

a harbinger of change the cutti

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imagine a library serving approximately 10,000 employees 24 hours a day, seven days a week. Imagine most of those employees are physicists, engineers, chemists, or other scientists who often work on projects related to national security (such as reducing global nuclear danger). Now imagine the employees are spread out over forty-three square miles in a fairly remote, mountainous region. How would the library overcome the challenges of the environment to meet the extensive information needs of the employees?

The Research Library at the Los Alamos National Laboratory has not only overcome the challenges and met basic needs, but also developed cutting-edge services and systems. According to director Rick Luce, the library has succeeded by following three guiding principles. "We see our innovations and our leadership sitting on the three legs of a tripod. One of those legs is the Library Without Walls, our digital library project. The second leg is the element of service. That's something we measure and feel very strongly about. The third leg is our strategic business management—our process for assessing and improving how we work. Those three things have allowed us to develop unique products and to do them rapidly."

The products have included databases customized with sophisticated search and retrieval features even before the database vendors offered them. The library also has integrated resources and moved massive amounts of data to the scientists' digital desktops. In addition, the library serves the general public during business hours. The online catalog and a large collection of unclassified technical reports are available around the clock and around the world through the library's Web site.

A peek behind the scenes at the organization's operations offers more than just a glimpse at the inner workings of a cutting-edge, customer-driven library. It reveals a vision of information services that is a harbinger of change not only for library technology, but also for the relationship between libraries and their information providers.

A HISTORY OF SCIENTIFIC EXPERTISE

Located about thirty-five miles northwest of Santa Fe, the Los Alamos National Laboratory was created in 1943 as part of the Manhattan Project. The University of California manages the facility for the Department of Energy. The laboratory is now one of 28 DOE labs across the country.

National security still is a primary part of Los Alamos' mission, but it also is one of the largest multidisciplinary scientific institutions in the world. Its overall mission is summarized in its motto: "Science Serving Society."

About one-third of the employees are physicists, one-fourth are engineers, one-sixth are chemists and materials scientists. The rest work in mathematics and computational science, biological science, geoscience, and other disciplines. Visiting scientists and students come to Los Alamos to participate in projects, and the laboratory staff collaborates with universities and industry in both basic and applied science projects.

The laboratory has always had a library. Today it has a staff of nearly fifty. More than half hold MLS degrees. Many have strong computer science and database development skills. The organizational structure is flatter than the traditional hierarchy found in many libraries, and the staff members are not bound by rigid job descriptions. These management approaches create a flexibility that is critical to operations because the library is, as Luce described it, a hybrid between an academic library with strong emphasis on collections and a special library with an emphasis on service and customized products.



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**Library at the
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Library at the Los Alamos National Laboratory

Luce joined the staff in 1991. He already was known nationally for pioneering work in integrating heterogeneous library systems in Colorado and Florida. At Los Alamos, he soon began to see a need for the library to expand its services, and he started formulating a plan that would put the operation on the cutting edge. He said the genesis of the initiative "essentially was the recognition that we worked at a world-class laboratory, and we needed to move faster relative to where we were going with our electronic services, or we were going to be left behind by our user community."

reports, and databases such as SciSearch, BIOSIS, INSPEC, and the DOE Energy Science and Technology Database.

Although only authorized laboratory employees can access the complete collection of virtual library content, Luce and his staff decided to develop the project on the Web because it provides access across multiple computing platforms, and it lets the librarians integrate resources. According to the project's Web page, the Library Without Walls "is distinguished by its integration of a broad set of library components

Citation Index," Luce said. "We wanted to make that available through the Web. At the time they told us there would be no Web product. So we licensed the database, brought it in-house, and developed a Web-based full-text retrieval tool. Other institutions in New Mexico started looking at it. Organizations like Sandia National Laboratory, the University of New Mexico, and the Phillips Air Force Research Laboratory said, 'Can we partner with you? We'd like access to that, too.'" Two years later, ISI developed a Web site.

"That would be one example of getting in front of the pack and delivering content on a very large scale. To take that example a little further, after we brought up the database, we developed alert capabilities."

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The laboratory reorganized in 1993 and the library became part of the Computing, Information, and Communications division, which comprises about seventeen groups, including the IT division. "The advantage of combining us," said Luce, "is we go to common meetings and hear where one another's business plans are moving. This has created a lot of synergy in terms of being able to tap in and upgrade infrastructure."

After the reorganization, the library upgraded infrastructure by enhancing its automation system, modernizing staff workstations, and developing a robust LAN. In 1994, the library launched the first generation of the Library Without Walls project, which established Web access to the online catalog, electronic journals, digitized Los Alamos technical

that work synergistically," and "the project's long-term goal is creation of a network of knowledge systems that facilitate collaboration among researchers."

CUSTOMIZING DATABASES

In 1995, Luce sought and received additional funding to enhance the library's initiatives. "I had one-time funding for one year," he said, "and my objective was to deliver a product back to the laboratory so good that follow-on funding would be demanded by the user community—and, indeed, that's what happened."

An example of a cutting-edge resource the library developed was a customized interface to a database from the Institute for Scientific Information. "In '95, we went to ISI and talked to them about licensing the Science

The alert feature lets an individual user create a customized research profile that is checked against the 18,000 journal citations added to the database weekly. New information matching the profile automatically generates an email notification. In addition, researchers can be notified when others cite their papers, or they can be notified when an important paper in their field is cited.

The library also has created links from the database citations to full-text articles. Luce said, "We take content—journal articles from providers where we house content locally, like Elsevier and Academic Press, as well as content from publishers where we connect to their sites, such as the American Physical Society—and we provide links from the database to that content."

The database now contains links to more than half-a-million articles. They are full-image, full-text files that can be searched for keywords, viewed on screen, and printed at a local printer. Hundreds of thousands of articles have been linked to the BIOSIS and INSPEC databases as well. "Again, we're well ahead of the market," Luce noted.

He added that one of the challenges of being a market leader is that information vendors often are not receptive to the ways the library wants to adapt their products. "They've been slow to change their economic models," he said, "and they've been slow to grasp that it would be to their advantage to partner with people to help them develop in front of the curve. With primary publishers as well as intermediary providers, such as secondary database creators, we've had to spend a great deal of time educating them about where the technology is and where it needs to move, and trying to work with them to change their paradigms so we can work together."

DIGITAL COLLECTION MANAGEMENT

By working with vendors and gradually changing paradigms, the library has reached a point where digital resources comprise a significant portion of the Los Alamos collections. The online catalog includes almost eighty databases, more than 1,200 electronic journals, over 600 electronic books, and even online video.

"We're getting videos into our catalog in two ways," said Librarian Kathy Pratt. "The first way is through the laboratory's distributed computing division, which has digitized videos on its server. A selector in the library decides which ones to add to our collection and then gives the URL to a cataloger who adds the reference to our holdings. The second way is through our own collection. We have quite a few, maybe 250

videos, and we've begun to digitize them." Public workstations with sound cards have been set up in the library to accommodate the digitized videos.

The Los Alamos information system also gives researchers access to digitized technical reports authored by laboratory staff members. We've also begun providing access to electronic technical reports from other agencies and currently link to over 2,000 of them. The library maintains a collection of 1.4 million classified and unclassified reports in microfiche and hardcopy. About 3,500 classified reports have been scanned and made available online to laboratory employees. More than 25,000 unclassified reports are available to anyone through the Web.

"We've promoted this feature at conferences around the country," said Librarian Lou Pray. "Technical librarians have been delighted to find out they can access thousands of unclassified technical reports from Los Alamos merely by visiting our online catalog."

The library staff used the experience of creating the report database to explore issues involved in electronic publishing. "When we started the Library Without Walls Project, we started with our re-

port collection," noted Associate Library Director Jackie Stack. "Digitizing the reports gave us the ability to figure out technical problems without dealing with copyright issues."

Besides the online resources, the library also provides access to a CD-ROM collection of more than twenty titles, but the staff is not building on it because it forces users to learn multiple interfaces and conduct the same searches through multiple discs. "We are moving away from CD-ROMs because desktop access and a single unified interface have been identified as most important to our customers," said Pray.

To supplement the resources available directly to the scientists, librarians are available to perform searches on hundreds of commercial and government databases not available through the Web.

"We see ourselves at the hub of scientific collaboration," said Stack. "Everything we do is moving us in that direction."

AWARD-WINNING CUSTOMER SERVICE

As Luce mentioned, the library staff considers customer service a crucial element in the library's success. Staff members continually

The library staff gather outside the library under the sign announcing their Quality New Mexico award.



Library at the Los Alamos National Laboratory

elicit feedback from clients and incorporate the suggestions into library products. "Customer-feedback is an integral part of how we do business," Pray said. "We have a database that tracks who our customers are, what products and services they use, and what they are saying about those products and services."

To collect customer data, the library uses various "listening posts," including outreach visits, focus groups, email logs of comments and complaints, and focused "voice of the customer" interviews. Pray said, "We also issue a quarterly customer survey to understand how the satisfaction level with our products and services is changing—and why." A specific library team is dedicated to managing customer data.

Last spring, the focus on service helped the library win the Quality New Mexico Roadrunner Award, which is based on the criteria for the Malcolm Baldrige National Quality Award. The Los Alamos Research Library was recognized for integrating a strong customer focus with visionary planning, for using a well-defined process to manage its business, and for providing distinguished service in support of scientific research.

The customer focus also has led to dozens of large and small innovations besides the ones already mentioned. Here's a sampling:

- The library system offers customized Web pages so employees can display information in ways that best meet their needs. "Customers can essentially create a home page on our Web server," said Frances Knudson, a Los Alamos Technical Information Specialist. "Customers can include the databases they use

and ignore the rest. They can select the top ten journals in their field. They can add links we haven't thought of yet. The page becomes a personal library for them."

- Researchers can place electronic holds on material, and they can electronically submit requests to receive books and reports through the mail. Electronic request forms are available for many other library services, including general information, photocopies, and interlibrary loan. A weekly list of new books goes out to patrons via listserv. During unstaffed hours, laboratory employees can use an automatic check-out machine. Overdue notices are sent via email.
 - Instead of positioning librarians at different desks, Los Alamos offers a combined reference/circulation desk. Staff members are cross-trained to answer various requests seamlessly.
 - The library works closely with Paul Ginsparg's preprint database (<http://xxx.lanl.gov>), an automated electronic archive and distribution server for research papers. The database represents "a phenomenon that
- started about five years ago," said Knudson. "It started out focusing on high-energy theoretical nuclear physics, but it's spread through most of the scientific disciplines. It's an electronic preprint, and it gives scientists the ability to comment on the papers. It's another model of scientific communication. It's not the final product, but it's something to make traditional publishers sit up and think."
 - When cataloging, librarians emphasize content instead of format. All formats for a document (e.g., print, Web, and microfiche) are listed on one catalog record.
 - Catalog records available through the Web are updated automatically. "We use the Geac Advance system," said Technical Information Specialist Miriam Blake. "We have a mechanism for adding links and other relevant information about electronic journals, databases, and technical reports into our catalog records. Then an automated process queries the records and builds our Web pages from them, so we don't have to manually update these pages at all," said Miriam Blake. The staff developed the first production Web interface for the Geac Advance library catalog, which spurred Geac to develop its own commercial version.

The Research Library's initiatives and database services have attracted interest far from the lab-

Lou Pray and Sharon Smith assisting customers at the service desk.



oratory. To share resources and create a medium for future technology exchange, the library has formed alliances with other institutions, including the University of New Mexico and Stanford University. The Library Without Walls project has formed partnerships with other libraries, journal publishers, and electronic database providers.

"We think it is of utmost importance to be a good community member," said Knudson. "We're not in competition with other institutions or database vendors. We're trying to develop our expertise and move faster with electronic products."

RE-AGGREGATING CONTENT

The library isn't in competition, but by moving faster, the organization reveals a changing relationship between information vendors and their clients. Instead of accepting prepackaged data off the virtual shelf, the library reorganizes and integrates information from various providers to create dynamic new resources. This involves not only customizing and reformulating the off-the-shelf databases, but also loading information from primary publishers—sometimes in the form of raw data.

"Essentially we're re-aggregating information produced by others," said Technical Information Specialist Doug Chafe. As an example, he described how the library links PDF articles to the INSPEC database on the organization's intranet. "We use a two-pronged approach. We take the INSPEC database, load it, and provide an interface. Then from publishers like Elsevier and Academic Press we load article PDFs onto our server. On both ends of the two prongs, we create something called a SICI (Serial Item and Contribution Identifier), which is a unique article identifier that can be built from bibliographic information. The INSPEC record has everything within it to build a SICI for that record. The PDFs come with an SGML file that provides the same information, so when we load the PDF files we also

create SICIs for those and put them into a database that links the SICI with the URL where we've loaded the PDF."

"When the user searches for an article, the interface queries the database to see if we have it. If we do, the system takes the URL and puts it into the record, which is then displayed on the Web. We've taken this avenue because we need to make the process as dynamic as possible. Right now we manage about a terabyte of data. And we're purchasing two terabytes more."

"Integration is really the key to how databases are managed here," said Lou Pray. She pointed out that libraries cannot get that type of integration from traditional database vendors such as DIALOG or STN. With those services, she noted, "you get the citation and then you may have to go somewhere else to get the full text."

Both integration and customization options are important for the library's multidisciplinary user community. "Our services have to go across all the disciplines—not just chemistry or physics," said Knudson, "and that's one of the driving forces for trying to merge all the databases and still come out with individualized products. We can serve a multidisciplinary laboratory, but give our customers the individual slices of information

they need. That's something we can do as a library because of our technical expertise. It's something a database vendor simply doesn't know how to do."

Knudson added that information technologies now on the drawing board may allow libraries to reduce their dependence on database companies even further. "With data mining techniques and automatic indexing, the role of database providers is changing and will be dramatically different during the next decade."

INFO-TECH FOR THE NEXT MILLENNIUM

One of the projects the library has on the drawing board is a data visualization initiative with Sandia National Laboratory. "That's something that is probably still a ways off," Director Luce said, "but we're working to try to use visualization tools to be able to navigate our way through metadata more effectively. We're trying to look at some of the relationships between data that might not be so apparent through traditional search-and-retrieval tools."

According to Chafe, an example of a visualization interface would be one that displays search results in a series of overlapping bubbles instead of a list of hits. For instance, when someone searches a

An INSPEC results screen showing electronic articles and locations.

The screenshot shows a web browser window titled "LANL Research Library: INSPEC at LANL (1969 - Present) - Netscape". The page header includes "Los Alamos Research Library INSPEC" and "NATIONAL LABORATORY". Below the header is a search bar with the text "Records Found: 3". The search criteria are "(t:combinatorics and yr:1998 and au:gn)" and "and". There are fields for "Subject" and "Submit".

Record 1 of 3:

- Article: [PDF Article](#)
- Title: Complex matrix models and statistics of branched contours of 2D surface.
- Author: Borotou, J.K., Soudashier, M., Vinter, T.
- Source: Communications in Mathematical Physics, Feb. 1998, vol 191, no 2, p 283-98
- Published: Germany: Springer-Verlag, 1998

Location Holdings:

MAIN	Holdings v 1- (1965-), Missing v 91, no 1 (1983). Last rec'd VOL 196 NO 2 / 1998. Latest issue on display. Shelves as COMMUNICATIONS IN MATHEMATICAL PHYSICS
WWW	http://link.springer.de/link/servic/00220/index.htm . Access restricted to LANL staff. Holdings v 184, no 2- (1997-)

Record 2 of 3:

- Article: [PDF Article](#) 484KB
- Title: U-ality and D-lyane combinatorics.
- Author: Fisher, E., Zornig, E.
- Source: Physics Letters B, 29 Jan. 1998, vol 418, no 1-2, p 61-9
- Published: Netherlands: Elsevier, 1998

Location Holdings:

MAIN	Holdings v 24B- (1967-), Missing v 149B, nos 4, 5 (1984); v 150B, nos 1-3, 6 (1985); v 151B, nos 1, 2 (1985). Last rec'd VOL 435 NO 1/2 / 3 SEP 1996. Latest issue on display. Shelves as PHYSICS LETTERS B
WWW	http://www.lanl.gov/journals/0272/692/ . Access restricted to LANL staff. Holdings v 341, no 1- (Dec 22, 1994-)
MAIN	All issues in stack. Holdings v 1-23 (1962-1966). Shelves as PHYSICS LETTERS