process for a lot of people.

Weber: Wow. But it was obviously corporate, I mean private individuals were not generally doing this.

Bourne: That's right. The searchers were usually corporate or government clients.

Weber: Yes.

Bourne: It was usually in a corporate setting.

Weber: And you mention the conference in London, I mean what percentage was national versus international for the clients?

Bourne: I'd be guessing 80 percent of DIALOG billing was U.S. national clients. We provided training in the field for all our new customers. We didn't have that much training overseas but we did have overseas offices and people who did training there, but the training volume was much greater in the States, and so I'm guessing the usage was proportional to that.

Weber: And were there overseas competitors? I mean most of your competitors were in the States right?

Bourne: Yes, sure. There were overseas competitors.

Weber: What were the main ones if you remember?

Bourne: The British Library had their own BLAISE system. The BRS system was overseas with an organization called DataStar. SDC was overseas.

Weber: Was there anything you wanted to add or that we didn't talk about?

Bourne: No I think we pretty much covered this activity. If I think of anything I'll call you.

Weber: Okay. Is there anything web search providers have not learned from earlier systems that they should?

Bourne: I don't know. Google certainly provides a masterful, very quick, very responsive service. I think it would be very hard for somebody to get into the business and get in the competition with them these days.

Weber: Yes, oh no doubt, but were there features or ways of doing searches early on that maybe were better and have been lost or anything like that? Or has it basically gone in the direction you thought it should?

Bourne: You know I think it would be hard to beat what they're doing except maybe there are people who want all of the results of the search, and not just the first 20 or 30. Google may try to whittle your search results down to just a very small handful, but you only need a few answers if you're asking for restaurants in Menlo Park. But it's not what some of the major search services do. If you are saying I want a patent search on rubber ducks or something, you want a total search, you want all 3,000 that satisfy what you're up to.

Weber: Also some of the earlier systems were based, you had more categorization of the material than you do today right?

Bourne: Yes, especially if you can't do text searching on words in the title, text, or whatever.

There was one area of personal activity I forgot to mention, and that is while I was at Cal as a faculty person, I did a lot of work for NGOs. During summer times and other vacations, I would go overseas and work, on a consulting basis, as an instructor in Tanzania, Egypt, Morocco, a number of overseas tasks on behalf of the National Science Foundation, the National Academy of Sciences and others. That was just more of my expanding interests and activities; that was fun to do.

Weber: And had most of those places that you went, were they computerizing significantly, when were you there?

Bourne: They were starting at the time that I was working at Cal. The earliest was Egypt.

Weber: Oh yes you described how you did a search remotely.

Bourne: Yes. That was interesting; and it was for the National Science Foundation. It was right after one of the wars in the Middle East, and NSF was doing a kind of show and tell, "Here are some of the kinds of technology transfer that we can provide to help you out after your recent activity." And so a number of organizations were invited over by NSF to give presentations on things that they could do that might be helpful, and I talked to their organizations about online searching and SDI (Selective Dissemination of Information) systems. And people at their major newspaper in Cairo asked, "Can you demonstrate this online searching?" And I said, "I think I can do it if you provide somebody who was part of the newspaper staff that we were working with to handle the communications end of it." They said they would. They were working with 15 characters per second Teletype equipment, and we were going to do a search from Cairo to Palo Alto, California. It was very difficult to do this because at that time, there was only one Teletype line out of Cairo. To get that very busy line, you had to "sit" on your keyboard and keep trying to start a message as soon as somebody signed out. It took a couple of days before we got the line. We did a search on marketing or some economic issue for their region that was interest to them. We got the demo done, and made front page news in their paper, so that was kind of interesting. This was the first remote online database search done in the Middle East, and maybe all of Africa.

Weber: Do you remember anything more about what the search was on?

Bourne: It was something about market growth or how much the gross domestic product was of the neighboring countries, something like that. Yes, it was interesting.

Weber: And that'll be the early 70s then.

Bourne: Yes.

Weber: Yes. Great. Well thank you, I really appreciate it.

Bourne: My pleasure, I'm more than happy to do it, it was kind of fun to go down memory lane and think of all those things again. So, if there's anything else I can do, give me a holler.

Weber: Believe me I will.

Bourne: Okay.

Weber: Great interview, thank you.

Bourne: Okay.

END OF INTERVIEW

