

# Meetings in Retrospect

## Pioneer Day 1984: Lawrence Livermore National Laboratory

Computing at the Lawrence Livermore National Laboratory (LLNL) was the subject of the Pioneer Day session organized by the AFIPS History of Computing Committee (HOCC) at the 1984 National Computer Conference on July 11, 1984, in Las Vegas. Highlights of the event included a display of artifacts and photographs covering the major personalities and equipment in LLNL, a movie that gave an overview of the lab's equipment, from the UNIVAC I to the modern Cray X-MP, and a panel session in which the hardware and software achievements of the lab were discussed by some 40 persons.

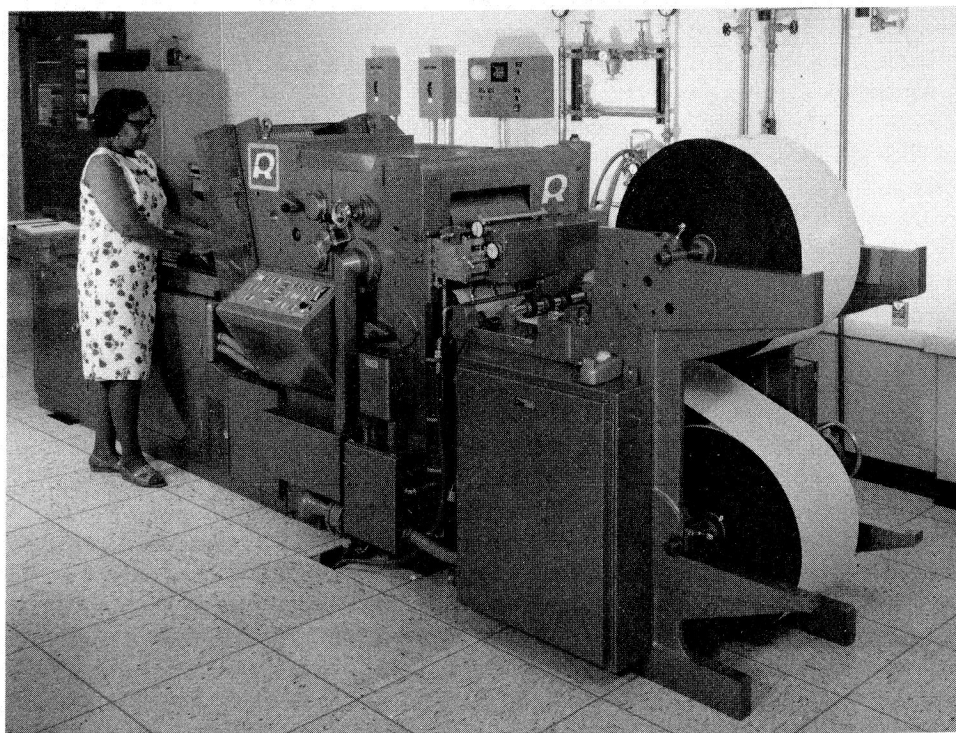
Even before LLNL was established on the Livermore site in September 1952, plans were being made for the acquisition of the most powerful computing equipment then available, the UNIVAC I. Sidney Fernbach, a theoretical physicist hired by LLNL's co-founder Edward Teller to head the lab's first computer group, did a splendid job of chairing the first part of the panel discussion. He described the tribulations of attempting to establish one of the world's foremost

computer groups when the town of Livermore could not even provide him with a post box number, let alone the more obvious needs such as an air-conditioned computer building. The staff initially worked in a few old U.S. Naval Air Training Base Hospital buildings (these first few buildings did not have such amenities as toilets, a recurring joke in many of the panel presentations). A temporary computer building was designed and constructed in just a few months, but time was so important that the lab set up two IBM Card Programmed Calculators (CPCs) on the hospital sunporch in order to get an early start on their projects (the CPCs had a sad habit of getting wet when it rained).

The UNIVAC I, the same one that had been used by CBS earlier that year (while still on the factory floor) to predict the outcome of the Eisenhower-Stevenson presidential election, was finally installed in a new 2500-square-foot building in April 1953 (Figure 1). This was the first of a long series of computers, some of which were ordered even before their predecessors



**Figure 1.** LLNL staff saying “bon voyage” to the UNIVAC I in 1959. *Left to right:* Joneal Williams, Stan Helmecci, Ed Lafranchi, Cedric Eastburn, Marvin Lehman, Sidney Fernbach, Pierre Noyes, and John Hudson.

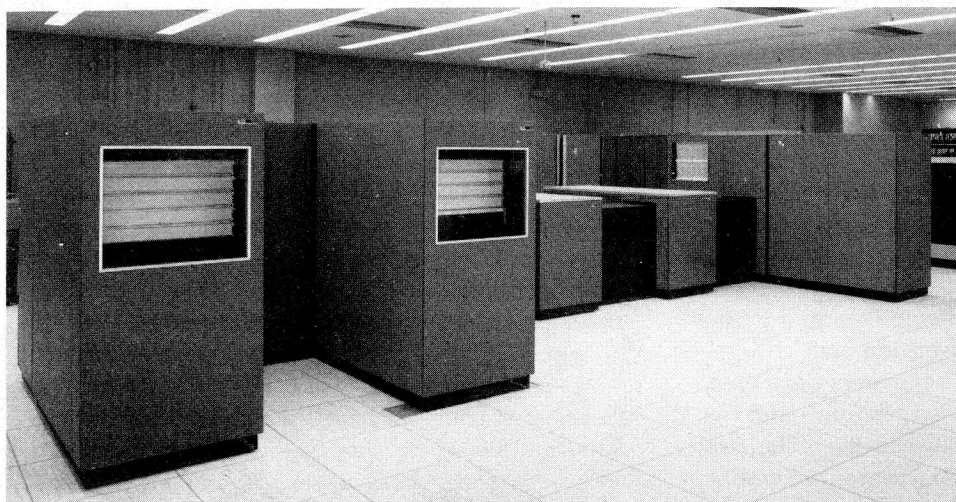


**Figure 2.** Radiation Inc. printer.

had been installed, that has kept the lab at the leading edge of powerful computer technology right up to the modern day. Duane C. Sewell, selected by Ernest O. Lawrence to help open the lab as a weapons design center, indicated: "It was hard for those in Washington to understand why the lab needed so many computers or how we could possibly use them. I believe that many headquarters people were convinced that we were just ordering the new machines as they were produced so that we could boast that we had the latest model." The list of equipment used in the lab reads like a historian's collection of the most important

machine developments; it includes, besides the UNIVAC I, four IBM 704s, two 709s, two 7090s, the Univac LARC, the IBM 7030 (Stretch), several CDC 1600, 6000, and 7000 series machines, DEC PDP10s, and Cray supercomputers.

The lab was always in such a rush to install the latest computer that it had more than its share of physical problems. Typical was the time the Stretch computer arrived before the building to house it had been completed. The roof had not been properly finished, and the evening after Stretch arrived, it rained enough to soak everything inside and fill the subfloor



**Figure 3.** IBM photodigital store at LLNL.

with water. The IBM engineers wanted to return Stretch to the factory, but Fernbach insisted that it be uncrated and powered up. Much to everyone's surprise it worked immediately.

The second half of the panel discussion centered around the software developments at the lab, including the Octopus computer network which Fernbach was instrumental in developing 20 years ago. The session was chaired by Edward Lafranchi, currently head of electronic engineering development at LLNL; he was partially responsible for the design and manufacture of the original interconnection equipment for Octopus.

Although not the first computer network to be developed, Octopus was certainly one of the most ambitious. It originally consisted of four CDC 6600 central computers with smaller machines acting as device interfaces, the world's fastest printer (manufactured by Radiation Inc. and capable of producing 30,000 lines of output per minute—see Figure 2), and the world's largest on-line storage device, known as the IBM photodigital store (Figure 3). It stored one trillion ( $10^{12}$ ) bits of information (10 gigawords). When this device was first attached to the network in 1961, it gave LLNL more on-line storage than existed combined in the rest of the world.

All of the software developments at LLNL were not discussed because of the sensitive nature of the lab's responsibility for nuclear weapons research, but several unclassified projects give an overview of the accomplishments at LLNL. Cecil Leith, a mathematician, developed a weather prediction system on the LARC by simulating the temperature and pressure changes at many different levels in the earth's atmosphere. One of his 1962 color animated films depicting atmospheric changes over several days was shown to the audience. Other projects mentioned included the simulations devised by the physicist Robert Lelevier to follow the life cycles of stars, and the planetary orbital calculations of Joseph Brady. Brady's systems were found to be useful in calculating the orbit and reentry time of Sputnik I and the orbit and return date for Halley's comet.

Following the afternoon session, Sidney Fernbach was honored for his contributions, made over 30 years, to the development of LLNL and to computing in general.

The Pioneer Day session was supplemented by an LLNL exhibit in the NCC convention hall. Photographs from the early days of the lab were displayed, along with artifacts from the earlier machines and the photodigital store. Perhaps LLNL can keep the display together as a permanent feature of the public areas in their buildings. A film narrated by John

Fletcher from LLNL combines photographs, old movie footage, and a modern tour through the lab. LLNL hopes to make copies of the film available for use in courses and other demonstrations at a later date.

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## Twentieth Anniversary of DODCI

On April 6, 1984, about 200 former students, instructors, administrators, and guests gathered in celebration of the 20th anniversary of the Department of Defense Computer Institute (DODCI). Marvin M. Wofsey, professor emeritus at George Washington University and computer-security consultant at Advanced Technology Inc., organized the event. After a reception at DODCI headquarters in the Washington Navy Yard and dinner at the nearby Officers Club, the DODCI director of education, A. J. Matulevich, welcomed the celebrants and noted that seven of the nine past and present DODCI directors were on hand.

Captain Stan Foote, DODCI's first director, provided a short history of the founding of the institute. As he recalled it, by 1963 the Government Accounting Office had issued 120 reports citing ineffective management and use of computers in the federal government. Defense contracts for computing projects (e.g., the SAGE system—see the *Annals* Special Issue, Volume 5, Number 4, October 1983) were increasing. "From SAGE onward," Foote said, "most of these systems overran their budgets. The Department of Defense (DOD) as well as Congress showed considerable, major concern over those overruns, which I would say collectively were mammoth." The Naval Command Systems Support Activity (NAVCOSAC) was established at about that time to consolidate the analysis and programming efforts for a variety of strategic systems in the Navy. NAVCOSAC was installed at building 196 in the Navy Yard, and Foote asked for a little building next door to it for expansion purposes.

While Foote was testifying before a House-Senate Armed Services committee, he was asked what "all this computer jazz was about." Foote thought for a few seconds, and then offered an analogy. He told the congressman that the armed services had used analog computers for years; they had done a good job, but there were some weaknesses. If any element of a system was changed, the analog computer had to be





Marvin M. Wofsey



A. J. Matulevich



Stan Foote



George L. King



M. G. O'Connell

redesigned. It took a lot of time and cost a lot of money. "Fortunately, someone had invented a player piano along the way," explained Foote, "so you didn't have to throw away the piano—you could put a new music roll on it. Therefore, if you like Beethoven or Bach or Boogie-woogie, you have the option of choosing the music roll you want, without throwing away the piano. The same sort of thing was going on in the computer world. This congressman told me he didn't like Bach, and I told him that that was just the point. He told me that he didn't understand, but we could have our money." The next year Foote went back to ask for more money, and reminded the committee that it had given money for the piano and that he was back to get money for the music rolls. He got it.

As the government's computer-related programs continued to overrun, there was more and more concern in Congress and in DOD. A DOD official was asked by Congress how much a computer instruction cost. He convened a meeting of the services and directed that they report monthly on the number of programs written, instructions written, and their cost. "I suggested that he didn't have enough room in his office for the paper mill that he was going to have, and that it might be a reasonable thought for each service to pick one organization and have them only report monthly. As you can expect, the amount of paper that came in was more than he could handle, and the project died of its own weight."

It was recommended that the DOD Computer Institute be created to teach DOD executives the fundamentals of computing. It would report to DOD, be funded by DOD, but be run by one of the three services. The Air Force suggested that the institute be at Colorado Springs, the Army suggested West Point, and the Navy at first considered Annapolis. Foote suggested that because NAVCOSAC was already in the Navy Yard, with a building next door ready for expansion, and because every flag rank officer and general officer in the services came to Washington for duty, it should go in the Navy Yard. DOD agreed. As

Foote said, "We were able to bring it to fruition in nine months; baby DODCI was born after that normal pregnancy. That's pretty good for government work."

The current director of DODCI, Captain George L. King, Jr., spoke next about the institute's expansion over the past 20 years. In April 1964 the institute put on its first Senior Executive course at NAVCOSAC in the Navy Yard, and in October of that year it established separate facilities at the Anacostia Naval Station Annex. The Intermediate Executive course and the Command and Control course were introduced, and these three courses became the core of the DODCI curriculum for the next four years. In August 1969, DODCI moved to its permanent facility in Building 175 at the Navy Yard.

During the 1970s, said King, DODCI's enrollment and course offerings increased significantly. In 1978, it conducted 12 different courses for more than 5600 students. That year the Navy decided that it wanted to divest itself of responsibility for DODCI, and the House Appropriations Committee began reexamining the institute's overall mission as an educational institution within DOD. Finally, the Secretary of Defense, Caspar Weinberger, directed the transfer of DODCI to the National Defense University (NDU) as of October 1, 1982, with the U.S. Army to be its executive agent. In conclusion, King said: "DODCI has come a long way since 1964, when it had a staff of 15 and a budget of \$345,000. In 1984 it had a staff and faculty of 74, and a budget of \$2 million."

Colonel Michael G. O'Connell, chief of staff at NDU, discussed the relationship of DODCI to NDU and the future impact of the realignment, and then three guest speakers were asked to give their views of what computing would be like in the 1990s. Each has had ties to DODCI, and each has been named Man (sic) of the Year by the Data Processing Management Association.

Carl Hammer, who retired as Univac's director of computer sciences in 1981, has been an NDU visiting professor since 1967. He expressed his appreciation to



Ruth Davis, Grace Murray Hopper, and Carl Hammer

the pioneers of the last 40 years, including Grace Hopper, who have helped the country maintain leadership in the military, the defense establishment, and the commercial world of electronics. "We would not have this leadership if the government had not had the foresight in the 1930s and 1940s to support various programs. That being the case, DODCI is in the right place." Hammer has served at the institute on a number of occasions, and has every time "been impressed with the quality of the staff—the leadership, the instructors—and the students." He is pleased to have made a small contribution to a very important cause.

Ruth M. Davis, now president of the Pymatuning Group Inc., noted that in asking her to look at the future of computing in the 1990s, DODCI hoped she would come up with a message to Congress that would equal that of Stan Foote in setting up DODCI—but she "has no equivalent of music rolls or player pianos!" The year 1990 is only 6 years away, she said, just about enough time to get a good programming language specified, much less written, debugged, and put in place. "It took much longer than 6 years to get even a COBOL standard into existence."

In thinking about what to say about the future, Commodore Grace Murray Hopper reminded herself that in 1944 she met Mark I, "the finest gadget I ever met in my life, and I *love* a good gadget," and could never have imagined today's computers. "Now that we have Model T computers, where everyone can own

one, can we see what computers will be like in the future?" She said that one of the remarkable things that DODCI has done over the years is to remain totally academic and unbiased—not influenced by manufacturers or anyone else—"telling the straight story about computers and predicting the future." In thinking back about Mark I, she remembered Howard Hathaway Aiken, who had helped to design Mark I and who governed it and ran it with a Navy crew during World War II. He told his staff that sometime in the future he was going to have a computer that he could put under the bed. He could turn it on when he went to bed, and it would run all night without breaking down. He said that a few years after that he would have a computer that would fit in a shoebox and would run a million times faster than Mark I. Hopper said, "We laughed at him—and yet he was entirely right." Aiken had also said that the computers would not all be general purpose; some of them would be special purpose, and systems of computers would be built. We are beginning to see that happen, said Hopper.

Hopper learned at midshipman school that her job was to provide leadership, with loyalty in both directions. "We should respect and inform superiors, and take care of our crew. We went overboard on management; we must go back to true leadership." DODCI, Hopper concluded, has always taught leadership along with management, and she expects it to continue in that role.

—Rosamond W. Dana