A library for the fifteenth through the twenty-first centuries

By Richard S. Cooper, Ph.D.
Acting University Librarian

University of California
San Francisco, California 94143-0840

The University of California, San Francisco (UCSF), began developing a program for a new library in 1977, started the design in 1985, began construction in 1988, and opened the library in September 1990. The primary objectives were to design and build a facility that would house print collections under optimal conditions, allow for ten years' growth, be flexible enough to permit future reconfiguration, support present and future technologies, and provide beautiful spaces in which to study. The planning process is summarized, planning concepts are outlined, and considerations for the electronic library are briefly reviewed.

The planning for a new library at the University of California, San Francisco (UCSF), began in 1977 with the appointment of David Bishop as university librarian and culminated with the opening of the new library in September 1990. In 1977, the University of California (UC) President's Office agreed to set the planning process in motion, and by 1982 UCSF had completed a long-range development plan which identified a site for the new library. Some preliminary programming for the building had been completed by the fall of 1983, when a new library became the number one campus priority for new capital projects. At that point the author joined Bishop in designing and building a dream library, a library for the 15th through the 21st centuries. Regrettably, Bishop did not live to see the culmination of his mission.

It was clear that UCSF needed a new library. The old library had become completely "landlocked" in the center of utility-intensive space better suited to teaching and research. The loading dock was shared with the cage-washing area of the animal research facility. Environmental conditions were atrocious; floods and other environmental disasters were legendary. The collections had become fragmented as the library expanded in snake-like fashion across to another building, up to another floor, back again and down to a basement. With only 66% of the minimum space recommended by then-current library standards, half of the collection was in storage; study spaces for users and work areas for library staff were inadequate, crowded, and poorly organized; and shelving arrangements had become increasingly irrational as space was desperately created for a growing collection. The reserve collection and reading room, although in contiguous space, could only be reached by exiting the library in one building and reentering from another.

The old library had become completely "landlocked" in the center of utility-intensive space better suited to teaching and research. The loading dock was shared with the cage-washing area of the animal research facility. Environmental conditions were atrocious; floods and other environmental disasters were legendary.

Bishop's vision went beyond providing adequate and comfortable study and work space, housing for a print collection, and optimal environmental controls. It included the electronic library as it would need to be configured well into the next decade. "We're planning our library at an incredibly critical time—after the electronics have been developed, but while the systems are still being defined," Bishop responded to a 1986 interviewer. "The role of the library is going to change from bringing the user in to bringing the information out" [1]. Did the advent of the computer age mean the demise of libraries as custodians of the printed word? Hardly. "These functions tend to reinforce one another," noted Bishop. "Putting this information on-line tends to increase the use of printed products" [2].

Although the need for a new library was never in doubt, the need for a high tech library took some

persuasion. To sell this vision and to encourage all segments of the campus to become involved in the planning process, the chancellor convened an all-day symposium in January 1984 to which students, faculty, campus administrators, librarians, architects, and library planners were invited to articulate visions for the new library. In August 1984 the Project Planning Guide was submitted to the UC Office of the President and in the summer of 1985 to the board of regents for approval. Subsequently, the legislature authorized funding for planning. The architectural firm of Esherick, Homsey, Dodge and Davis (EHDD) was selected, and two planning committees were formed. A project planning team met once a week for the hard-core development of the program and schematic drawings. The team consisted of the architects, the university librarian, the associate university librarian, a capital planner and a project manager from the university, a library consultant, representatives of the physical plant department, and a changing cast of various consultants. As plans were developed, they were presented to a campuswide review committee consisting of members of the faculty, student representatives, campus administrators, and key members of the planning team. At various times, meetings were held with the Academic Senate or the campus as a whole to review the progress of planning. In July 1986 the board of regents approved the architects' design and certified the environmental impact report (EIR); in November of that year the voters of California passed the Higher Education Capital Outlay Bond Fund referendum, which made construction funds available. Working drawings were completed in the summer of 1987, and construction bids were solicited in September of that year. November 1987 marked the official ground breaking and the start of a fund-raising campaign; construction itself began in January 1988.

Throughout the construction phase, the associate university librarian, with specific responsibility for defending the library program, participated in weekly meetings with the general contractor. Other participants included the design architect, the construction architect, the capital planner, the project manager, inspectors, and various subcontractors. However satisfactory the working relationship between the library and the architect in the design phase (superb in this case—uncounted drawings were torn up before everyone was satisfied), the construction phase is one of compromises, changes, negotiation, and trade-offs. Everyone has an agenda: aesthetics for the architect, profit margin for the contractor, program for the library, timetable for the campus, etc. In this phase the owner's representative, the project manager, plays a critical role in balancing the different agendas, and the quality of the inspectors hired will determine the quality of workmanship in the building. This is also a time of surprises—some things just don't work or cannot be built as designed. Because the gift campaign generated upgrades to building finishes and furnishings and resulted in substantial change orders, a critical period occurred in May 1989, which unfortunately coincided with Bishop's terminal illness. The library program suffered as the associate university librarian struggled to pick up the university librarian's burden, and some of the consequences are still being resolved.

Beneficial occupancy for equipage occurred on the original target date of August 6, 1990, contrary to everyone's expectations, given the complexity of the project and the magnitude of change orders. The month of August is the only satisfactory window for moving an academic health sciences library, and any slippage would have meant moving over the winter holidays or delaying until the following summer. By June 1990 it was apparent that the library was caught between the proverbial rock and hard place: conventional wisdom said delay the move, but the move contract had already been established, and plans were already afoot to develop the release space soon to be vacated. Normally about four months should elapse between completion and beneficial occupancy to ferret out the building's flaws and, in particular, to balance the heating, ventilating, and air conditioning (HVAC) systems. Then furniture should be installed, followed by equipment and collections. Finally, staff should move in. In the case of UCSF, everything happened at once, a nightmare experience that should never be repeated! The library opened its doors to the public on September 10 even though the security system was inoperative (six weeks later security guards were still present); there were no locks on any doors nor even windows in internal office areas. The building has total climate control with state-of-the-art computerized controls, and while air quality was superb, the temperature hovered at around sixty degrees for several weeks owing to a program problem.

PLANNING CONCEPTS

Growth for the collections was projected to ten years beyond the occupancy date of 1990, assuming 700,000 volumes and a projected net growth rate on campus of 6,224 volumes annually. (The remaining annual growth of 5,000 volumes will be housed in the Northern Regional Library Facility, a shared storage facility for the four northern campuses of UC.) A planning standard of 12.5 volumes per square foot was used to calculate the space allowance for bound volume holdings; other individual planning factors were used for each type of nonbook material. This yielded a figure of 52,600 assignable square feet (a.s.f.) for collections.

Space for users was based on a formula of twenty-five a.s.f. times 25% of the three-term average en-

rollment of the campus, yielding a figure of 22,730 a.s.f. for users. Although this allocation is based on student enrollment, the space actually must accommodate all students, faculty, staff, clinical faculty, consulting physicians, and members of the public who use the library.

Everyone has an agenda: aesthetics for the architect, profit margin for the contractor, program for the library, timetable for the campus, etc. In this phase the owner's representative, the project manager, plays a critical role in balancing the different agendas, and the quality of the inspectors hired will determine the quality of workmanship in the building.

Staff space, which covers all workstations and service areas, was based on a planning factor of 168.75 a.s.f. per actual budgeted full-time library employee (70.95 FTE). This yielded a figure of 11,970 a.s.f.

In addition to the 87,300 a.s.f. assigned for library purposes, 1,000 a.s.f. were allocated for the history of the health sciences department, based on the rationale that the library is its laboratory.

Since the building envelope was restricted by limitations on campus growth to 120,000 gross square feet (g.s.f.), a high efficiency ratio was necessary to achieve 88,300 a.s.f. from this. Clothes closets were sacrificed, and some additional space was gained by ingeniously including parts of the mechanical plant on the two levels of parking built beneath the library (a separately funded project) that, because they were open at the sides, were not included in the space calculations.

Other planning considerations were not developed by formula but were based on the desire to have flexible space and to be able to accommodate new computing and telecommunications technologies. To accommodate the former, a steel moment frame with internal columns was the preferred mode of construction, rather than interior concrete shear walls, and except for the first two levels, this was achieved. The original intent of having all five floors able to support the weight of compact shelving was quashed in the value engineering phase, but a waffle slab was retained on the first level for this purpose. To accommodate emerging technologies, a consultant was retained in the first part of the project to develop the space requirements and location of cable trays, as well as a budget for what eventually became GALEN℠ (General Access Library Electronic Network)*.

* GALEN is a trademark of UCSF.

Figure 1
West facade, UCSF library (photograph by Deborah Stinski)

The schematic design phase dealt with a host of additional challenges. The new library is sited on a steep hillside with two levels below and three above street level (Figure 1). A tunnel needed to be incorporated into the library building to permit exiting from the parking structure underneath the adjacent building; this determined the location of the library's loading dock and freight elevator. Since the north and west facades of the building face a residential neighborhood and Golden Gate Park, designers desired to soften the appearance of the building (and the campus) by stepping the building down the hillside in a series of terraces (Figure 2); this, with the smallness of the footprint as determined by the site,

Figure 2
Oriental garden, fifth floor terrace, UCSF library (photograph by Deborah Stinski)

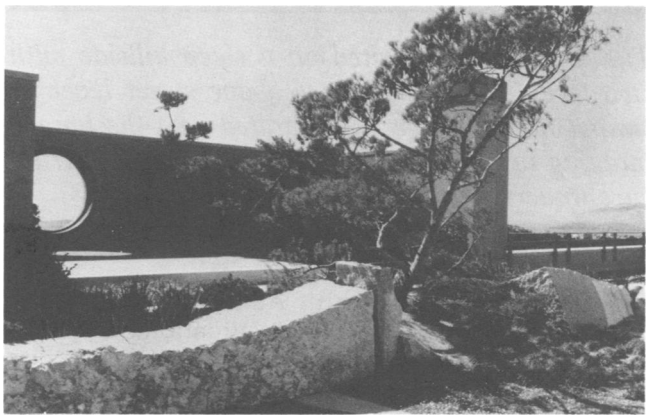
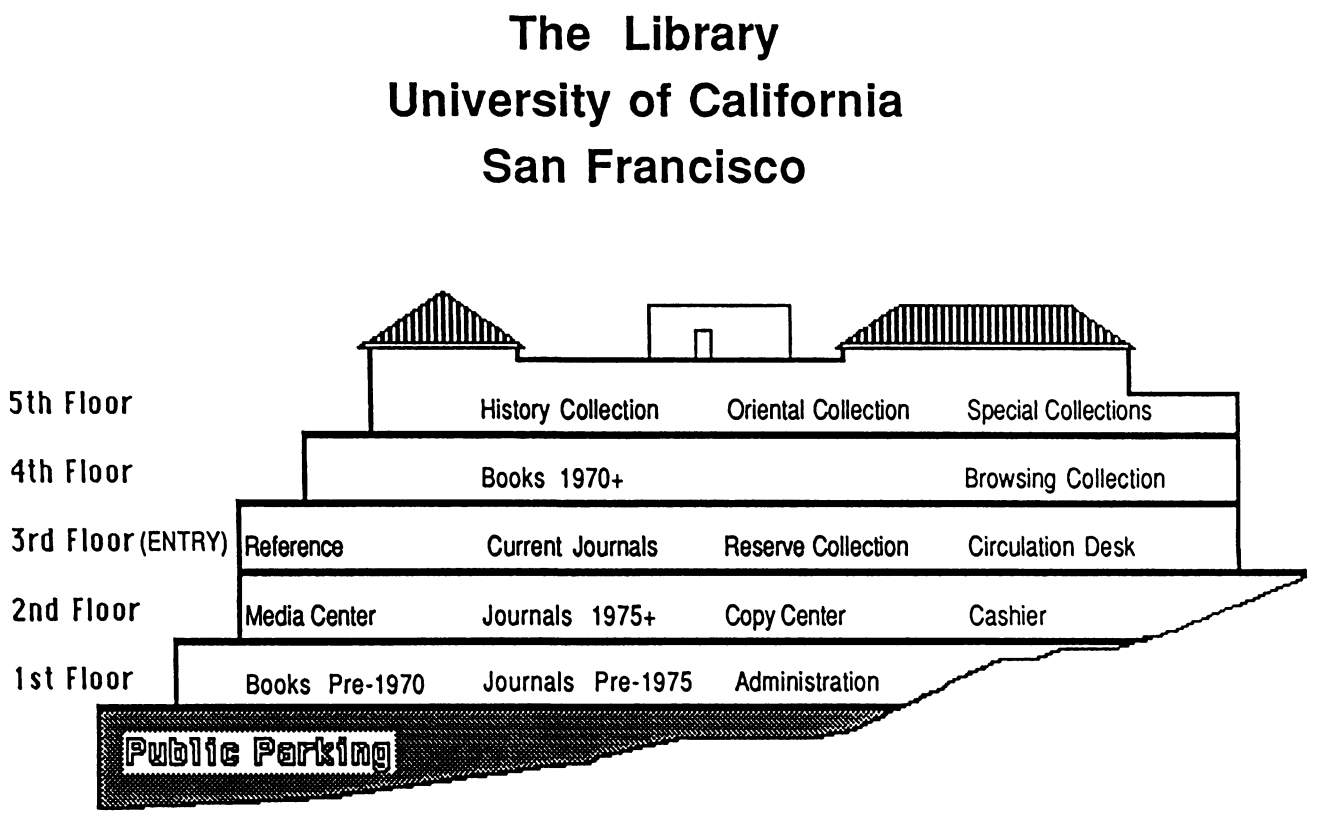


Figure 3
Profile of the five-level UCSF library



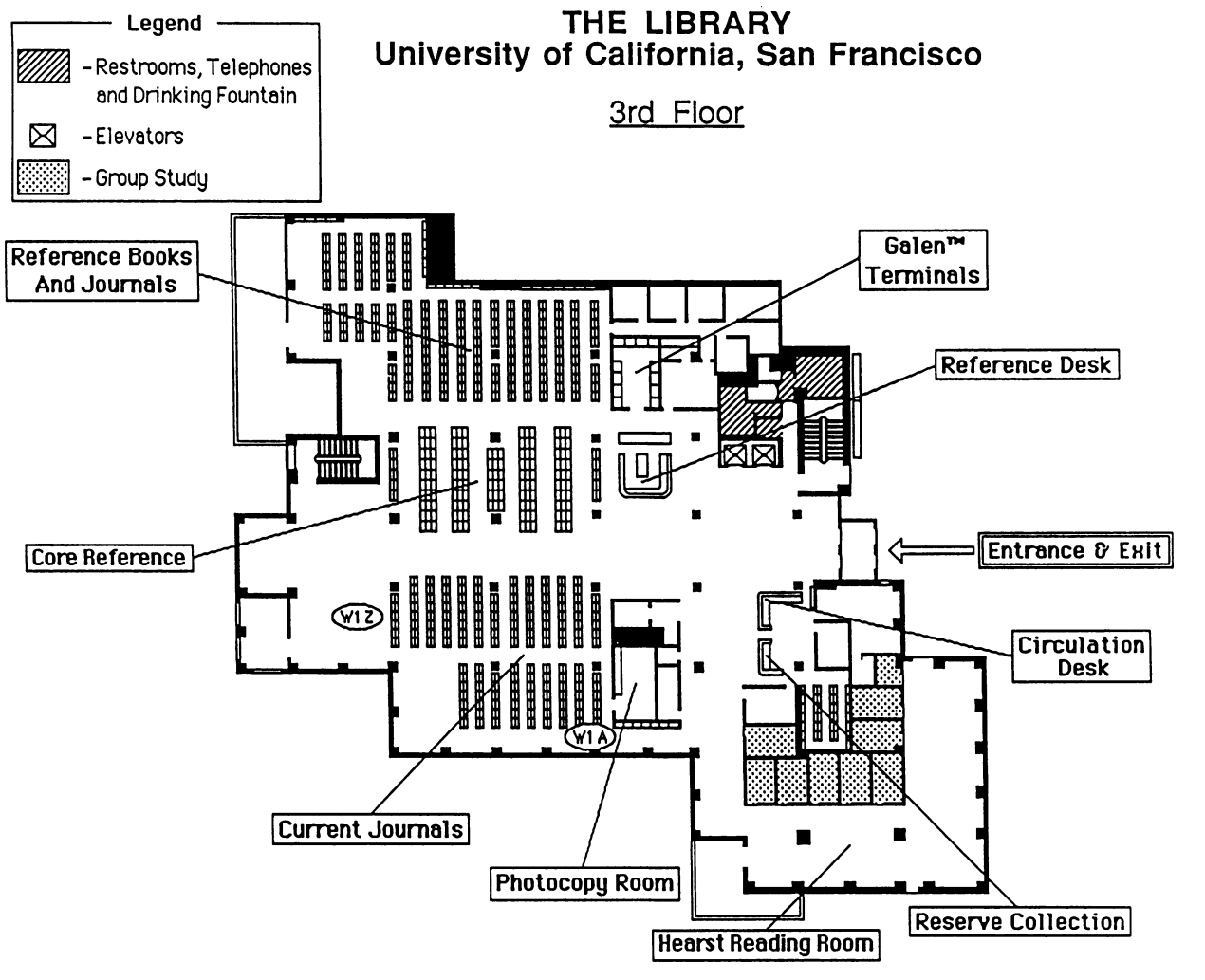
left few choices as to where elevators, stairwells, and rest rooms stacked one upon another could be situated to be both functional and consonant with the programmatic organization of the building. These limitations, along with requirements to meet all applicable handicapped access, fire, seismic, and California/

The new library is sited on a steep hillside with two levels below and three above street level. A tunnel needed to be incorporated into the library building to permit exiting from the parking structure underneath the adjacent building.

Office of Safety and Health Administration (CAL/OSHA) codes created a difficult situation. Additionally, in the interest of good civic relations there was a desire to meet the building height limitations of local building ordinances, even though the university as a state institution was not subject to them. The reduction in ceiling heights inevitably led to conflicts where the mechanical, electrical, and plumbing systems competed for available space.

Despite all these constraints, the solution was a workable one (Figure 3). Since the entry is on the middle floor of the building, the most important services and collections (circulation and reserve books, the reference desk, the reference collection, and current journals) are grouped in the middle, similar to a sandwich (Figure 4). Monographs published since 1970 are on the floor above, and bound journals from 1975 to date are on the floor below. All pre-1970 books and pre-1975 journals are on the first (bottom) floor, for the most part in compact shelving (Figure 5). Special collections (the history of medicine collection, oriental collection, and rare book collection) are on the fifth floor (Figures 6–7). A browsing room, the only recreational collection on campus, is on the fourth floor (Figures 8–9), and a large copy center with a cashier's office is on the second floor. Library administration and technical services are on the first floor. Every floor has a room with copy machines and a room with GALEN terminals (Figure 10); GALEN ter-

Figure 4
Third floor, UCSF library



minals are also scattered about the library for stand-up use. Seating throughout the library is available for more than 900 users and includes fifteen group study rooms accommodating six persons each and twelve faculty carrels, in addition to seating at tables and carrels and lounge seating.

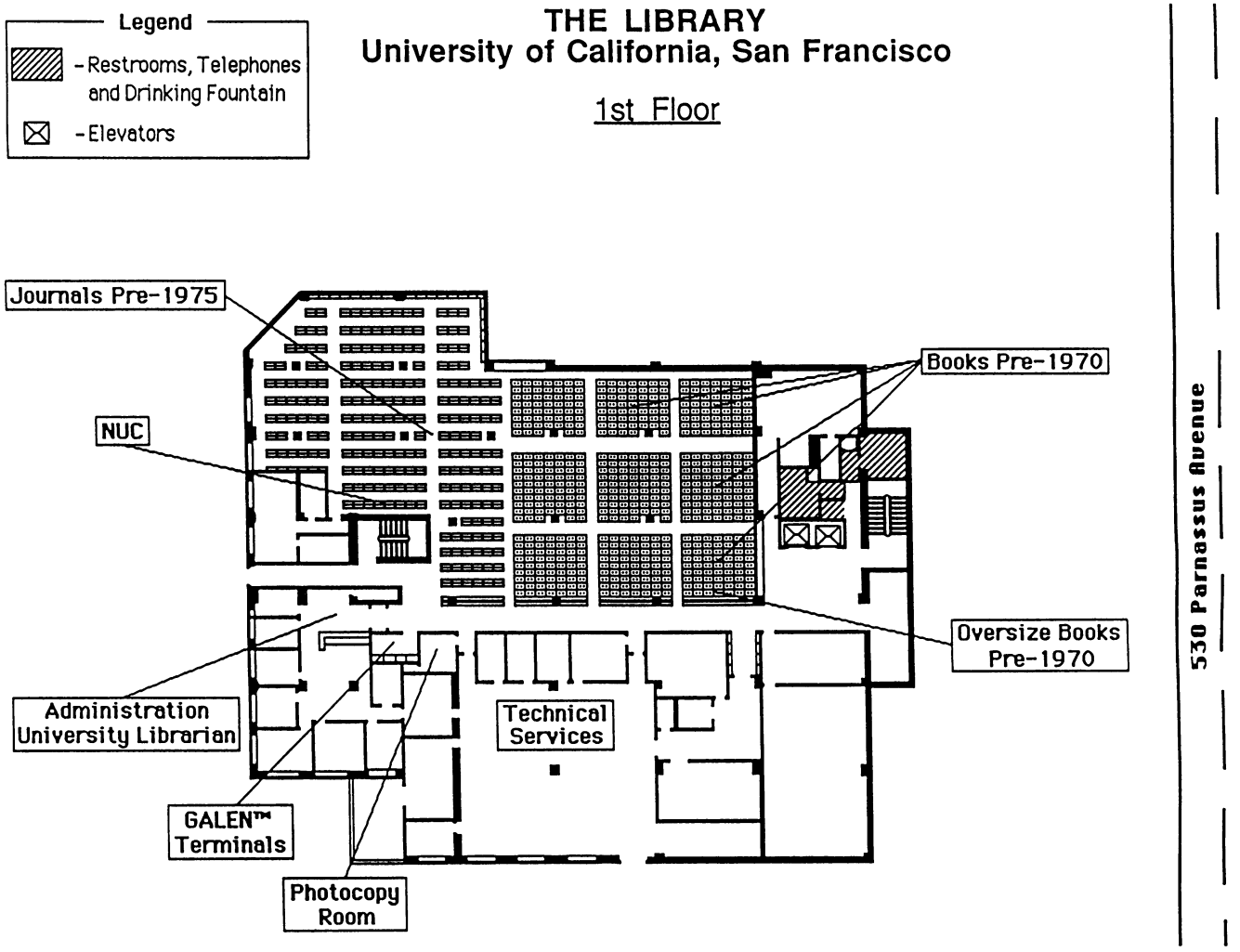
The media center on the second floor consists of an autodidactic learning resources area and a bibliographic instruction classroom, all on a raised computer floor (Figure 11). There are sixty-three single workstations in the media center and three group study rooms, each accommodating three individuals. These workstations are configured with DEC PC clones, MACs†, VCRs, laser disk players, or combinations thereof for interactive learning. The bibliographic instruction classroom is configured with twenty-four workstations, half PC clones and half MACs; all are linked with echoing software (Timbuktu‡ for the MACs and Close-Up LAN§ for the PC clones). The modular workstations in the bibliographic instruction classroom are portable with a small footprint and can be moved to an adjacent storage area so that the bibliographic instruction classroom can be set up as either a fifty-seat meeting room or in any possible configuration as a conference room. There is also a twelve-seat viewing room and a six-

† MAC is a registered trademark of Apple Computer.

‡ Timbuktu is a trademark of Farallon Computing Inc.

§ Close-up LAN is a trademark of Norton Lambert Corporation.

Figure 5
First floor, UCSF library



seat microform area. The entire media center is on its own subnetwork, linked to the other library LANs.

Programs accommodated on the first floor include a preservation lab (128 a.s.f.) and storage for the university archives in compact shelving (336 a.s.f.) with a staging area for working with the archives (98 a.s.f.). A generous supply room on the first floor and staging areas on the first and second floors, along with an exhibit preparation area on the fifth floor, provide space for the problematic program areas that are so often overlooked or inadequately provided for or arise subsequent to completion of the building. Access to all staff areas is controlled by card-operated locks (Schlage Intellis**), which permit access closely tailored to staff needs and provide a record, if needed, of who goes where.

GALEN

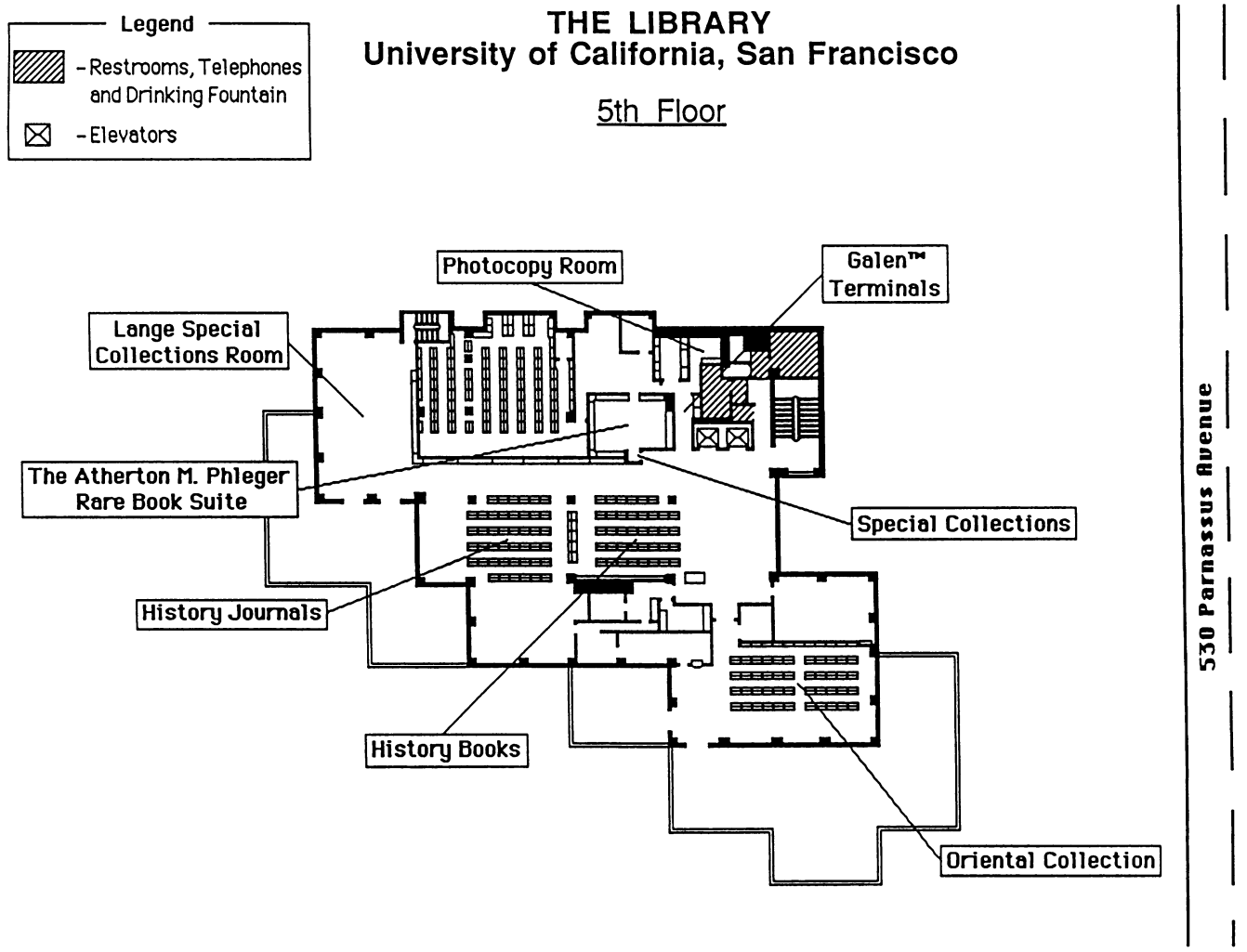
Early in the planning process a consultant was retained to develop the space requirements and budget for computer-based systems. Based on some simple planning assumptions (that two minicomputers used for accessing the MELVYL†† system would be supplemented by a library minicomputer, in addition to an INNOPAC‡‡), a footprint for the computer room

** Intellis is a registered trademark of Ingersoll Rand.

†† MELVYL is a registered trademark of the UC.

‡‡ INNOPAC is a registered trademark of Innovative Interfaces.

Figure 6
Fifth floor, UCSF library



was developed, as well as cable tray schematic layouts and a projected budget of $3 million (to be raised from donor contributions) for equipment. The subsequent development of the GALEN system, named by Bishop, took on a life of its own as a development project but was inextricable from the planning for the building itself. The consultant was brought back into the planning fourteen months before completion of the building to complete the cabling specifications and to resolve a problem naively thought to be simple, but that instead became the GALEN project: the problem of bringing multiple databases, each hitherto accessed by dedicated terminals, to the desktop of each library employee.

The databases in use at that time were MELVYL, INNOVACQ§§§, INNOPAC, and OCLC. In addition, a few micros accessed dial-up databases. MELVYL is the union catalog of the nine UC campuses and contains, in addition, serials holdings information on other California institutions. Several other databases are mounted on MELVYL, including five years of MEDLINE and Current Contents. It was obvious that workstations dedicated to accessing a single database were both impractical and impossible to accommodate in the footprint given. The idea of a front end for staff to access these databases immediately suggested that this would be an ideal solution for public

§§ INNOVACQ is a registered trademark of Innovative Interfaces.

Figure 7
Fifth floor lobby, UCSF library (photograph by Paul Fusco)

access as well. This project was dubbed GALEN and, realizing the potential it had for providing access to information beyond the confines of the library itself and the implications this had for campus information technology planning, a policy and oversight committee was established. This committee included high-level representation from the library, the academic vice-chancellor's office, information technology services, and a project manger hired to oversee development.

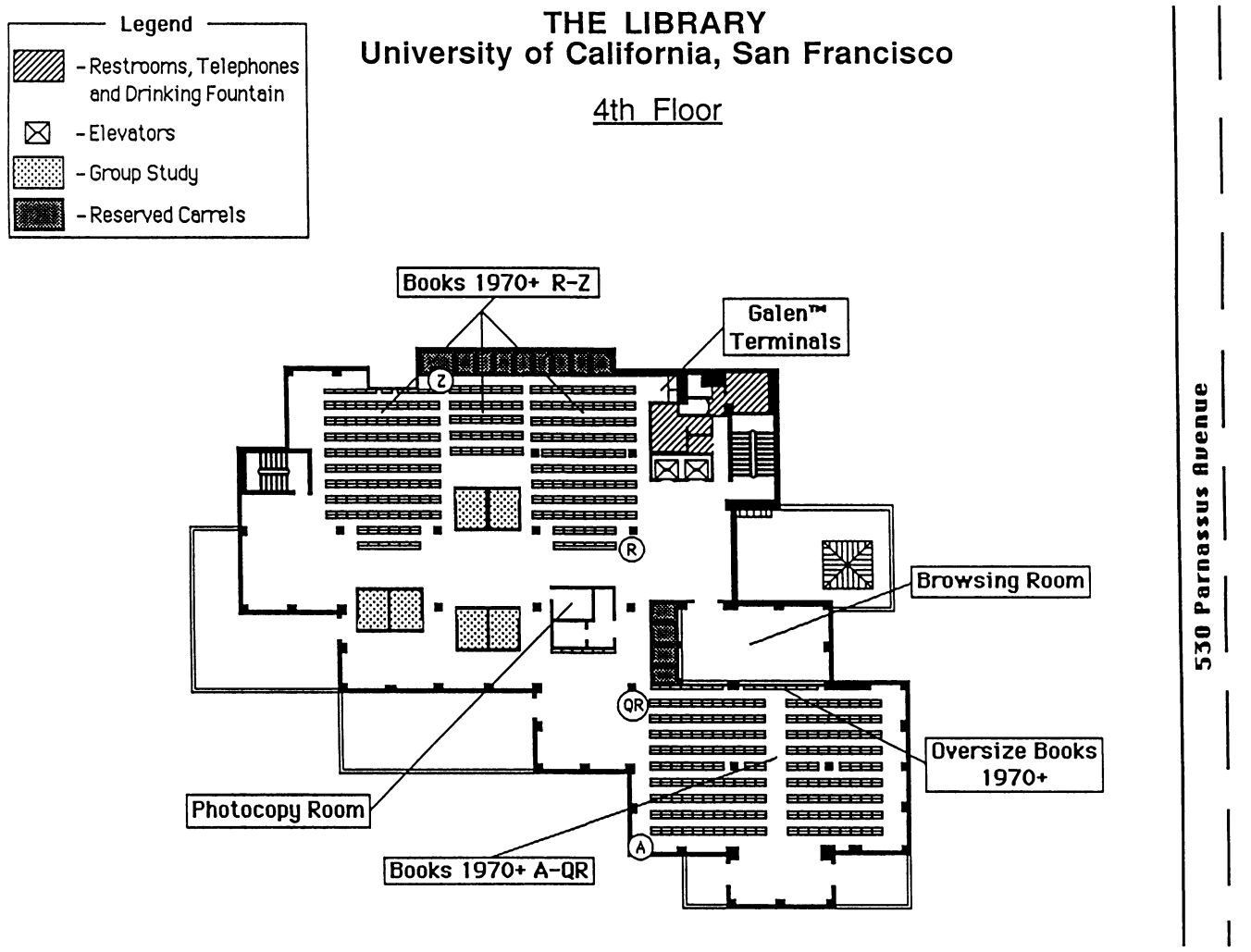
It was obvious that workstations dedicated to accessing a single database were both impractical and impossible to accommodate in the footprint given. The idea of a front end for staff to access these databases immediately suggested that this would be an ideal solution for public access as well.

The desires of this group were daunting:

- the provision of a seamless and transparent interface to multiple databases which would permit the results of one search to be entered into a subsequent search in another database without rekeying
- the ability to plug the results of these searches into queries of online public access catalogs (OPACs) in order to determine ownership and availability, and to turn a negative response on the former into an interlibrary loan request or a negative on the latter into a hold
- the ability to build a file which could be sent off to an electronic address, printed, or downloaded to a floppy disk on the spot
- the availability of both PCs and MACs so that users would be confronted with familiar hardware and could download data in compatible formats
- CD-ROMs available on the network; etc.

An additional task of phase one, targeted for completion on August 31, 1991, was the specification, development, and installation of systems to support

Figure 8
Fourth floor, UCSF library



the media center, so that these stations would support additional applications programs such as word processing, spread sheets, and statistical packages, as well as computer assisted instruction (CAI) materials and simulation exercises.

During phase two, targeted for completion on December 31, 1993, image retrieval capability will be developed; GALEN will be packaged for installation on any workstation, anywhere on campus; and integration with other campus information resources will begin. Artificial intelligence capabilities will be developed in phase three, ending on December 31, 1995. The overall budget for this ambitious project (a desktop IAIMS, as it were) is approximately $5,557,565.

A technical planning team consisting of the project manager, library systems officer, associate university librarian, computer center director, and two consultants wrestled with the technical issues, and given the requirements placed on the project, these did not yield easy answers. The process of determining what would work was lengthy and intensive. Every factor was a variable: whether to base GALEN on a mini- or microcomputer, which microcomputer LAN operating system to select, whether to use dedicated servers or a peer-to-peer network, what the memory size of the workstation shell should be, whether to support MACs and PCs on the same or separate networks, what cost and performance should be, which ethernet*** boards to choose (and in particular soft-

*** Ethernet was a trademark of the Xerox Corporation, but has now passed into generic use.

Figure 9
Browsing room, fourth floor, UCSF library (photograph by Paul Fusco)

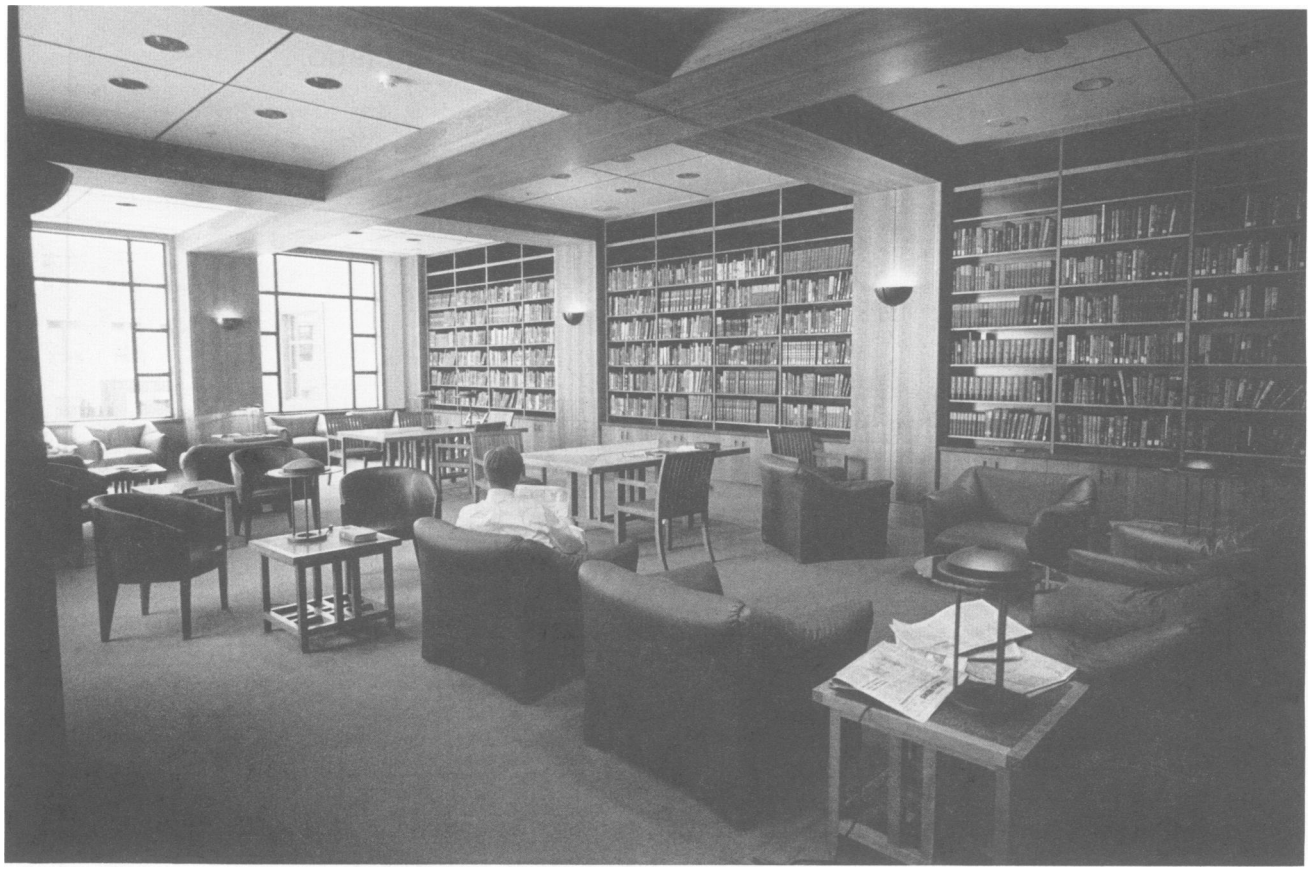


Figure 10
GALEN terminal room, third floor, UCSF library (photograph by Paul Fusco)

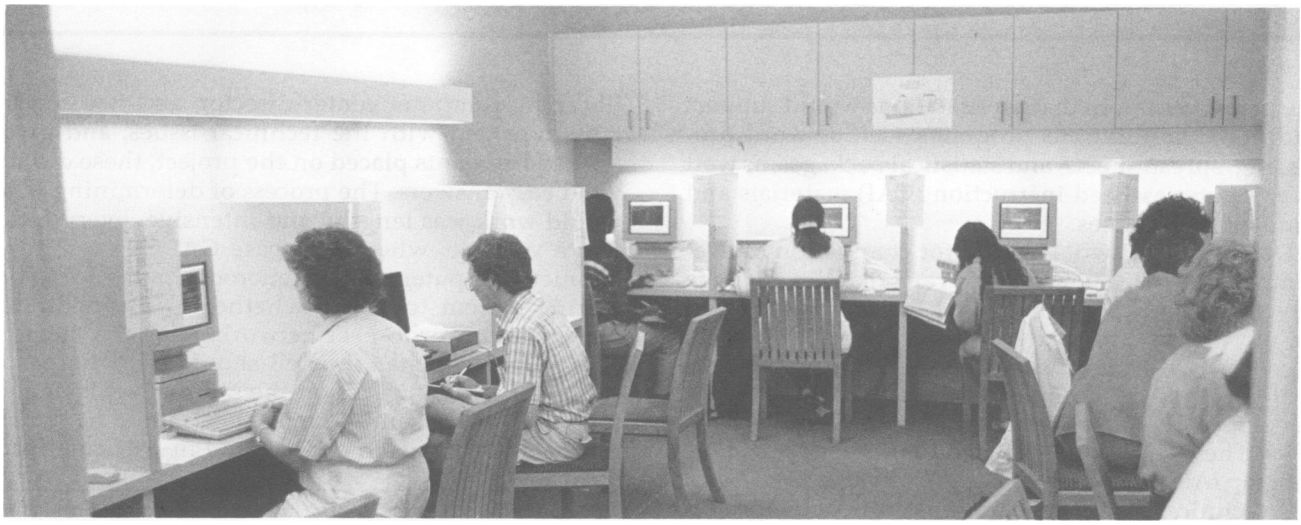
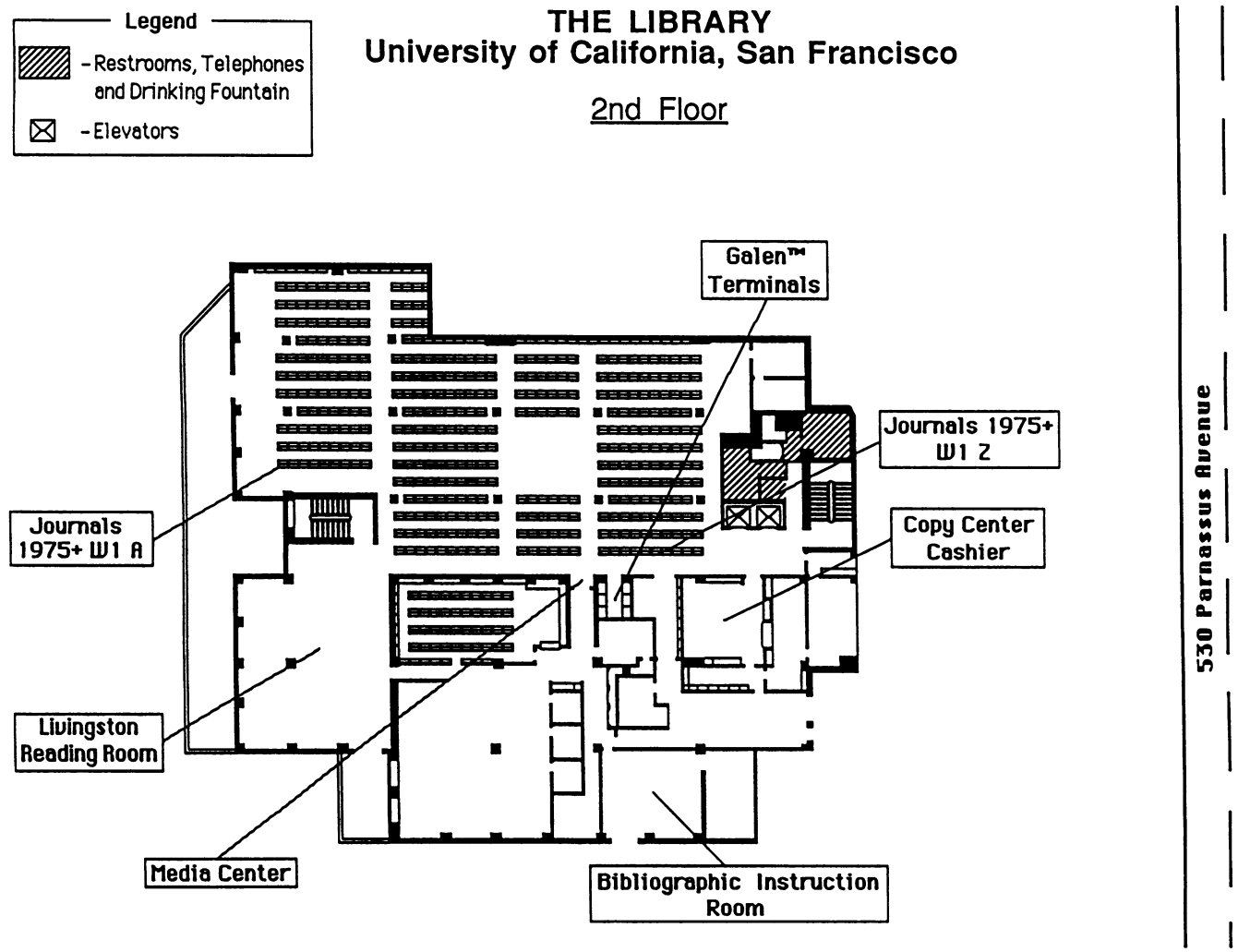


Figure 11
Second floor, UCSF library



ware driver availability, both for the selected network operating system and the selected TCP/IP software), which LAN platform to use, what desktop devices to buy. Regardless of vendor promises, the only guarantee that any one device, program, or product will work with any others is onsite testing.

GALEN became an integral part of the major issue of how to cable the building and how to terminate the wire at the workstation. Owing to the need to accommodate both existing and future technologies, the cost considerations for installing or failing to install specific types or configurations of wiring, and the desire of fund-raisers to solicit corporate support or gifts in kind from the computer industry, a painful process of elimination began. Elimination of a token ring network resulted in a savings of $750,000. Subsequently all types of coaxial cable and shielded twisted pairs were eliminated. Eventually a 250-node network using both 10BaseT††† ethernet over unshielded twisted pair and Fiber Distributed Data Interface

††† 10BaseT is a specification for supporting baseband signaling at 10 megabits per second over twisted-pair wiring. It is a probabilistic media access protocol of the Carrier Sense Multiple Access with Collision Detection (CSMA/CD) type and is covered by a draft standard of IEEE's 802.3 Committee.

‡‡‡ FDDI is a protocol, developed by Committee X3T9 of the American National Standards Institute, for high-speed LANs employing fiber-optic technology. It features dual-ring topology with individual nodes connected by point-to-point fiber. Media access is controlled by a token passing protocol similar to the IEEE 802.5 protocols, and it supports a transmission speed of 100 megabytes per second. Saffady provides a more complete description [3].

(FDDI)‡‡‡ compatible fiber-optic cable was selected, permitting transmission now at 10 megabits per second over the twisted pair and eventual migration to the fiber-optic cable with transmission at 100 megabits per second. One caveat to the library planner: if one uses computer/data communications consultants (and you should), retain them throughout the project. UCSF initial planning was predicated on tying in to a campus broadband network backbone. During the hiatus in this consultancy, unbeknownst to us, a baseband backbone was installed. When the consultant was brought back toward the end of the project this meant that there were insufficient wiring closets and some user space had to be cannibalized to create them.

Unbeknownst to us, a baseband backbone was installed. When the consultant was brought back toward the end of the project this meant that there were insufficient wiring closets and some user space had to be cannibalized to create them.

Bishop's "library for the 15th through the 21st centuries" is now a reality. Bishop told an interviewer that "our biggest challenge is to make sure there is a conduit, a plug and a wire wherever they're needed" [4]. This was achieved, and a building of exquisite beauty has been created to honor his memory.

REFERENCES

1. BAIN LJ. One for the books. UCSF Mag 1986 Oct;9(3):14-31.
2. IBID.
3. SAFFADY W. Local area networks: a survey of the technology. Libr Tech Rep 1990 Jan-Feb;(26):1.
4. BAIN, op. cit.

Received November 1990; accepted November 1990

APPENDIX

Library planning and construction data

Architect	Esherick, Homsey, Dodge and Davis
Contractor	S. J. Amoroso
Furniture	
Designer	Simon Martin-Vegue Winkelstein Morris
Builder	Fetzer, Inc.
Gross square feet	120,000
Net square feet	88,300
Project cost	$40,379,829
Construction	$36,661,444
Furnishings	$ 1,132,828
GALEN	$ 2,267,832
Collection moving	$ 317,725
Linear feet of shelving	100,868
Main book/journal collection	68,320
Compact shelving	25,032
Rare books and archives	7,511
Public seating (number of seats)	904
Study tables	263
Carrels (freestanding)	245
Lounge seating	93
Media workstations	73
Classroom	24
Group study rooms (15)	87
Faculty enclosed carrels	12
GALEN terminals and reference bars	86
Viewing room	12
Group media rooms (3)	9
Ground breaking	November 1987
Opening	September 1990
Dedication	March 1991