CHEMICAL HERITAGE FOUNDATION

CARLOS A. CUADRA

Transcript of an Interview
Conducted by

Colin B. Burke

at

Los Angeles, California

on

21 May 2001

(With Subsequent Corrections and Additions)

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Oral History Program
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CARLOS A. CUADRA

1925 Born in San Francisco, California on 21 December

Education

1949 B.A., psychology, University of California, Berkeley
1953 Ph.D., psychology, University of California, Berkeley

Professional Experience

Veterans Administration Hospital
1953-1956 Staff Psychologist

System Development Corporation
1957 Training Specialist
1957-1959 Head, Personnel Planning and Training Group, Air Force Project 466L
1960-1962 Head, Project Team, Intelligence Systems
1963-1964 Staff Member, Special Projects Department
1965-1966 Technical Assistant to the Head of Special Development Division
1966-1967 Head, Information Systems Technical Staff
1968-1970 Manager, Library and Documentation Systems Department
1971-1974 Manager, Education and Library Systems Department
1974-1978 Manager, SDC Search Service

The Annual Review of Information Science and Technology
1964-1975 Editor

National Academy of Sciences Committee on Scientific and Technical Communication
1968 Consultant

National Commission on Libraries and Information Science
1971-1984 Member

Cuadra Associates, Inc.
1978-present Co-Founder and President

University of California, Los Angeles
1979-1980 Adjunct Professor, Graduate School of Library and Information Sciences

American Chemical Society
1991-1997 Member of Governing Board, Chemical Abstracts Service

1997-2000 Member of Governing Board for Publishing

Honors

1948 Phi Beta Kappa, University of California, Berkeley
1949 Highest Honors, University of California, Berkeley
1968 Merit Award, American Society for Information Science and Technology
1969 Best Information Science Book Award, American Society for Information Science and Technology
1970 Distinguished Lecturer, American Society for Information Science and Technology
1975 Information Product of the Year, Information Industry Association
1980 Hall of Fame Award, Information Industry Association
1980 Miles Conrad Memorial Lecture Award, The National Federation of Abstracting and Information Services
1987 Pioneer of Information Science, American Society for Information Science
1997 Honorary Fellow, The National Federation of Abstracting and Information Services
2001 Roger Summit Award, Association of Independent Information Professionals

ABSTRACT

Carlos A. Cuadra, a pioneer in the field of information sciences, begins the interview by discussing his family and educational background. He describes how he continued his education while serving in the Navy during World War II. He did his undergraduate and graduate work in psychology at the University of California, Berkeley and wrote his dissertation on the Minnesota Multiphasic Personality Inventory. Upon graduation, Cuadra worked at the Veterans Administration Hospital in Downey, Illinois. While still in Downey, he was recruited by the RAND Corporation to work on projects related to the United States Air Force.

He began work for RAND in the System Development Division, which split off and became System Development Corporation [SDC]. Dr. Cuadra began to learn about computers and programming while he was working on intelligence project 466L for the Air Force. He was made head of the Intelligence Systems Branch of SDC and worked on various information systems such as MEDLARS II, MEDLINE, ORBIT, and ELHILL. He became interested in the developing field of information science.

After meeting some of the pioneers of information science, he was surprised to learn that an annual review did not exist for that field. With the support of Hans Peter Luhn, IBM; Helen L. Brownson, National Science Foundation; and the American Documentation Institute, he started the *Annual Review of Information Science and Technology*. Cuadra briefly worked as a consultant for the National Academy of Science's Committee on Scientific and Technical Information [COSATI], and was later appointed to the National Commission on Libraries and Information Science [NCLIS], on which he served for thirteen years. By the time he became a member of NCLIS, he was the manager of the Education and Library Systems Department at SDC. During this time, Cuadra began to see a possible market for online information services. Within SDC, Cuadra created SDC Search Service, one of the first online retrieval services. In 1978 he founded his own company, Cuadra Associates [CA]. CA was quite ahead of its time in that it foresaw the need for powerful information retrieval systems for in-house use. CA developed STAR®, which was one of the first such systems. CA also published a directory of databases called the *Directory of Online Databases*. Cuadra concludes the interview with some thoughts about his work habits.

INTERVIEWER

Colin B. Burke had recently retired from the history department at the University of Maryland at Baltimore County and held a research fellowship at Yale University when he came to CHF. He spent his residency working on his book on the history of computer-based scientific information systems and related government policies, from the 1950s through the early 1990s. He received his Ph.D. from Washington University in St. Louis and currently serves as Associate Professor Emeritus at the University of Maryland. He

also served as a Fulbright Scholar in Poland and as a Scholar-in-Residence at the National Security Agency.

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INTERVIEWER: Colin B. Burke

LOCATION: Los Angeles, California

DATE: 21 May 2001

BURKE: This interview is with Dr. Carlos Cuadra in his office in Los Angeles. You were born and raised in San Francisco. Would you discuss your family background and education in those years?

CUADRA: My father came from Nicaragua. My mother was born in the United States, but her mother was born in Mexico City, Mexico. I was raised in San Francisco, went to a parochial and a public school, and went to Lowell High School in San Francisco. I went there for about two years and then attended Commerce High School for part of a year. Then I left home at about the age of fifteen and didn't return to the area until about 1943. Then I was inducted into the [United States] Navy.

I spent two years in the Navy from 1944 to 1946. I was trained as a radioman but spent most of my time on an island in the Pacific called Manus Island, in the Admiralties [Islands] chain. My main job, aside from occasionally copying Japanese Morse Code, was to run an off-duty school called the College of the Admiralties. Its purpose was to provide education for all the sailors on the island.

My job was to identify possible courses, schedule classes, assign students to classes and round up instructors; there were a lot of college professors and others who were in the Navy and serving at the time. This was how I learned how to promote access to education. I came back to the States when I was discharged in 1946 and enrolled at the University of California at Berkeley.

BURKE: How were you able to get into Berkeley if you had not completed high school?

CUADRA: While I was on the island, I took a bunch of U.S. Armed Forces Institute courses, and the College of the Admiralties also had some courses for which it gave credit. As a result of taking those courses, the principal of Lowell High School, who I believe was named Leroy H. Stevens, awarded me with my diploma in 1946. My coursework in the Navy allowed me to get into Berkeley.

BURKE: Why did you select such a tough, new subject as quantitatively-oriented psychology?

CUADRA: I thought learning psychology would enable me to help people. My first professor taught the scientific method, and I got a job with him as a result of taking his course. It was Psych [Psychology] 1-B, but I don't remember his course's proper name. Psychology 1-A wasn't given that semester, so I started with the wrong course, 1-B.

During that class, I took very detailed notes and typed them up. When I showed them to a fellow student who missed a class once, he thought they were wonderful. I got the idea of taking all of my notes, documenting them, and printing them. I bought a mimeograph machine and started selling my notes for the course. The professor got wind of this, and he didn't like it at all, so he offered me a job as his reader which I accepted at the end of my introductory freshman course in psychology. I remained a reader and teaching assistant in psychology for most of the time I was at Berkeley, starting with my entrepreneurship with the mimeograph machine.

BURKE: Did you have to take a standardized test, like the SAT [Scholastic Aptitude Test], to enter Berkeley at that time?

CUADRA: I don't recall if I took the SAT. I don't know what I needed to get in. To get back to the previous question, this particular professor focused on scientific method, and that got me interested in the scientific aspect of psychology. Since I had previously been interested in clinical psychology, I took both clinical and abnormal psychology courses. At the same time, I was involved in experimental psychology, statistics, and the more classically scientific part of the discipline.

BURKE: If my memory is right, you were forced to do correlations with the old Friden [Calculating Machine Company] table calculators.

CUADRA: I remember the name Friden and also Monroe [Calculator Company]. Those old calculators made a lot of noise.

BURKE: Crank and crank and crank the answer. That must've taken a lot of patience and devotion. What made you choose the quantitative field for your graduate degree?

CUADRA: My graduate work was actually in clinical psychology.

BURKE: But didn't you do your dissertation on a psychometric tool (1)?

CUADRA: I did, but it was a clinical psychology tool called the Minnesota Multiphasic Personality Inventory [MMPI]. I was interested in why some people who, after looking at their MMPI results, you might think would be institutionalized because they were seriously ill were not. Some people who weren't able to function and other people who were able to function seemed to have the same kinds of test scores.

I did a study in which I compared two groups in terms of their MMPI profiles. Each pair had an almost identical MMPI profile, but one person was locked up in Langley-Porter [Psychiatric Hospital] and the other was not. I forget how many cases there were, but in essence, I had a group of functional people who seemed in every respect like a group of institutionalized people.

I tried to figure out what the difference was between the two groups. The way one did it in those days was to do an item analysis to look at what responses were different even though they led to the same score. I don't remember now, but the conclusion was that the people who were able to function had some ability to look at themselves and express doubt about their conclusions. If someone said, "I think someone is sending poison gas into my room," it was the "I think" that made the difference.

BURKE: They could put the brakes on.

CUADRA: That's right, they could. The ability to question your own thinking was like psychological glue that could hold you together. The people who could not do that were the ones that were hospitalized.

BURKE: That helps me to understand why you chose your job after you graduated. As soon as you finished your dissertation, you went to the VA [Veterans Administration] hospital in Downey, Illinois. How was your experience there? You were there for three or four years, correct?

CUADRA: I was there for three years. I had been doing a psychological internship as part of my graduate work. First, I was at a juvenile court interviewing the boys and girls who were brought in.

Then, I did psychological testing at the Berkeley Mental Hygiene Clinic, on the University campus. After that, I worked for approximately six months at the Veterans Hospital in Palo Alto, California. That was my last internship.

When I got my degree, I wanted to stay in Berkeley, but they wanted to make sure that people got cross-fertilized and didn't stay in one place too long. Therefore, I took a job in the Veterans Administration Hospital in Downey, Illinois.

BURKE: You were married in 1947?

CUADRA: Yes.

BURKE: Did you have children before you left grad school?

CUADRA: Yes. I had been married earlier in 1942 and I had a daughter by that marriage. Then I had two children with my second wife.

BURKE: Was paying for graduate school financially difficult for you?

CUADRA: It didn't seem difficult because I worked. I worked as a reader and as a teaching assistant. My wife and I were both very fast typists, so we typed dissertations for other students. That was a small team business. I also had help from the [Montgomery] GI [Government Issue] Bill.

BURKE: Describe some of your experiences at Downey.

CUADRA: Even before I got there, I had some misgivings about the field of clinical psychology. I worked in the violent ward for six months, where we did group therapy once a week. There were usually five to seven patients at each session.

There was one patient who had never spoken to me and, as far as I knew, had not spoken to anyone before. One day, after six months, he turned to me as I handed him coffee and said, "Thank you," in a clear voice. I was absolutely astounded and elated and thought, "My God, I'm Freud!" [laughter]

When I calmed down, I realized that he had only taken a tiny step on a journey of potentially thousands of miles. He would probably never leave the violent ward; he would never leave the hospital; he would never have a job. I found that very disheartening. All I could think was, "I helped him, but it doesn't matter."

Since I was trained in clinical psychology, I took the job offer in Downey; although, I had been unsure about how valuable and satisfying it would be. During the time I was at Downey, I supervised interns and did testing and some therapy.

I worked at Downey for about three years and I think I continued to be frustrated by my inability to make a big difference. When the RAND Corporation offered me a job in California,

which was where I wanted to be anyhow, I jumped at it and left the field of clinical psychology forever.

BURKE: You must have felt a transition in your life when you moved from Downey to one the first contractual think tanks in the country.

CUADRA: Yes.

BURKE: RAND was associated with the burgeoning West Coast computer industry.

CUADRA: RAND worked for the [United States] Air Force. When I was hired, I didn't know what I was going to do. The interviewer came to the Chicago area and said, "I can't tell you what you're going to do because it's top secret, but I think you'll enjoy it." He was persuasive enough for me to come and take the job. [laughter]

BURKE: Did they seek you out or did you apply?

CUADRA: I don't think I was actively looking for a new job. I think they may have been recruiting nationwide. Several people in the company had invented a training method that they wanted to apply to Air Force personnel manning radar sites. It was brand new and had not been detailed, but the Air Force was persuaded that it would be helpful. RAND decided to hire a few hundred Ph.D. psychologists to figure out how to do the training. I was one of the people that they hired.

BURKE: Was the training something like program instruction?

CUADRA: No, it involved simulation. The basic concept was that you would go to an air defense site and shut off all the external communications. The connections to the various radar sites miles away and to the Air Force base from which you'd scramble fighters would be shut off. Instead, we would pipe in simulated radar returns. They would appear on the screen just as though they were real airplanes and, in some cases, real missiles. The whole idea was that for two hours the personnel at the air defense site would be stressed in ways that you could not stress them in ordinary life.

For example, if you were in Minot, North Dakota, you might see only one airplane a day, perhaps a United flight going from east to west. Yet, that site might be the first to see a bunch of Russian Bisons [Myasishchev M-4 bombers], Bears [Tupolev Tu-95 strategic bombers], or

missiles. How could they cope with an actual invasion without having had any practice in dealing with a heavy load and aircraft identification? The whole concept was to simulate a realistic situation. At the end of the exercise, you would tell the site personnel what they had done. You would say, "This was a Russian bomber, but you identified it as a commercial airplane." Hence, the feedback on this simulated war game provided training that would never have a chance to occur otherwise.

The psychologists invented exercises like malfunction scripts. For example, if the personnel being trained called for fighter planes to be scrambled in order to identify the unidentified aircraft, a trainer acting for the fighter base would consult a script and perhaps say: "The aircraft are not available; they aborted on takeoff." The personnel were then forced to come up with a response to the situation. We found ways to stress the personnel on the site and help them grow.

BURKE: Did you move to SDC [Systems Development Corporation], or did you stay with RAND [Corporation] for a while?

CUADRA: Both. I was in the System Development Division of the RAND Corporation. Those were the people who invented this training concept. RAND found it difficult to give objective advice to the Air Force and sell them a service at the same time.

BURKE: Do you mean that they were struggling with how to be a non-profit but do something essentially commercial?

CUADRA: That's right. And so it was agreed that the System Development Division would be split off into a separate corporation that became the System Development Corporation. I moved along with it.

BURKE: Was the SAGE [Semi-Automatic Ground Environment] system completed by that time?

CUADRA: No. I went to RAND in 1956, which was pre-SAGE. In 1957, I went to System Development Corporation [SDC]. They were, I believe, in the process of working on SAGE.

BURKE: Did you gain some early experience in software from that project?

CUADRA: No, only by osmosis. Once Lincoln Laboratory [at the Massachusetts Institute of Technology] decided that would happen, they needed someone to do the programming. SDC hired approximately eight hundred programmers. They hired people who looked potentially skilled or skillful in programming and taught them how to program.

BURKE: It is amazing that they were able to complete the project without having hired skilled programmers. Now, was this the Air Force Project 466L?

CUADRA: No, 466L was an intelligence system project. I don't know the date that I worked on that. It was a multi-company project for the Air Force that was headquartered in Camden, New Jersey. RCA [Radio Corporation of America] and IBM [International Business Machines, Ltd.] were the major companies, and there were a number of other companies like A.I.R. [American Institutes for Research], System Development Corporation, and Librascope [a subsidiary of General Precision Equipment Corporation]. There might have been one or two other companies that I can't recall. Our job was to define the requirements for and design a system for a type of intelligence information that had to do with electronics, among other things. I think I was there for about a year. I was sent as a system analyst to help define the system's requirements.

BURKE: Did you get into theoretical systems analysis at that time? By that time, systems analysis had become quite formal, even in academia.

CUADRA: Yes.

BURKE: Did buy into all that and use it? Or was it off the cuff?

CUADRA: No, there was a fair amount of training at SDC in system design. One of the things that the psychologists did, in addition to helping design exercises, was to figure out how to train the staff. For the SAGE system, we needed to design simulations that would train the personnel in the SAGE sites, which are not radar sites, but rather gigantic data processing facilities. We needed to have a team of four people at each site and one of my jobs was to recruit and help train those people so they could run the exercises for the Air Force on site. There were actually full-time, permanent SDC employees stationed at SAGE sites.

BURKE: You came into contact with the largest computer systems in the world at the time.

CUADRA: That's right.

BURKE: Wasn't Librascope building a small computer system at the time?

CUADRA: They built small airborne computers at that time. Initially, I had approached computers from the training side, not from the data processing side. I learned about computers through osmosis.

I want to tell you about system analysis. SDC taught its staff members system design. Their concept was fairly formal. We started with the general needs or requirements which turned into more specific requirements. We looked at constraints and resources, and you refined the requirements.

My role in the 466L project was to apply the formal knowledge of system analysis that I had learned at SDC. Unfortunately, it turned out my contributions were almost irrelevant. The two main corporations, IBM and RCA, had very different views about gathering intelligence information.

RCA, which was the communications giant at the time, thought that all of the data that was collected from the Soviet Union, which was the target at the time, should be transmitted back to the U.S., where it could be processed in a computer. IBM had a totally different concept, which was that you'd have a whole bunch of computers in Europe and Asia, and you'd process all that stuff, distill it, and send [laughter] the residue, so to speak, over a single cable to the U.S. RCA and IBM fought about that quite actively.

I was a pygmy among the giants trying to identify what was necessary and accomplish it. RCA and IBM had different views of how it should be done, because their views were so connected with their business aspirations. It was almost impossible for them to think impartially about how the system should work.

BURKE: Did you ever go to the intelligence center in Texas?

CUADRA: Yes, it was called the Air Force Security Service. We went to the NSA [National Security Agency], where I originally had my polygraph taken, and got involved with them. You sound familiar with that world.

BURKE: I had an amazing time processing information there. Even the first day was an incredible experience in handling mass data collection.

In 1960, you moved ahead to what was called intelligence systems in SDC. What was that?

CUADRA: The Intelligence Systems Branch. As a result of their experience with 466L, SDC decided to get involved with similar systems. They set up a branch and I was put in charge of it to try to develop more businesses like 466L. We did end up with several projects that were intelligence-related.

[END OF TAPE, SIDE 1]

BURKE: I assume much of your intelligence-systems work with SDC involved organizing and distributing documents and handling a multitude of facts. Did you also do work for the commercial sector?

CUADRA: For many years we worked primarily for the Air Force. In the mid-1960s, SDC started working for other agencies. One of them was the National Library of Medicine [NLM]. SDC got a contract to develop a system called MEDLARS II [Medical Literature Analysis and Retrieval System], and along with that, the information retrieval system associated with MEDLARS II, called MEDLINE [NLM's online database of indexes, journal citations, and abstracts].

The system that was developed and eventually delivered to the Library of Medicine was also sold commercially thereafter. The system was called ORBIT [Online Retrieval of Bibliographic Information Time-Shared]. The National Library of Medicine contracted with SDC to add certain commands to the ORBIT system that accomplished particular functions that NLM needed. The new system was called ELHILL by the National Library of Medicine. SDC continued to sell ORBIT to other commercial organizations even as it sold copies of the system to other government agencies.

BURKE: Were there big, commercial buyers of ORBIT at that time?

CUADRA: There were very few commercial buyers. There were two major sales that I'm aware of, although I was not connected with those particular sales and don't have the details. I believe the Coca-Cola Company may have bought a copy. The [U.S.] Department of State, which is not a commercial buyer, also bought a copy. I don't know where the others were sold.

BURKE: Was ORBIT an online system?

CUADRA: Yes. When it was installed at the Library of Medicine, it was for use on NLM's computer to provide online service to physicians and other health professionals. About the same time that was happening, SDC was aiming to provide service on a commercial basis using ORBIT, as its retrieval software. That was followed by a couple of years of supporting NLM.

BURKE: In 1965, you became the head of the Special Development Division. Did that have to do with information systems, like ORBIT?

CUADRA: No, I don't think so. I had a staff role in the Special Development Division of the SDC. We did a number of different pieces of research, and I don't recall anything in particular about it. It's a blur.

BURKE: By 1967, you were the head of information systems technical staff. Was this associated with an ORBIT kind of project?

CUADRA: Yes, I think that also involved odds and ends of information-related projects. I remember one of them was trying to invent an automated fingerprint analysis technique. And I spent maybe six months analyzing and marking fingerprints, trying to see whether there was a way for a machine to identify similarities. It seems ludicrous now that there's a wonderful system to do that automatically, but at the time no one knew how to make one. [laughter]

BURKE: That was a big task. Did you know that Vannevar Bush tried to invent machines to do that in the 1930s?

CUADRA: Really?

BURKE: Bush had some of his students pursue it in the 1940s. Then their students at MIT pursued it in the 1950s and 1960s. I think, eventually, one of them hit the jackpot with the system that the FBI [Federal Bureau of Investigations] and a lot of police departments bought.

CUADRA: I remember, we built a projection device that shined pictures of fingerprints on an acetate-type screen. Then we had two local policemen, who were fingerprint experts, mark them. We would show two versions of the same fingerprint, and they had to mark the identifying points. But when you roll a finger from left to right, it's different from right to left. The identification points move a bit, so we had to measure the extent to which the same characteristic had moved. It was a question of, did they move so much that they couldn't be recognized as matching? There were a bunch of measurements.

BURKE: It seemed to be an insurmountable problem until really fast computers developed. Around that time, you seemed to identify yourself as an information scientist, and started to form a

new professional organization. You started publishing *ARIST, The Annual Review of Information Science Technology*. Did you feel that information science was a distinct field of study? Was there some kind of substance and theory which made it unique by that time?

CUADRA: Just to note, I was not actually a publisher of *ARIST*. But yes, because of my background in intelligence work, I became interested in learning more about managing documents. I think the first time I went to a professional meeting concerning intelligence work was in 1963 when I went to an ADI [American Documentation Institute, now ASIS] meeting. It was all very new to me, and I just went there to see what I could learn. I found myself very interested in the content. It seemed like nice, clean work. [laughter]

For some reason, I decided to do an evaluation of the meeting. I'd found some correspondence from Hans Peter [Pete] Luhn, who was then the incoming president of ADI. He was with IBM and was the inventor of the SDI [Selective Dissemination of Information] concept. I think he either sent out the survey with his signature, or somehow he aided and abetted it. Because of his endorsement, I got very good response. In retrospect, I realize that by trying to measure something, I attempted to get a handle on this new field that I didn't know anything about. I was measuring using my old background in psychology to ask questions about, "How did you like this," and, "Is this better than that?" and so on. There may be a copy of the study around, but I don't know where.

Anyhow, that got me in contact with Pete Luhn. He said nice things about me. Then, a year later, I think I did a study; I was still trying to learn; I wrote to about forty of the leading lights in information science. I got their names by looking at bibliographies, almost doing Gene [Eugene] Garfield-type stuff; and identifying who had been cited and what they said. I wrote to all of them. They had all written so much that I decided I had to ask them, "What's the most important thing that you have written and why is it important? Would you send me a copy?" Strangely enough, nearly all of them did! [laughter]

I was clearly corresponding with my betters at the time. I read and published a report on what they said (2). At the end of this report, I said, "I really wish there were an annual review in our field," as there was in psychology. I thought, "I wish there were such a thing in our field. It would make it easier to learn."

My report got the attention of Pete, who brought it to the attention of Helen [L.] Brownson at the National Science Foundation [NSF]. She called me up and asked me if I'd like to start an annual review with NSF support. I was horrified. I said, "No, I don't want to write one; I want to read one." [laughter] "I'm trying to learn something." Our conversations went on for quite awhile, and it finally dawned on me that the only way this would ever come about was if I helped to do it.

There were four-way conversations: ADI, Pete Luhn, Helen Brownson, and me. NSF said they would support the annual review if I were the editor. NSF told that to ADI, and they told me that they would support the annual review if ADI were the sponsor. We all had to work together to get the project off the ground.

BURKE: NSF was a major sponsor for the development of information science and defined how it would be constructed. Do you know if they gave money to SDC projects?

CUADRA: I only remember two projects that they funded. I know the *Annual Review* recieved a grant from them. The rest of the support for the *Annual Review* came from SDC. The other was a study of relevance, which also received an NSF grant (3). And there may have been another one, but I don't recall.

I think the SDC had to agree that it would release part of my time for the *Annual Review* project. So, it was all agreed, and we started the *Annual Review* by rounding up authors and defining chapters. The most interesting thing about that was the name. At the time, ADI was the official organ of what is now called information science. And ADI had a publication called *American Documentation,* and it had a position called "The Editor". The editor was Arthur [W.] Elias.

I think most of the council was not very hot on the idea of the name I proposed, *The Annual Review of Information Science and Technology*, but they eventually agreed. I don't think Arthur was delighted to have another editor when he had a position called "The Editor." But, anyhow, we got past all of those things and we were able to launch the *Annual Review* series.

BURKE: Do you think that by that time there really was a distinct thing called information science? If so, what made it different from special librarianship?

CUADRA: Well, I'm not sure why I wanted that name. That was 1965, and my memory doesn't [laughter] help me at all on that.

BURKE: There started to be courses taught called information science.

CUADRA: I think I was hearing that, and I liked that better than documentation. There was a wonderful person named Robert [A.] Fairthorne who said the memorable words, "Documentation is about the marking and parking of documents." I thought that that was a marvelous way of looking at it. I had limited skills in the marking and parking of documents. I knew more about using information, and was interested in the needs for information, the uses of information, and information retrieval; this was the stuff that other people were doing at SDC. So my notion of what information science was went beyond the marking and parking of documents. It included it, but it went beyond. So I think that the first several years of the *Annual Review* helped to expand whatever the field was. But I'm sure that the concept of information science already existed, or I wouldn't have asked for that particular title.

BURKE: But that helped you become a very central figure to information science in America. Also, I think that it was important was that you were in the Los Angeles area, which was developing one of the centers of information sciences. Bob [Robert M.] Hayes was out there.

CUADRA: Joe [Joseph] Becker was too.

BURKE: In 1968, you take the job as manager of library and documentation systems at SDC, which is a more direct commitment to the library information field as a career. Did you feel that you had now built a life on this stuff?

CUADRA: Yes, we were getting more projects having to do with information that were funded by various organizations. The Los Angeles School District funded one project, and the U.S. Office of Education also funded a number of projects.

BURKE: SDC didn't do ERIC [Educational Resources Information Center database], did it?

CUADRA: We did some things for ERIC. It seemed like a business to SDC, and my job was to find projects, staff them, and do them; then find the next projects, and so on.

BURKE: You were on what the academics call "soft money."

CUADRA: Yes.

BURKE: Yes. You better get it in, or you're out.

CUADRA: Yes. [laughter] Quite hard.

BURKE: Stressful.

CUADRA: Yes. Fortunately, SDC had enough things to do, and they tended to move people around. If we hit a dip in funding and there were two people too many, they usually found

something else for the people to do. So it wasn't a kind of life-and-death situation that you might find in a purely commercial organization without an R&D [research and development] backup.

BURKE: So, about the same time, you also start to emerge as an important policymaker for information in the country. You became a long-term member of National Academy of Sciences [NAS] committees on information.

CUADRA: I think it was very brief.

BURKE: Then you moved to NCLIS [National Commission on Libraries and Information Science], which we'll talk about again in a little while.

CUADRA: Right. I can't even remember the National Academy of Sciences work. I think it was very brief. It may have involved a few meetings.

BURKE: There was an important study, one of the first ones of the Committee on Science and Technical Information [COSATI] (4).

CUADRA: Communications.

BURKE: I ran across a fellow named Harold Lancour.

CUADRA: Sounds familiar, but I don't know him.

BURKE: He was from SDC and then became science advisor for the President. And my thought was, when I tried to figure out how you got the NAS connection, which is the old academic world, not the new government information world, that he might have been the contact that got you onto that committee.

CUADRA: I don't recall anything about being there. I was on one NIH [National Institutes of Health] committee, I believe. I don't recall being on an NAS committee. I do recall participating in the COSATI work. Our representative there was Dr. Launor [F.] Carter, who was my boss. My staff and I did a lot of the homework for COSATI.

BURKE: Yes. I think Carter was also an advisor to the White House.

CUADRA: He served on the National Advisory Committee on Libraries. The COSATI report was probably the fifteenth time such a study had been done, and one of the first things I proposed to Launor that we do was to recommend that this never be done again (5). I recall saying something like, "All these recommendations have existed before. If they haven't been followed; there isn't anything new to discover; there's a failure of will. We ought to say that." He didn't do it. [laughter]

BURKE: I read almost every single one of those reports.

CUADRA: Oh!

BURKE: I started when I was twenty-four years old and a few minutes later, I suddenly hit my sixties. [laughter] It was repetition.

Was the reason for the number of reports that there was a battle about who was going to control the supply of scientific information in America?

CUADRA: Yes.

BURKE: There were the newly arrived government agency types who wanted those agencies to do as much as possible. There was an older, non-profit academic group who had started the original scientific journals that were associated with the prestigious universities. Then there was the emerging group of for-profit information vendors. The reason for sudden outbursts of reports was that one of these might start the policy recommendation process, and the other two had to jump in quickly. There was a split between the groups associated with the White House versus the groups associated with Congress. Congress usually has the, "Let's expand the bureaucracy" New Dealers. They did things like ERIC.

CUADRA: I think my take on it was much more simple-minded. [laughter] I felt like the people that were funding the studies really didn't know what to do and their way of dealing with that was to do another study; but it never helped them. Their problem was that there was not a clear objective for the studies. The study didn't answer the questions that would have enabled it to proceed, and they couldn't move ahead, so they did something that seemed like activity, but it didn't go anywhere.

BURKE: "Do something."

CUADRA: "Do something." And we did another study.

BURKE: In 1971, you moved into a department at SDC that was even more committed to information science, called the Education and Library Systems Department. With this system, SDC tried to become a commercial provider for educational materials.

CUADRA: Not necessarily. There was an Education Systems Department. And I was running the Library and Documentation System Department within SDC. There were the two departments and the department head of education left. Rather than look for a replacement for him, they merged the two departments.

BURKE: Did you provide informational training in house?

CUADRA: No. We carried out projects funded by other organizations.

BURKE: Were the military and government agencies still the main buyers of the educational training packages?

CUADRA: It was much more government-wide by that time. The educational projects were largely for the U.S. Office of Education.

BURKE: What were the projects like? Were they part of the Great Society programs to reform education?

CUADRA: I don't have any recollection of the education side. The assistant department head largely ran that part of it, and I focused on the library and documentation systems side.

BURKE: Just about that time, you became a member of the National Commission on Libraries and Information Science [NCLIS] and sat on that Commission for fourteen years, correct?

CUADRA: Yes.

BURKE: How did you get on that Commission?

CUADRA: I was invited to be on it. In the early 1970s, I was pretty visible because of the *Annual Review*. I also gave talks fairly frequently. They needed two information persons on the Commission by law. The rest could be librarians, library trustees, and other folks, but there had to be two information technologists. I was one, and Joe Becker was the other. How I got nominated, I do not know.

BURKE: Do you know anything about the origins of the law which mandated putting two information specialists on the Commission? What was the political background of that?

CUADRA: I don't know.

BURKE: The NCLIS started out as a kind of left-of-center, Democratic, New Deal group. It was started by librarians who wanted to help the American underprivileged. But once NCLIS was finally organized, it took a turn and incorporated not just the old-fashioned, American Library Association people, but also the new, cutting-edge information specialists and people in the for-profit sector of the information providers in America. I still haven't been able to figure out exactly how that change took place.

CUADRA: I don't know. There was a prior group called the National Advisory Commission on Libraries, and I believe that Launor Carter of SDC may have been on that.

BURKE: Douglas M. Knight was as well.

CUADRA: Yes. I think a book came out of that Commission which included a chapter that my group helped put together. I think the book was called, *Technology and Libraries* (6). I link it in my mind with that Advisory Commission. Maybe Knight was the editor of the book.

BURKE: Why did you stay on the NCLIS for that long?

CUADRA: I think the chairman kept asking for me to be reappointed. They'd say, "Would you serve if we appointed you again?" I said yes. I said yes twice, and the third time, I said no. [laughter] Actually, I wasn't asked by the chairman; I was asked by the Republican White House, I

think. I got some invitation to be reappointed and, also, to contribute to the Republican Party. By that time, I decided that I'd had enough and wanted to do other things.

BURKE: There was an important report that came out of NCLIS. What it said was that we should create a balance between the old, elite, academic information providers in America, the government provisions, and the new, emerging, for-profit sector. Were you involved with that?

CUADRA: I'm not sure what report you're referring to. I think there was one called, "The Public Private Sector (7)."

BURKE: That's the one.

CUADRA: Yes, I definitely was involved with instigating that. In fact, during most of the Commission's existence when I was there, there was a great deal of tension between the library community and the rest of the world, like the publishers and other folks.

[END OF TAPE, SIDE 2]

BURKE: Did you feel a sense of crisis with the NCLIS?

CUADRA: Yes.

BURKE: Did you feel that there was any tension between members of the board?

CUADRA: Yes, definitely. There were several views of what the Commission was for. The library community, I think, largely saw it as a group that would help to improve the lot of libraries and library users. I think everyone was in agreement about that. The disagreement had to do with how it was supposed to happen. A number of the members, I think, saw their role as trying to get money for libraries. The legislation said that our charter was to help meet the library and information needs of the nation. When I read that, I thought in terms of the users, not of institutions providing the service. So there was that one difference.

There was also a difference between the view that the Government should do something for libraries by actually operating the various kinds of information services and another view that the private sector should provide those services. That tension occurred from the beginning. The

different views of our role existed from the beginning and continued through the thirteen or fourteen years that I was there.

I recall two times when the situation became particularly tense. One time had to do with copyright, when the libraries and publishers had different points of view. The second time had to do with the proposed National Periodicals Center. A number of the Commission members, along with most of the library community at the time, I think, were advocating the establishment of a government-funded National Periodicals Center, run by the Library of Congress, that would provide full-text documents to everyone.

At the time the Centers were being proposed I said, "But haven't you heard of ISI [Institute for Scientific Information], information brokers, and the British Lending Library Division? There are many existing sources of hard, full-text documents. If you're going to recommend this, you have to account for these existing things."

The result of this kind of conflict was the establishment of a task force with about twenty-four members. Some were drawn from academe, some from government, some from the commercial world and, I think, some from non-profit. That group met a number of times to see if they could talk about the differences in perspective and see if they could reconcile their different views and come out with something productive. There was a report called, "The Report of the Public/Private-Sector Task Force," which, I think, was developed primarily by Bob [Dr. Robert M.] Hayes who was the chairman of the Task Force.

BURKE: By the way, that report was just reprinted and reissued this year (7).

CUADRA: It was?

BURKE: Yes, because we're going through the same kind of problem with the [World Wide] Web.

CUADRA: The NIH wants to run a free online document service, in effect.

BURKE: That's right. It's the same kind of players and many of the same problems magnified by the fact that the Web is international.

CUADRA: Yes.

BURKE: Hayes' report was, I think, reissued in a very nice volume to say, "Look, we've been through this one before, guys. Let's see what can help."

CUADRA: There was actually another study. Because of the conflicting views about the National Periodicals Center, we, the Commission, agreed to have a study done. We hired the Arthur D. Little Company and Vince [Vincent E.] Giuliano to study the possible requirements for such a center.

Giuliano summarized the study in one sentence. He made a presentation to the Commission and said, "The time for a National Periodicals Center has come and gone (9)." And he posed three alternatives. One was what the Commission wanted and the library community wanted, which was for LC [Library of Congress] to be running the center. Another was to have something that had government-run components and linked to other sources. I forget what the third alternative was. The Commission accepted his report and said, "All right, you're done."

Then they went to the Congress, I believe, to try to establish a National Periodicals Center. The Congress actually voted to have such a center, but there was an education bill, I believe, and there was a trigger in it that said that provisions for the center would only be triggered if the funds for something else reached a certain level. It was almost an impossible amount.

BURKE: This was just as the American economy started to decline in the 1970s?

CUADRA: I don't recall. One of the things I think I told people in a talk I gave in New Orleans for the AIIP [Association of Independent Information Professionals] is that I saw my role there as different from others because I'd come to the Commission while I was an *Annual Review* editor. I saw my role not as an advocate for the institution of the library, but rather almost like a research person asking questions. "Do you really mean that? Is the following so-called fact true?" I was acting like an editor rather than an advocate. [laughter]

For part of the time that I was at the Commission, I was also on the board of the Information Industry Association. I behaved somewhat the same way with them. They sometimes thought I was the tool of the librarians, and the librarians thought I was the tool of the information industry because my role was the same in both cases. I was trying to find out what was true and what might work. I did not think in adversarial terms. There were times when I felt much more positive toward th e information industry than I did toward the government. This was when SDC found it necessary to sue the National Library of Medicine for "stealing its software."

BURKE: I remember that. Didn't they give away a database to somebody and want it back?

CUADRA: SDC invented one of the world's first database systems that was almost like a predecessor of Oracle [Corporation]. I think it was called CDMS, Centralized Data Management System. They lent a copy to the University of Texas, which, I think, used EDS [Electronic Data Systems], [H.] Ross Perot's company, as a contractor. I'm now telling you things I don't know first hand, but I was told that when SDC wanted to get it back from Texas, they said, "We don't have it; we've given it to EDS." SDC didn't get it back. I've always wondered whether that product launched the EDS service bureau business, but it was not my department. I'd love to know the answer to that.

BURKE: By 1974, you're managing the SDC Search Service.

CUADRA: Yes, but I started in 1972. I did a study. I wondered about whether there was any market for this kind of online service. I bought about seven thousand names from NTIS [National Technical Information Service] of people who had bought information, and invented a survey form, just like I'd always surveyed things. The objective was to find out if there was a market for online access to information.

Since there wasn't any at the time, I had to describe how it would work. Then I asked a series of questions on a single page. I got, I think, less than one-percent return. Most of the people said, "No, I wouldn't need it. I wouldn't use it." I decided they were wrong. [laughter] I put the survey away, went to management and said, "We've got to start an online retrieval service." I think I concluded that there are some things you don't know you need until there's a means to satisfy it. The means actually creates the need. "If you build it, they will come." I got management approval to let me start this online retrieval service which we called SDC Search Service. And that's how it started out.

BURKE: That was very courageous because computer technology in the early 1970s, and even in the mid-1970s, was still very crude to what we envisioned as the power of communications.

CUADRA: Well, it was pretty powerful then. The SAGE system had been in operation for twelve or fourteen years with very reliable computers. The ORBIT software was very solid. The chief problem at the time was getting low-cost, fast, reliable communications and having enough customers to make a business out of it.

BURKE: How did your products sell?

CUADRA: Slowly! [laughter] When they first started with an experimental use of online technology, we were using teletypes [manufactured by the Teletype Corporation]. My partner, Judy [Judith] Wanger, our executive vice president and a colleague, actually traveled around the

country with two big boxes containing teletypes. They gave demonstrations for ERIC and clank, clank, clank, clanked, six characters per second or so. Initially, the National Library of Medicine was using teletypes, as well. That all changed with the establishment of Tymshare Incorporated, which used many computers, leased lines, and provided low-cost and quite reliable communication.

BURKE: Was that the BBN [Bolt, Beranek, and Newman Company] group?

CUADRA: No, Telnet came from BBN. It came later, I think. TYMNET was a creation of Tymshare Incorporated in Palo Alto. Telnet and TYMNET became the two networks that made it possible to sell online services.

BURKE: Who were you selling the SDC services to for many years?

CUADRA: Initially, we sold services to pharmaceutical companies because they had been using SDC's computer and the MEDLINE database. When MEDLINE first started, the National Library of Medicine ran it on their own computer and also ran a copy on SDC's computer for about a year and a half. They allowed the pharmaceutical manufacturers to use NLM's service on SDC's computer because pharmaceutical manufacturers had, I believe, contributed data or indexing to NLM. When NLM started running MEDLINE only on its own computer, we had an empty computer, [laughter] or a part-empty computer.

We had started offering online access to the ERIC database and had some pharmaceutical people who knew us, and we wanted them to continue to be our market. We loaded a database of Chemical Abstracts Condensates data on it, and that became the first commercial database that SDC Search Service offered. The pharmaceutical companies were people who knew the value of information, the importance of getting things first, and knowing who else had information of a certain kind. We branched out from there. As we saw another market, we added a database that the pharmaceutical folks would like and then tried to sell it to someone else. Then we added a database that the new core would like. We added users and databases in steps.

BURKE: How were you able to calculate how much should be charged for using the system?

CUADRA: We experimented with charging twenty-five dollars per connect-hour for the ERIC database. This was at the time when connect time was the only way that anyone thought of this stuff. When we put up the Chemical Abstracts database, I think we charged a similar amount. About the time that we were starting to go commercial, DIALOG [division of Thomson Corporation] was also going commercial, and we looked at their prices and decided they ought to be somewhere in the same ballpark.

Unfortunately for us, DIALOG's costs were much lower than ours, so they could be much more profitable than we could be by charging the same prices. At that time, we didn't know what their costs were and it didn't matter because we had to charge something that was comparable, or we wouldn't get any business. So, the prices kind of crept up from there.

BURKE: In 1978, you took a big life step, and you founded your own company. How come?

CUADRA: Two reasons. One is that I think I'd become bored, although that word is too strong. After ten years with the *Annual Review*, doing the next issue was no longer a thrill. There came a time at SDC when adding the next database and finding the next group of customers wasn't exciting.

The other part of it was that it was very hard work to run the kind of business we were running within SDC. SDC was used to billing millions of dollars a month to the Air Force or other large customers for major projects. And we would be billing approximately one or two thousand customers twenty-seven dollars and fifty cents or three hundred fifty-two dollars and, occasionally, two thousand dollars. It didn't fit.

The other problem was that I was paying retail for computer services. The computer center had to charge us its retail prices or they would get in trouble with the government. That was their view. So I couldn't make a mistake in loading the database because I'd have to pay to reload it at commercial prices. So our profit on paper never looked wonderful to the company. The company was always wondering why we couldn't raise our prices, get rid of the ERIC database, or somehow become much more profitable.

The real answer was that we didn't have our own computer, the way DIALOG did. We didn't have our own low-cost disk storage, the way DIALOG did. And there was no way, short of doubling our user base, to make it highly profitable, given the commercial rates we paid. And they would not allow me to buy computer time from anyone else. I was stuck and that was frustrating. Both being un-thrilled about doing the next crank of the handle and finding it frustrating to be trying to build something in an organization where it really didn't fit, made it easy to leave.

BURKE: That was brave of you. You've had a family. The kids were still living at home, right?

CUADRA: Yes, my kids actually helped me decide to do it. At dinner one night, I said, "I'm thinking of leaving the company, and I don't know what I'll do next. Are you worried about that?" They probably should have said yes, but they said no. [laughter] So I did it. I went to the vice president and said, "I'm going to resign from the company. I will stay as long as you want until you find someone. Whether it's two weeks or six months, I'll stay that period. I don't want to damage the business, and I don't want to damage my colleagues, but this is not discussable and it's

not changeable." I didn't leave any room for discussion. I didn't want to be talked out of it and I didn't want to discuss what I didn't like.

BURKE: I was impressed when I read a sketch of your biography. You were fairly ahead of your time in predicting the course of computer communications technology. Did you make a bet on Cuadra Associates by really foreseeing networked, small computers, the workstation precursor of the PC [personal computer]?

CUADRA: No, I didn't. When we started, I had no idea what we would do. I wasn't going toward something; I was going away from something. Judy Wanger, our executive vice president, left SDC on the same day as me. We started the company a week later. We had no prospects. We had planned to be consultants and try to figure out something to do. The first thing we did was to help Haines [L.] Gaffner. He had a company called Link [Resources]. He was a marvelous salesperson, and sold a number of clients on a multi-client study of the database retrieval marketplace. After he sold them on the idea, he needed someone to help do it. [laughter] Judy and I were the only people who had run an online service business and converted a bunch of databases, and we weren't employed. So, Haines hired us.

BURKE: This leads to your major publication for a long time, [*Directory of*] *Online Databases*.

CUADRA: As part of that study, we learned something about non-bibliographic databases, which we had never been exposed to before at SDC. We decided that we would start giving seminars to tell our friends in the library world about those other sources of information that would be useful to them and help them be of value within their organizations.

We did seminars all over the U.S., Canada, and Europe to demonstrate the uses of chemical databases and other things that most libraries had never been exposed to. After about six months to a year, the people giving the seminars were burned out and it occurred to us that maybe we could turn our handout of non-bibliographic databases into a publication. We decided to put every online database on Earth, both bibliographic and full-text, in one publication. Our directory of databases called *Directory of Online Databases* started as an outgrowth of our seminar business.

BURKE: That led you into creating STAR [System to Automate Records], which, I understand, was one of the first local network-based systems which the individual user like a library or an archive could use.

CUADRA: The need for something like STAR became apparent when I was still at SDC. We had a number of companies that mounted their private files at SDC. They were intended for their own private use, but there were no software packages around to let them operate and provide the same

kinds of retrieval capabilities that ORBIT or DIALOG or any of the big systems had. We thought that there was a market for that if something could be built. We heard of a computer system called the Alpha Micro [manufactured by Alpha Micro Products], which was the world's first multi-user, multi-tasking microcomputer. I think we have one in storage, still. You could put twenty-four simultaneous users on that little box.

We decided, "Let's write some software for this, and people can use this. We'll be able to sell it to organizations that put their data on SDC and DIALOG as private files. But they can use it within their organization instead of dialing in." One of our users was in Paris, and they had to dial all the way to Santa Monica to get access to their personal data. I discovered, once, by accident, when I was in London, that it is possible to gain access to other people's private files. I thought I was dialing into ORBIT at SDC, but I found myself in the *New York Times* information bank.

BURKE: Oh!

CUADRA: I had no password; I had no idea how to get to it; I didn't know the phone number; but there I was talking to it and looking at a report of their online traffic. I realized then that this is a dangerous business, that the communication networks allow for such an accident to happen, for someone to get into someone else's very sensitive private files. That convinced me that there was a need to have software running on your own computer, in your own building, with your own data. That led to the decision to build such a system.

BURKE: Who were the initial programmers?

CUADRA: The initial programmer was my son Neil [G. Cuadra], who had joined us; I think he stayed at SDC for about nine months or so after I left. He converted the Chemical Abstracts database. He also wrote the accounting system for the SDC Search Service. He was in the middle of working on an addition to the Chemical Abstracts database, and he didn't want to leave it in the lurch, so he finished the job there and then joined us. That's when we started building STAR.

BURKE: To conclude our interview, I have a general question. You were born in 1925 and this is 2001. Apparently, you're still working a twelve or fourteen hour day.

CUADRA: How do you know that? [laughter]

BURKE: I had a hunch.

CUADRA: [laughter] No, not that much. Well, the real truth is that we have not been successful enough for me to hire more people to do the work that I'm doing. Since I have enough energy to do it, I'm doing it. I would be delighted not to work as much; I would be delighted to be able to watch more basketball or football on the weekend. But, in the meantime, there's work to be done, and I'm doing that.

BURKE: Thank you very much for a very enlightening interview.

CUADRA: Thank you.

[END OF TAPE, SIDE 3]

[END OF INTERVIEW]

NOTES

1. Carlos A. Cuadra, "Psychometric Investigation of Control Factors in Psychological Adjustment," Ph.D. dissertation (University of California, Berkeley, 1953).

2. Carlos A. Cuadra, "Identifying Key Contributions to Information Science," *American Documentation* 15(1964); 289-295.

3. Carlos A. Cuadra, Emory H. Holmes, Robert V. Katter, Everett M. Wallace, *Experimental Studies of Relevance Judgments*. (Santa Monica: System Development Corporation, 1967).

4. U.S. Federal Council for Science and Technology. Committee on Scientific and Technical Information. *Recommendations for National Document Handling Systems in Science and Technology*, (Washington, D.C.: Clearinghouse for Federal Scientific and Technical Information**,** 1965)

5. See note (4) above.

6. Carlos A. Cuadra, *Technology and Libraries* (Santa Monica: System Development Corporation for the National Advisory Commission on Libraries, 1967).

7. United States National Commission on Libraries and Information Science, *Public Sector/Private Sector Interaction in Providing Information Services* (Washington D.C.: Government Printing Office, 1982).

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9. Vincent E. Giuliano et. al., *Into the Information Age: A Perspective for Federal Action on Information* (Chicago: American Library Association, 1978).

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