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Library Trends

University Library Buildings

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Library Trends, a quarterly journal of librarianship, provides a medium for evaluative recapitulation of current thought and practice, searching for those ideas and procedures which hold the greatest potentialities for the future.

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Introduction: A Contribution Toward Planning University Library Buildings

DAVID C. WEBER

December 16, 1963, was a significant day for higher education, for on that day Congress passed the Higher Education Facilities Act. Libraries received 22 percent of the first $470,000,000 granted, and nearly a half billion dollars a year is the current appropriation level for undergraduate and graduate grants and for loans, with the authorization being three times this level. But this should only be the beginning. The Carnegie Commission on the Future of Higher Education last year recommended that Congress increase federal aid to higher education in all forms from its present level of three and a half billion a year to thirteen billion by 1976. In addition, private revenue sources would, hopefully, continue to pay half of the necessary level of total expenditure, while the responsibility of the states would be reduced from 27 percent to 17 percent.

There are still major universities with library buildings dating from the turn of the century—clearly outdated and incapable of meeting the needs for books, readers and staff in the latter third of this century. New colleges and universities are being created, and an increasing number of branches is being added to long established state universities. All of this has made the 1960's a fantastic period of academic growth and library construction; there appears to be good reason to expect the 1970's to exceed the strides of the past decade.

With all this activity, there is a need as never before for adequate guides for the planning of library buildings which will meet the needs of institutions for fifty to eighty years. Although some of the classics in the literature are still useful, there are enough new problems and complexities that another publication treating university library buildings needs no apology. This issue of Library Trends was designed in particular to review developments in university library

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buildings over the past two decades and to give special attention to some of the more difficult areas where new trends in higher education are stretching the technology, requiring new planning techniques, and treading ground not covered by published information.

There are a number of landmarks in the literature which still serve to help an institution which is planning a new library facility. In 1941 Wheeler and Githens' *The American Public Library Building* appeared and its suggestions can still be applied with profit to an academic setting. In 1946 Herman H. Fussler directed an institute at the University of Chicago Graduate Library School, and published its proceedings as *Library Buildings for Library Service*, which covered broadly and competently a number of the most significant topics of interest at that time. In 1949 the famous book *Planning the University Library Building* by John Burchard, Charles David, and Julian Boyd appeared. This work was the result of some years of discussions by librarians, architects, and engineers as members of the Cooperative Committee on Library Building Plans. This is another classic still valuable for modern application.

In 1952 the first Library Buildings Plans Institute was staged by the Association of College and Reference Libraries' Building Committee. This was followed by a series of annual institutes with published proceedings. These proceedings are of uneven value yet occasionally have an extraordinary paper on such important issues as modular design or compact storage of books. In 1960 Ralph W. Ellsworth privately published his stimulating compendium entitled *Planning the College and University Library Building: A Book for Campus Planners and Architects*. In 1963 Anthony Thompson, a British architect, published his useful *Library Buildings of Britain and Europe: An International Study* which included a theoretical discussion, bibliographical citations, and plans and details of a large number of libraries in Europe as well as some in the western hemisphere.

The modern classic is without doubt Keyes D. Metcalf's *Planning Academic and Research Library Buildings*. This should be on the shelf of not only the librarian but also the architect and planner of any institution which is undertaking a major library project. Metcalf's treatise incorporates the wisdom of this eminent academic library building expert and is comprehensive, detailed, and lucid; however, even in this book there are areas where recent developments have not been covered extensively.
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This issue of *Library Trends* was in some measure designed as a supplement and an updating of Metcalf's work; it studies developments in this decade which have created new problems, which make use of new techniques, which form new trends, and which are leading to new successes while undoubtedly creating some new challenges and problems in the planning of effective university library buildings.

One should not leave a brief review of the landmarks without touching upon two organizations which have provided extraordinary, although indirect, assistance to librarians. One of these is the Educational Facilities Laboratories, Inc. (EFL), of the Ford Foundation. EFL supported the 1964 Colorado Institute for the Training of Library Building Consultants and has funded a number of studies and many reports on a wide variety of educational and library building needs. EFL supported projects resulting in such publications as the 1964 pamphlet on *Study Carrels: Designs for Independent Study Space*, the excellent 1967 pamphlet, *The Impact of Technology on the Library Building*, and *Environmental Evaluations of 1965*. Its efforts are commendatory and constitute required reading for anyone planning educational facilities for the future. The second publisher is the United States Office of Education which has obvious interests in seeing that its grants to educational institutions are used wisely and economically. It has supported a good deal of research; one of the best products has been *Educational Facilities with New Media*.

Anyone wishing to prepare himself thoroughly for a major library building effort, would undoubtedly profit by studying some important publications in the fields outside the educational one. There are a number of monographs which provide careful or scholarly treatment of architectural problems and should certainly be considered background reading for anyone working in this area. (A number of such works are listed in the additional reference section.)

A work useful in giving a clear understanding of the actual process of campus building design is *University Space Planning: Translating the Educational Program of a University into Physical Facility Requirements* by Harlan D. Bareither and Jerry L. Schillinger. Such items can be supplemented for specific problems by citations provided by an architect.

To introduce the articles which follow, it may be useful to summarize some of the more recent criticisms made of university library buildings. Any building is bound to have weaknesses, yet when errors
recur in many building efforts and when librarians and architects have not gained wisdom from the errors of the past, it is a sad commentary on the usefulness of librarians who are supposed to preserve and make available the records of past thought and experience.

In a 1952 *Library Trends*, Ernest J. Reece provided a most competent review of trends which concluded with the statement: "Persons exploring library problems have commented . . . that there exists no scientific basis for evaluating library buildings and therefore for planning them . . . . There are questions too about flexibility, and whether it should be applied to a building as a whole; and the same about expansibility, since even it must have limits. There are also insufficiencies to be overcome on the constructional side. . . ."\(^{13}\)

It is curious that a dozen years later Verner W. Clapp, then President of the Council on Library Resources, iterated that "there is little that can be called scientific in the development of library architecture."\(^{14}\) Clapp proposed that studies for improved building design constitute an essential program for overcoming the obstacles in the future of the research library. He stated that the experience which is used in planning buildings is "for the most part almost entirely qualitative and rule-of-thumb in character and rarely represents the testing of specific alternatives or hypotheses."\(^{14}\) Enumerating a selection of building weaknesses, he then refers to problems of supervision, the ratio of seating capacity to enrollment, the speed of delivery of books, exit controls, illumination, departmentation, book storage facilities, and concludes that "a program of needed research should be laid out and followed."\(^{15}\)

Writing three years before Clapp, Ralph Ellsworth outlined his targets for research in the Rutgers "State of the Library Art" volume on Buildings.\(^{16}\) Ellsworth reviews a great number of aspects of the building program and gives his personal assessment of them. He points out where no research is needed and outlines those that need effort. Concerning reading quarters for students, Ellsworth states that "This is an important problem. It needs to be studied in terms of campus-wide study facilities and in terms of what the student needs to read. The problem is somewhat intangible but should be tackled. Different methods of teaching should be analyzed in terms of the study conditions they require."\(^{17}\) There are echoes of this research need in the work by Robert Sommer of the Department of Psychology, University of California, Davis, in his work on reading quarters and degrees of privacy. Writing in 1967, Sommer stated that data on the use of

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study carrels and student reaction to them do not support recommendations for substantial increases in carrel facilities, although some authors have recently considered that 75 to 85 percent of all library seating should be of an individual carrel nature. As much as library design has improved, the study areas remain critical and are almost never handled in ways which meet most of the students' stated desires.

Another over-all critique may be cited. Writing about libraries in Bricks and Mortarboards, a 1964 report from the Educational Facilities Laboratories on college planning and building, Alvin Toffler states:

When the modular revolution began, shortly after World War II, its critics charged that it would create large numbers of standardized, factory-like libraries across the country. Similar design principles had been used in hasty construction of aircraft plants and similar structures during the war. Characteristically they were long, low, unbelievably bleak, and unimaginative. The loft spaces in them were too big, emphasizing the closeness of the ceilings and giving the interiors a claustrophobic appearance. The ruthless elimination of ornament heightened their look of grim, uninviting efficiency. . . .

A number of early modular libraries shared these unpleasant characteristics. But since the mid-fifties increasing attention had been paid to making college and university libraries livable.

What might be called the new humanism of the library can be seen in the way space is cut up and put together, as well as in the way it is subsequently furnished.

Toffler continues by pointing out that much of the interior of libraries in the fifties was totally unaesthetic and in a style that was "dead" as far as the students were concerned. In the words of the prominent architect, Gyo Obata, "Within the essentially horizontal spaces of the pure modular library we have very little chance to create any spaces that would add a new dimension for a person going through the building." Toffler accompanied his report with pictures to show how a few of the very best architects like Obata
have turned this design problem into modern successes. He urged libraries to follow the lead of the few who have modulated stark modularity into a new style of far greater sophistication.

This is not to say that librarians and architects have now learned how to make their buildings totally flexible, pleasing, economical, efficient and satisfactory to the students and librarians on the one hand and to the trustees and the alumni body on the other. The number of successes are unfortunately outnumbered by those not reaching this level of achievement, and there are still formidable problems.

Two problems of fundamental importance which come up at the very beginning of the planning process will be mentioned first. First, there are not adequate and comprehensive quantitative data which provide planning parameters. (A brief but inadequate set adopted for the University of California is reference number six in Muller's article.) Any set which does not cover all types of services and materials or which does not leave room for quality considerations and judgment will lead to later library frustrations. This danger is compounded when distant state government agencies exercise supervisory prerogatives on the basis of such planning parameters. There is, secondly, major disagreement amid the pressures of campus politics on the degree of library physical centralization that can be justified. This is a problem touched upon in the article by Davidson and given specific attention in Ellsworth's private publication, yet there exists no commonly accepted set of principles to help with this problem.

Financing and cost control present another difficult aspect—the obtaining of comparative cost data, an important matter when trustees may try to determine why their library building is going to cost more than one in a distant city. For example, it is not possible to take the Dow Buildings Cost Calculator and use the index for San Francisco at 389 and New York at 310 to convert the New York University Library costs for construction into a San Francisco condition. New York has to cope with winter weather; the San Francisco building must be designed for earthquake resistance. In the building index such varying construction problems and code requirements are not reckoned with; the index merely figures differences in material costs and labor. The Engineering News Record cost index is no more helpful.

A final problem to be cited is caused by building code frustra-
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tions which have not been adequately resolved for research libraries. In Chicago, for example, the code requires basement levels with stack areas to be subdivided by masonry walls and fire doors despite the fact that they hold a single collection. The Uniform Building Code (Section 3304.C) prevents dead-ended stack aisles of more than six sections. The waste space under stairs at the lowest level cannot be utilized (Section 3308.F). The constraints upon fire exits and panic hardware on doors (Section 3307-3315) and the inability to lock up a research library, as one would lock a vault with rare materials, are further evidence that librarians and academic administrators have not stated their case before state boards as persuasively as have fire marshals and building inspectors.

One could easily continue with a list of mistakes and frustrations which librarians face when planning and seeing through the construction of new facilities. The 1965 Library Buildings Institute proceedings include seventeen pages devoted to mistakes; note especially those singled out by Jesse.

In an effort to publicize important improvements in the design of university libraries and to help reduce the more egregious errors, the authors of this issue of Library Trends deal comprehensively with a selection of major current issues in the planning of libraries. The first three topics were chosen to provide summaries of what is happening, why it is occurring, and how it is being achieved. The next eight articles provide practical detail on some of the more difficult and challenging of the major problem areas in designing university library buildings.

The paper on "Design Fashions" surveys major university architectural trends in this century. "Significant Developments" concentrates on significant changes in library space treatment during the past twenty years. "Master Planning" refers to methods of planning as well as the treatment of major units in the library system. Specific practical problems are handled in chapters which treat them in more detail than the three above. "Financing" surveys the range of issues and illuminates the complexities in understanding costs. "Urban Building Problems" studies particular problems accentuated under urban conditions. "Undergraduate Libraries" deals with the philosophy of such a structure as well as special internal conditions. The "Branch Library" paper highlights space problems due to decentralization, the nature of branch areas, and the storage library facility. "Special Collections" are treated in a comparison of the more success-
ful designs of the past thirty years. The special characteristics of "Media" facilities are given a thorough review. "Lighting and Mechanical Progress," an increasingly difficult field, is given detailed analysis. "Automation," a major issue requiring difficult decisions, is here given a practical treatment.

Each of the papers is by an acknowledged expert. Not that it is claimed that these are definitive statements; on the contrary, these authors are keenly aware of the rapid developments in space planning and they are dealing with difficult current issues in the design of university libraries. All who shared in this publication hope it will be a useful document and aid in the goal of producing better quarters for library service to university communities.

References

1. In a 1963 study of university library buildings (Samore, Theodore. "Academic Library Buildings: Needs, Legislation, Inventory," College & Research Libraries, 25:297, July 1964.), 17 percent were still in structures erected prior to 1923 and another 17 percent between 1923 and 1932. Richard Dober has made a severe but candid comment that "There are few pre-World War II libraries worth continuing in use as a library. Expansion of these monuments is costly and difficult, and usually accomplished only through the desecration of the stagecraft qualities of design they usually possess." (Campus Planning. New York, Reinhold Corp., 1964, p. 91.)


12. Bareither, Harlan D. and Schillinger, Jerry L. University Space Planning:
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Translating the Educational Program of a University into Physical Facility Requirements. Urbana, University of Illinois Press, 1968.


15. Ibid., p. 103.


17. Ibid., p. 127.


20. Quoted in ibid., p. 80.


23. One absurdity appears in the California Administrative Code, Title 19. Public Safety, issued by the State Fire Marshal. Article 33.01 defines “occupant load” on which exiting capacity must be calculated; and, despite the actual number of seats in the library, the minimum occupancy is figured by dividing the total floor area by fifteen which is the only per capita square footage allowed for libraries! Thus a 300,000 net square foot research library seating 1,000 readers must have exiting capacity for 20,000 unless the architect can convince the County and/or State Fire Marshal to classify the stacks as “storage warehouse” where 300 square feet per occupant is permitted.


ADDITIONAL REFERENCES


DAVID C. WEBER


Design Fashions and Fads in University Libraries

HARRY SANDERS, JR.

Each city has its glamor buildings which dominate the urban pattern—a capitol or city hall, court house or post office, cathedral, temple, tower or public library. These prima donna types—their very siting usually rivaling the monumental importance of their configuration—have been the style setters throughout the history of architecture and city planning. Each generation has watched them run the design gamut—sometimes for pride and beauty; sometimes for sparkle, glitter and show; sometimes to be the avant of the avant-garde, often simply to create a better building. This, oddly, many have done.

Whereas the city has numerous glamor buildings, the college or university may have but one, and often the library is the one to wear the tiara of the campus. Here again the drama of the site of the house of books may upstage the design of the structure itself. But in spite of the theatrics, results often can be rated as excellent.

In this article, I want to comment on the major design changes (yes, many of them have been fashions and fads) of the twentieth century in university buildings—principally libraries. I shall attempt to relate their architecture to the other three-dimensional (and some two-dimensional) aspects of design. I shall at least touch on the rapidly-changing professions, old and new, which become involved in the programming, design and development of the total university library.

The past seven decades on campuses, as in cities, have seen the tempo of design changes which were previously evolutionary, increase to such a degree that they may be termed revolutionary. Since the advent of the machine age with its rapid means of transportation and communication, and all of the accompanying technology of construc-
tion, campus plans and building aesthetics have not remained fixed.

To cite one example of the rapidity of the design trend or fashion of this century: it was not long after the great architect Edward Durrell Stone began utilizing the pierced block wall (or grille) design before his work was being imitated in every state. What Stone had handled well from a functional and artistic standpoint never came out as well when “adopted” by others less skilled. Moreover, it was not long before the pierced wall or grille was being reproduced in all forms and was for sale by the square foot or square yard in stores, including the five and ten variety, across the nation.

Urban growth has surrounded and enveloped many a campus. On the other hand, many institutions have sprawled over into their neighboring communities. New campuses, of which there are many, have been established in already thickly populated areas, sometimes arbitrarily, often not without reason. Even campuses still in suburban or rural settings have themselves become urbanized in their attempt to accommodate their increasing enrollments and their teaching and research responsibilities. Few universities today are not involved with governmental agencies in their quest for physical expansion or in their search for a method of survival. All of these new involvements make us wonder how much longer we will be able to refer, as Webster does, to the campus as “the principal grounds of a college or school between the buildings or within the main inclosure.”

In brief, the grounds of places of learning have changed emphasis since 1900 from classic (but not always efficient) serenity to unprecedented (and often frenetic) growth. Building design during this same period has moved from the fluffiness of Victorian infatuated with the past to the harshness of some moderns. This is especially true of the university library building which has become an increasingly important structure during these seven decades, which has encountered technological changes and improvements, and which has gyrated about every design cliché while doing so.

Why the library especially? For a number of reasons. For one, it is synonymous with culture and higher education—and therefore, important. Academically it has long been the heart of the campus, and this role is strengthened each year.

Because of its academic position, the library also has taken the place of honor physically. Since it came into its own, and especially from 1900 onward, the library has been a popular gift package, memorializing the name of its donor. Consider, therefore, the number of crown sites allocated to libraries—on axis with the main entrance,
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the highlight of the quadrangle, at the terminus of a long vista, the
tower symbol of the campus, or in a handsome grove of trees.

A look backwards seventy years also underscores the record num-
bers and large sizes of university libraries being established. This is
attributable in part, no doubt, to Andrew Carnegie, who built up-
wards of 1,900 community libraries in the United States and Canada
between 1897 and 1918.

The period since 1900 also has witnessed major internal design in-
novations—in modularization and flexibility, book storage, lighting,
ventilation, humidity control, acoustics, audio-visual facilities, micro-
filming, and computerization. Most importantly, this period has seen
people and books brought together.

Before 1900, design changes on the university campus—as in the
city—came gradually. But as the twentieth century has gained mo-
momentum, the changes in design fashions and fads which formerly
would have taken generations have been telescoped into a matter of
months. Travel, publications, and television share this responsibility
for time compression with such additional factors as new materials,
new methods of construction, growth of population and growth of
institutions. This is true not only of the actual architecture of recent
libraries but also of its related components in interiors, furnishings,
colors, landscaping, and art.

To repeat: by no means have all of these design fashions—even all
of these design fads—been negative. On the contrary, the past seventy
years have seen enormous advances in the design professions and
have produced many great solutions for the expanding needs of our
university libraries. And today I would predict that the next twenty-
five to fifty years will have an even more powerful influence.

Only very recently have regional and city planning come of age
and been accepted as professions. Even more recent has been the
development of campus planning as a separate design profession; it
is today where city and regional planning were in 1945. Today we
are seeing the birth of still another design profession—urban design,
which promises to take over the large-scale site planning aspects of
city and regional planning as the latter become more involved in the
multi-disciplines of sociology, political science, economics and law,
in addition to three-dimensional design. Landscape architecture, too,
has come of age.

Meanwhile, architects, the senior profession, have kept pace with
the changing requirements of this jet age and have been able to
produce results which undoubtedly will take their place alongside the
great buildings of history. Interior design, too, has taken on a new dimension—that of relating to architecture. In top-quality design today art is everywhere—no longer is it something only to be "hung"; the trained artist works with the architect, the landscape architect, the interior designer, and the owner.

This coordination is, aesthetically speaking, the greatest change of the past seventy years, at least in those areas of the country which are sophisticated in their approach to design. It used to be (and unfortunately still is in some sections of this country) that a site for a building would be selected, probably by the owner, with little or no thought given as to what function it was to perform or of its relationship to an over-all plan. The architect, then engaged, would have to step in and do the best he could in designing the building. (It is only in fairly recent years that the value of programming has been recognized.) Upon a building's completion, it would be turned over to others who would proceed to inflict their tastes on it or camouflage the architecture with furnishings and landscaping. An encouraging start has been achieved in the coordination of the efforts of the designers and the owner or client.

A review of the design fashions and fads of this century reveals immense variety. We have seen the pendulum swing from the campus library designed from the outside-in (without consideration to the interior arrangement) to the one designed from the inside-out (and as for the exterior, come what may) and back again and back again. We have observed library facilities squeezed or shoe-horned into symmetrical floor plans; we have seen the unpleasing result as would-be asymmetrical compositions have been forced on axis in sites full of dramatic appeal but totally impractical.

Because of the library's relation to culture and because "culture" until twenty-five years ago was more foreign than American, we have inherited classic or Islamic temples of books, basilicas, Gothic towers, Italian campaniles, Renaissance palaces, Italian hillside towns, Georgian mansions, Spanish missions, and early London churches. We have countless examples from the Ecole des Beaux Arts, a few from Germany's Bauhaus movement, and others reminiscent of Greek Revival, Italianate, Romanesque Revival, Mid-Rococo, Gothic Revival, Neo-Gothic, Early Baroque, Neo-Renaissance, Pseudo-Gothic, and Neo-Pseudo-Early-Late-Mid-Everything!

There are blockbuster edifices located in pastoral settings with no windows; glass boxes in warm-to-hot climates (and what a boon to the manufacturers of draperies, shades and other methods of con-

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trolling the sun); view windows viewing service alleys; sunny reading decks in the Deep South and shady ones in the Far North.

There are “precious” buildings, “period” buildings, non-buildings, engineered buildings, expandable buildings, and buildings by computer. There are garage-type structures, boxcar modern, and even some “like the side of a barn.” There are precast and poured-in-place and the box-on-box style from Expo ’67. The library has witnessed everything that concrete will do up to this time; “exposed aggregate” may become the style of the sixties yet. The library was one of the principal users of the glass block in the era when it appeared that this construction feature would take over forever. (Actually, a very practical and useful product, but, in my opinion, so overused—and usually poorly used—that it has virtually disappeared from the market. Remember the curved glass block wall of the thirties. Few libraries of that period were without it.)

Because libraries oft have fallen prey to trial and error, there are examples of grand staircases leading nowhere; false fronts and their counterparts in design, “honest architecture,” which often out false-fronted the false front; stacks stacked on multi-floors of a tower served by a single elevator. There are round buildings, octagons, hexagons, star shapes, free-form; there are modular buildings designed to fit the module of the Corinthian column.

Libraries have come all the way from the dome and its rotunda through the mansard roof and the undulating roof to the flat top with its shiny and hideous mechanical equipment showing (though the model and renderings of this building no doubt showed everything clean above the fascia). There has also been the flamboyant roof or the multiple arch and the hyperbolic paraboloid or the double butterfly. But of late, many new libraries have come back to the mansard and the dome.

Our smaller campus libraries are more comparable to a city’s branch libraries which have had to struggle to fit into neighborhoods of Colonial, English, Spanish and contemporary homes. The small libraries, too, have witnessed the clichés of each generation. But clichés are less dramatic when practiced in residential scale.

Library interiors have somewhat paralleled exteriors in keeping up with the styles. To put it another way, the stages of interior design of libraries may be compared to the indoor plants of the respective generations. Starting with the potted palm and coming through the aspidistras, the rubber plant, the Boston fern and the succulent, we arrive at the greatest asset in all history to the interior decorator or
designer—the philodendron, without which there might never have been contemporary architecture.

No period of history has seen anything as revolutionary as the comings and goings of the interior furnishings styles of this century. If one starts with the last phases of late Victorian and Gay Nineties he passes through the Mission or Golden Oak period; the Mid-Grand Rapids (encompassing the Colonial and Spanish trends of the twenties); through the thirties with its Classic Moderne (with a final “e”) and the Modernistic (I use this word advisedly, though I am aware that the “ic” ending is dropped when describing good modern or contemporary design); through a short but powerful spell of Japanese influence following World War II, to the enormous popularity of Danish Modern. Now we are back to the Spanish or Mediterranean. Less widespread but notable were the sliding Shoji period or the Shutter period, both of which have left their mark since 1945, and the influence of tinted glass in more recent years.

Perhaps the greatest single influence in the furnishings of libraries has been the American Windsor chair, certainly the trademark of a record number of libraries—university and otherwise—in the United States.

An important influence in the interiors of libraries has come about in recent years with the widespread use of carpeting. Not only has this product proved its value in providing acoustic qualities for otherwise noisy areas; it also has aided materially in providing the quiet, clublike character which many libraries hope to achieve.

There are two schools of thought in the use of color in libraries. Some librarians and their interior designers advocate bright colors in an effort to take away from the institutional character of their buildings. Others avoid any color—even stained wood and dark trim—in the belief that such might be eye-catching and thus disconcerting to the reader.

Libraries have thus lived through apartment house tan, celadon green, all white (colors which blended with the ever-present murals of WPA days), Chinese reds, every shade of cream and beige, psychedelic colors and patterns, and the currently “in” golds, oranges and mustards.

I believe that library furnishings were, for the most part, inferior to the exterior design of the buildings (at least until very recent years). Probably this is because so many libraries of the past appeared to be furnished for effect only—certainly not for efficiency,
comfort and practicability—or because the furnishings budget vied with the landscaping budget for being the area where savings were achieved. (When construction bids are high, it is automatic: “Cut the furnishing budget; reduce the landscaping.” And this usually when those budgets have been minimal since the start.) Or perhaps (and I am afraid this is the major reason) because many institutions have failed to recognize the importance of engaging a professional interior designer, one who can advise on quality and cost values as well as aesthetics, one who is a coordinator, one whose work will complement that of the architect.

There is not much to say about the landscape of the turn-of-the-century university library. Chances are the building had a formal or monumental (Queen Anne?) front with very formal, dignified planting to accompany it. Often it simply had a pair of Italian cypress flanking the main entry. The other elevations all (Mary Anne?) would slide into oblivion, with cottage landscaping and occasionally a few bushes and flowers. Interior courts in those days were light wells, which served little purpose except to act as giant trash receptacles.

In the past thirty years, however, libraries have learned the value of indoor-outdoor living, if one may use this descriptive cliché. (No other does as well.) Buildings are no longer “front-door, back-door” types. They now take advantage of their site and the open areas around the building. Moreover, reading decks and courts have been humanized by the landscape architect.

Most importantly, the landscape architect and the site planner who think in terms of urban scale have taught us that the spaces between buildings are as important as the buildings themselves. This is nothing new and has been recognized in many parts of the world since the first buildings were assembled on a common site. But this phase of landscape-site planning had been bypassed and overlooked, especially through the early decades of this century.

With increased emphasis on the use of outdoor spaces has come, of course, new demands for appropriate “outdoor furniture.” Suffice it to say here that no project is complete until the total design has been accomplished. This includes, besides benches and actual tables and chairs, light standards, signs (informational and directional), kiosks, and special sidewalk and paving features.

All of these fashions in twentieth-century university design—most of them concerning library design—lead us to the question of what
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will come next. There are those who would have us believe that the library, as we know it, will fall prey to technology and that the book will become obsolete.

Certainly computer and microform technology, today's communications, and the demands for flexibility caused by today's rapid changes cause serious questions to be asked and decisions to be made. Already major design changes have been instigated and many more are in store. But in summation, I agree firmly with the consensus of the participants of the Educational Facilities Laboratories' June 1967 symposium on The Impact of Technology on the Library Building, that:

It follows . . . that library planners can proceed at this time with confidence that technological developments in the foreseeable future will not alter radically the way libraries are used. In planning library buildings today, we should start with the library as the institution we now know it to be. Any departures in the future should be made from this firm base. . . .

All the fields of technology are swirling with action, and it is certain that, in every individual library, planners and administrators must be constantly alert to innovations, to local potential for assimilating developments, to the possibilities for interaction between libraries. On a broader scale, continued research, experimentation, and study must be carried on to help solve today's planning problems. Technological progress perforce will continue. But it is not breakthroughs that are going to make a new world so much as the constant accumulation of new experiences over a considerable period of time. . . .

Now, more than ever, it is important to design library buildings so they will be inviting and comfortable for people to use. The library building itself will gradually change, but people, who use libraries, are a constant factor.1

So planners should be able to go confidently back to the drawing boards without fretting about an occasional cliché. A cliché now and then may stimulate our design teams and result in even more humanization of the library buildings which will be designed for the student of the computer era.

Reference

Significant Developments in University Library Buildings

DONALD C. DAVIDSON

Distinct trends in the planning, construction, and architecture of university library buildings are identifiable as the twentieth century begins its final and apparently most affluent third. The first third was one of Gothic exteriors, books housed efficiently in seven foot six inch stack floors, readers typically seated in big, high-ceilinged, almost medieval reading rooms, and undermanned staffs. The middle third was one of depression, war, inflation, and arithmetical precision in securing and arranging library space (formulae in the securing and space standards in the arranging). Now the seventies, and perhaps the eighties and nineties, will build on the heritages of the collegiate Gothic, separate stack structure approach of the earlier third and of the loft or "modular" library buildings. A measure of boredom with the austerity of the loft became apparent during the later sixties.

Not only are complete new libraries being planned on the twin heritages of collegiate Gothic experience and of modular planning precision, but new increments are being added directly to earlier structures, perhaps in accordance with prior plans, or otherwise by modification of previous long-range plans. New structures are being designed for aging fixed settings with ingenuity and, occasionally, with dramatic excitement.

The great size of some additions to the library makes existing space a relatively picayunish factor in some cases. Some notable examples of the very large beginning anew are the Universities of Edinburgh, Chicago, Minnesota, New York, and Indiana. The decision whether or not to abandon is an agonizing one to be made after thorough study and analysis of a total situation.

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The experience of various institutions in deciding whether to start anew or to add to an existing facility seems to point to the necessity for planning for even further expansion and internal flexibility in either case. Unpredictability of academic program, of the very nature (as well as rate of inflow) of materials and information in new guises, of the number and mix of future users, and of consequent service needs has been amply demonstrated in case after case—the newest buildings included. Too often the complaint is heard that too little space was planned for processing staff, or that the total space equation has been altered by the unexpected arrival of a book-hungry new academic program.

Architectural Record, in its editorial tribute to Le Corbusier, commented that architects are “seldom commissioned to invent architectural form, they are hired to design buildings.” After a look at the university library buildings of the two post-World War II decades this generalization certainly appears valid. Now, however, it is possible to suggest that future architectural historians may find in Walter Netsch’s library buildings for two universities in Chicago, Sir Basil Spence’s exquisitely detailed rectangle for the University of Edinburgh and William Pereira’s tour de force at the University of California, San Diego, seminal, aesthetically successful, examples with which to describe a general reintroduction of architecture as a major factor in the university library building scene. To arrive at Netsch’s Northwestern University Library from the rear on a snowy day is to get a vision of a building which contains certain effectively merged elements—upside-down modern Gothic; to leave it from the front is again to admire it for its treatment of mass, just as one admires a European cathedral for its compatibility with its setting. The other Netsch building in Chicago is at the University of Chicago, and is also reminiscent of the medieval as well as the collegiate Gothic. This is a building with an exterior that actually conceals rather than reveals a precise interior hegemony of elements.

In 1968 Jerrold Orne wrote: “There are more very large buildings being built today. There is evidence of greater expansion of reader space, and greater acceptance of design for massive numbers in one place.” At Edinburgh, along with Brown, Washington at St. Louis, and U.C.L.A., the trend to bigness also is apparent. In these examples the loft building approach seems to have reached successful culmination, significantly asymmetrical, with the details of off-center entrance lobbies providing some relief from the boredom of interior columns.
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and low ceilings. A successful earlier and smaller example, with a "lively roof of prestressed, folded plates," is at the University of Nevada. The exterior architecture in these five cases pleases through balanced simplicity—and at Edinburgh by harmonious contrast with the general urban, although park-like, setting.

Sir Basil and Walter Netsch, whose solutions are often daring, challenging, and exciting have a California counterpart in William Pereira. His solution to the requirement of planning a research library building, while at the same time providing a focal point for the campus, was the architectural creation of a sphere—of five floors suspended in space above ground. This building at San Diego, and the one at Northwestern University, essentially handle the heavy traffic of the public, the staff and the in-flowing materials on the lower levels—where pertinent program requirements are met in large integrated, undergirding chunks of simple loft-type space. The ups and downs of the core (undergraduate centered) collection, the forum and other elements which at Northwestern manifest themselves in complexities of traffic linkages or in extra need for geographical orientation have no counterparts at San Diego. At San Diego "first time" traffic to the five upper floors is introduced by elevator to the central stack floor in the sphere; from there it can disperse itself upwards or downward by stairway or elevators. The University of Utah Library and Learning Center, a large rectangle, is effective visually on its site through treatment of mass (varying fenestration, roof overhang, recesses, balcony) and of materials (pre-cast concrete with white quartz chips and integral patterns).8

Midway between those essentially rectangular modular successes and the challenging (though perhaps architecturally controversial) buildings mentioned above, there is a group of pleasing library buildings which effectively arrange several "cubes" of space in homogeneous artistry. Indiana University has one of the largest of these, with a separate area designed around the needs of undergraduates, another for more advanced students and research workers, with a third area for common services.9 The exterior is a balanced series of rectangular cubes, with varying sized windows on the lower floors and no fenestration at all on the top eight levels of research stacks. The cubes can be duplicated at right angles to make a large building without overwhelming the site visually.

Then there are the towers being planned or built for places as far apart as Belfast, Northern Ireland, New York University, the Uni-
versity of Massachusetts, and San Jose State College. New York University has to face the wedding-cake code requirements of New York City, and puts its reserve and undergraduate libraries on two large levels below ground, thus from street level getting an upward and downward traffic flow, something almost always desirable in planning a library building.

An influential moderately high-rise research unit was pioneered at Cornell with its Olin Library; this building has the special facilities of carrels, faculty studies, common and seminar rooms located peripherally to long stacks. This Cornell-type library building is also to be found at Ann Arbor in the research addition, and in the long and narrow third unit at Santa Barbara, the latter being designed for lateral doubling to make it six (rather than three) bays wide.

Obviously, variety is another feature of the contemporary library building scene. There are buildings that peek over the edge of a hill and climb down it (Tufts and Alaska). There are buildings with new structural-architectural design elements (Marcel Breuer’s trees at St. John’s University). The top floor was freed of columns some years back in Mies van der Rohe’s John Crerar library in Chicago. Now fans and condensers are being moved from roofs to ground level, or even to separate structures. Or, if they remain on the roof, they are incorporated into the total design as at the University of Chicago. A tour de force, dramatic but not overpowering, was built at the University of Glasgow incorporating five sculptured and peripheral towers. The catalog hall at Minoru Yamasaki’s library for the Regina campus, University of Saskatchewan, might be termed a catalog “chapel” within the exterior cathedral form. The University of California, Santa Cruz, Library sits gracefully and in scale amid clumps of redwood trees whose shade warranted the extensive use of glass and inner open spaces. At Stanford, the planning office’s model of a proposed 200,000 square foot doubling of the 1919 main library building shows a series of flat roofs. These seem a mild contrast to the dominating verticality of the Hoover Library tower, the quadrangle type architecture of the main building, and the columned and pavilioned feeling of the Meyer (undergraduate) Library Building.

The proposed addition to the main library at Stanford shows a first floor of 91,000 square feet and thus points to a continuing trend toward larger floor areas at lower levels. This dates from the Firestone Library at Princeton, a prototype modular, or loft, university library constructed soon after World War II. Later Notre Dame put
an area the size of two football fields into its main floors; Northwestern, the University of California, San Diego, and the University of Massachusetts are proceeding in the same direction. These examples reflect a continuing desire to accommodate processing staffs close to the bibliographic services and records, and both are, increasingly, very large consumers of space. Where available land is limited some libraries have become reconciled to placing the processing staffs on an upper story, confidently hoping that parallel access to a unique record (the card catalog) may be supplanted as electronic communication devices and a multiple record (a computer-produced book catalog) become more feasible. Sacramento State College is planning to put processing staffs on a higher floor for this reason.

The location of the library, it has long been said, should be central. Clearly now, even on such a modestly-sized graduate campus as the Naval Postgraduate School at Monterey, the question of defining centrality becomes complex. Which group of users, coming from where, going to where, when and for how long, can determine the center. Second and third campuses have developed and will continue to develop to siphon off elements of a large, general collection. The relation of the library site to other academic buildings and to residence halls remains a major consideration, but sometimes location in relationship to traffic patterns (pedestrian, publicly transported, in private vehicles, or from parking lots or spots on public streets) suggests the wisdom of a location, as at Monterey, at a major traffic entrance, adjacent to campus and city street parking. At the University of Alaska the site chosen was closest to the largest parking lot for off-campus students and on the student route between academic buildings and on-campus residence halls. At the Indiana University the multiple-purpose structure is bisected logically by a pedestrian throughway from a busy public street across which many patrons live. The research library addition at Michigan sits atop a pedestrian walkway required by the campus traffic pattern. The undergraduate Meyer Library at Stanford invites through foot traffic on its lower floor. At Hofstra patrons may cross a busy highway by bridge leading into the library and beyond. The University of Minnesota Library is, in effect, notched at a corner by a public bus route. At Santa Barbara the location was determined by the first of the college-level master plans, now in a university level master plan; it is indeed central, and isolated from all but pedestrian traffic ways. This will be alleviated somewhat when an undergraduate library is
built a few hundred yards away on the route to the private apartment and housing area forming a unique enclave populated by two-thirds of the student body. The device of the undergraduate library, of course, is a significant development over the last two decades.

The compact, "instant" unified campus, such as Simon Fraser University in British Columbia, and a couple of other new megastructure campuses in Ontario, make the problem simpler. An "omnibuilding" approach is taken for Pace College, New York City, where the library is on the third and fourth floors of a five story lateral building. Atop this building sit ten dormitory floors. One suspects that librarians would greatly prefer such compactness, for it strengthens the case for centralized library service, virtually eliminating the opposing argument of distance from laboratory or chalk board.

There has been a pronounced nationwide trend toward very long hours—three times as long as the period into which most classes are concentrated; this makes the factors relating to traffic to and from housing just as important as those concerned with general academic and classroom traffic patterns.

The problem of entrances logically related to traffic patterns remains one that, in almost all cases, should not be resolved through multiple entrances and exits. The problem, of course, is primarily one of controlled exits. The individual inspection station approach is an almost universal solution of a standard problem.

The more "open-stack" the operation, the greater the need for unified exit controls. Free access to stack areas for all patrons is becoming standard, while in stack areas the interspersing of readers at tables, in offices, carrels, seminar rooms, common rooms, or rooms with individual stations for graduate students in the same or closely related disciplines, has become normal. The University of Chicago, however, hoped to help preserve its books by keeping stack temperatures somewhat cooler than the usual American level. This decision, combined with a desire to minimize the unofficial internal migration of books in a 3,000,000-volume stack, led to placing all the 2,200 carrel and study seats in reading rooms outside but adjacent to the bookstacks, while leaving within the stacks some 265 consultation tables. This return to the concept of a separate stack area—open to all comers, however, with floor controls and charging stations at the stack exits—is a basic determinant of the total program. Chicago's subject specialists are relieved of control of collections and other extraneous administrative matters, and are available for consultation.
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by patrons in the core area on each floor which separates stacks from reader stations. The combination of heretofore dispersed libraries permits the provision of card catalogs on subject floors, adjacent to both books and subject specialists.

The University of Chicago library is representative of two major characteristics of the university library of this age: first, in its subject arrangement, which was pioneered by Ralph Ellsworth at Iowa and Colorado. The University of Utah's new structure is so arranged, as is the library at Arizona State University. The expanded University of New Mexico building, and others, subscribe to the same philosophy. How the principle is effected varies from place to place but subject arrangement is a basic, well-established trend. One strong trend is to arrange the collections primarily by the classification, for the ease of the patron. There is, at the same time, more of a tendency to arrange the book stack according to the classification scheme, than to plan subject specialization in specialized rooms dominated by subject specialist reference staff. Economy encourages this trend; subject specialists can be "pooled" as is planned at Sacramento State College.

The University of Chicago's new building is a good example of a second recognizable trend, that of increasing centralization as former branches and departmental libraries merge into more efficient centralized units. The trend to longer hours is an economic factor which accelerates this movement toward centralization.

Libraries are also being forced underground by aesthetic or code considerations. According to a 1968 news story in an architectural magazine, several hundred students stopped work on the removal of a couple of small trees, preparatory to skylight construction for the underground library at Yale: "Its 16 large skylights protruding from below, like rows of giant rectangular eyes, would effectively destroy the green open space, which students had used for decades as an informal meeting ground, touch football field, girl-watcher's lair, and outdoor reading room." Student opinion and the New Haven Preservation Trust concurred on burial of the structure. An alternative solution proposed by the architect was a moat design, which was accepted for construction. In one case at least, opinion forced a library even more underground.

As one approaches the University of Illinois undergraduate library from the Illini Union one wonders if the two small flat-roofed structures, reminiscent in appearance of bus or subway stations, have any-
thing to do with the library. They do, for they are plaza level elevator stops and stairway exists. Otherwise this building is completely underground, forced there since it was not permitted to cast shadows on a dedicated monument, an agricultural plot. Light is brought into the two story structure through a 72' by 72' central open well and courtyard.\(^\text{17}\) Other buildings are forced underground only partly in order to meet code or aesthetic considerations. Not many had the tremendous water table problems encountered in building the library at the University of Amsterdam. Johns Hopkins University had problems with ground pressure as well as with water in submerging five-sevenths of its library below ground.\(^\text{18}\)

The cantilever is being increasingly employed to provide specialized space and to vary exteriors. The library at Trinity College, Dublin, a simple rectangle, has a south facade with cantilever variants making a Corbusier-like play with mass. Brown University, the University of Utah, and others employ the technique in a more repetitive manner, usually to good effect. The University of Missouri at Kansas City cantilevers bays to accommodate two tables for four students or three double carrels, with windows on the sides. University of Utah Library windows provide vertical contrast at the inner wall. The Hillman Library at the University of Pittsburgh uses a triangular indented window on each side of an individual study station which faces the blank portions of two outer walls, or with two windows in the faculty studies along other walls. Arizona State University is one of several examples which also demonstrate the use of the cantilever to make an essentially rectangular building look less blocky, bulky, or big.

Fenestration, too, is varied at Arizona State. On the top floor there is a narrow clerestory window strip above the walls for carrels and studies. Precast walls with slit windows characterize the next two levels, while the first two stories at ground level are largely glass, rather typically, therefore, being recessed. There is also a level below ground, moated. Access to the main floor is by bridge. Aesthetically and functionally this is one of the more successful subject-arranged loft or modular buildings in the West. The fenestration of the Science Library, University of Aberdeen, creates an exterior decorative motif. A repetitive upside down “U” for four bays is part of a semi-symmetrical pattern, which in turn reflects the basic structure. This is designed to take two floors of the stack per structural floor, the mezzanine stacks providing for expansion and flexibility.\(^\text{19}\)

Fenestration as part of the visual environment of the patron at work
is something that the librarian, as representative of the user, must specify. User opinion well might be sought. If there is an exterior view, such as of a city park as at the University of Sheffield, then the large reading room (if one must have one) is the most logical to be located adjacent to the view. If the exterior view is of "a semi-derelict area" then the architect may create a view by providing an inner courtyard as at the Faculty of Arts Library, University of Liverpool.20 Except for some of the British "plateglass universities" 21 one's cumulative impression of visits to American and British libraries is that windows are located more often as design elements than as apertures to provide light or a view; there was, of course, a fairly recent period when librarians learned the hard way about heat gain and glare from excessive amounts of plate glass.

The unobtrusive, asymmetrically arranged windows in the mountain-toned walls of the library at Brigham Young University permit some view to the user and visitor. The latest addition to the University of Houston Library has twenty-one columns which are paralleled and equalled in size by window strips. An unusual method of turning a corner, and letting "the interior peer through" is seen in the two story lounges at each corner of the library of the National School of Agriculture at Chapingo, Mexico.

Moving to the interior of the building at Arizona State, and staying with the visual environments which architects wish to create, one finds that the entrance lobby is opened to the second floor, which does minor violence to the sonic environment desired by library patrons. It here does no great violence, as do some such holes punched through floors, to the flexibility inherent in loft space at or above the desirable minimum of three bays square. When architects punch holes through a number of floors to create an atrium both dangers exist. At the University of Utah the sonic environment is handled by having the horizontal traffic ways within the attractive atrium itself, and separated from subject reading areas by glass walls. The building is large enough to overcome the danger of interruptions to basic space flow. Three bays, twenty-five and a half feet by twenty-five and a half feet each, plus the cantilever encircle the atrium, and hence flexibility appears protected. Courtyards must pass the same tests as atria.

The university libraries at Utah and Arizona State also are convincing demonstrations of the truth of the architectural injunction of Mies van der Rohe that "God is in the details." 22 The materials used
in covering floors and walls at Arizona are coordinated in texture and color, and the schemes are extended to such details as the colors of door pulls.

The bay size of twenty-two and a half feet by twenty-two and a half feet was nearly always the standard until recently, but there is now a trend to larger bay sizes, still reflecting the three foot (plus at least an inch and a half at each end of a stack range) library book shelf. York University in England is pioneering the four and a half foot shelf, while the four foot shelf has not yet been accepted in the United States; this may be because the gauge of steel used in the United States is less. Larger bay sizes accommodate flexible arrangements of books and readers. To the latter a table space of at least three feet by two feet each is now the standard, and this means tightness within the smaller bay. The larger bay is therefore welcomed (twenty-four feet at Urbana, twenty-five and a half at Pittsburgh and Salt Lake City, extension by a bit over three feet on one side at Bloomington, twenty-seven at Edinburgh23 and the University of Chicago, and thirty by forty-five, University of Illinois, Chicago Circle24).

Circular buildings are unusual, and stack arrangements within such space must be ingenious. At Northwestern the first layout will house intermingled stacks and reader stations radially, with a built-in alternative for parallel stack ranges. At Chabot College in Hayward, California, serpentine wood stacks avoid a wheel-spoke appearance.25

Escalators and automatic doors are now being employed as libraries become larger and traffic demands such aids. There is increasing acceptance of and satisfaction with the longer, space-saving stack range (forty-five feet at Santa Barbara, thirty-nine at Tempe) but many libraries cling to the traditional shorter lengths. The four foot six inch center to center range placement appears to be the satisfactory norm. Stack areas without study tables, carrels, studies, and seminar rooms are unusual. The individual study station is popular, perhaps in danger of becoming over-popular. The table for four or six is still preferred by some patrons.

Longer open hours, and perhaps longer individual stays, have suggested the inclusion of food dispenser machines, snack bars, tea rooms (Edinburgh), and cafeterias (Indiana and Washington at Seattle). Libraries where these activities are within the library proper envy libraries where food can be purchased adjacent to but distinctly sepa-
rate from library operations (the coffee bar at Warwick University, Coventry, is thus isolated).

The mosaic wall on the dominating research tower which stands above the two more general floors at Notre Dame is a rare example of exterior decoration on a grand scale. The sandblasted murals at Bowling Green State University form another. Interior decoration on the same scale is about as rare. A dramatic and effective exception is the sculptured mural, "The History of Writing," four stories tall, created by Professor John Tatschl for the stairwell of the new addition to the University of New Mexico Library. Murals are also found on the central walls of the University of Strathclyde in Glasgow.

Stairways themselves continue to invite the eyes of architects. Circular ones are featured at the University of California, Santa Cruz, the Air Force Academy, the University of Pennsylvania, and the Countway Library of Medicine at Harvard. A "geometric form stair well" at Xavier University in Cincinnati, is a triangle encompassing an open well at the corner near the main entrance. Librarians have not yet convinced architects that steps to get into libraries are no more desirable than they are to get into department stores; it is too easy to find the nuisance of steps even in the most recent and most effective libraries. The wheelchair test too often is barely and deviously passed.

Painstaking and continuous attention to detail is the price in time for a successful building. This extends to electrical and mechanical details, for which architects normally rely on engineering specialists. Bernard Kreissman told a session of the annual meeting of the American Association of Law Libraries in 1968 that "the librarian should work with the engineer and make him justify and explain all details and items relating to the electrical and mechanical areas of the building." He further suggested the bringing in of consultants in times of crisis after the building is completed. The use of consultants has become much more common in such matters as library organization, furniture and its arrangement, and color coordination. Consultants are also being employed fairly often for newer purposes such as acoustics, air-conditioning, engineering, the design of audio-visual facilities, and cost estimating. Occasionally one hears of a contractor's having been retained during the planning stage in order to reduce costs through construction simplifications.

The possibility for imaginative expansion of a building would be
increased by regarding each increment of space as a new and separate challenge. This was the approach taken in the Cornell-type additions made at the University of California, Santa Barbara, and the University of Michigan. Stack additions continue to be made at the University of Illinois, for one example, as a continuing commitment to the traditional research stack. Other institutions have decided to place a loft or modular type structure in locations where additions to a self-supporting stack structure had earlier been contemplated. How to expand can become a difficult problem when the existing architecture is incompatible with planned expansion. Planned expansion should be considered even in every completely new building.

Librarians, at best, have the initiative only for a very short time very early in the process of planning a building. Therefore, it behooves them to think on a macrocosmic scale similar to that which architects must always consider when facing a new problem. Thus librarians and their consultants, early in the game, must jointly develop positions on flexibility, expansibility, fenestration, stairs, steps, and the movements of patrons, staff, books and information into, around, up, down, and out of the proposed building. Librarians, accordingly, must think about and state positions on basic space in large chunks and on possibly bothersome interruptions to such basic space as those created by the mezzanine, atrium, or two-story treatment of part of the building. Librarians must not allow themselves to be overly absorbed by the microcosmic features which they will necessarily have been considering with all their staff in the detailed statement of program (a program definitely and desirably has become a habit). Buildings can too easily go in fundamentally undesirable directions because the client is not yet ready to talk with the architect about such macrocosmic features as those here suggested. Details are vital, it is true, but the large view and the early initiative are equally important.

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4. For Mr. Netsch's "Field Theory" and its first full application at Wells
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21. Beloff, Michael. “The Plateglass Universities,” Encounter, 30:14, n. 1, May 1968. The title is a "generic term... It is architecturally evocative: but more important it is metaphorically accurate."


General Note: The British university libraries mentioned were visited by the author in 1966/67 as Visiting Senior Research Fellow at the University of Sheffield. Most of the North American libraries mentioned have also been visited by the author.
A REQUEST FOR INFORMATION on long-range library planning was sent to all seventy-six university libraries of the Association of Research Libraries (ARL) early in January 1969. Responses were received from all but nine, reflecting a high degree of interest in the subject matter. Only ten of the responses indicated that little or no formal planning was being done. Fifty-seven of the responses showed evidence of thought having been given to planning for future needs and, in a majority of these, a great deal of attention had been paid to formal planning.

The data showed that there are no hard and fast rules governing planning work. Much ingenuity, thoughtfulness, imagination, and risk-taking are required for developing plans that will open up new and better service opportunities. Planning is not a pedestrian exercise. The impetus for planning for university libraries comes from several directions:

1) Those in top-management positions in libraries feel that some of their most important responsibilities are to set goals for the future, to anticipate library developments, to attempt to envisage the future in terms both of size and feasible spatial patterns for the best possible service.

2) There is an understandable anxiety among top managers and faculty library committees about the possibility or likelihood of running out of space long before funds become available for creating new space. Administrators wish to forestall space crises involving emergency storage arrangements, overcrowded reading areas, excessive shifting of book collections, and inadequate and unsuitable work space for the staff. Librarians are all too familiar with sorry situations where good library service became difficult or virtually impossible because of lack of foresight on the part of those responsible for

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providing funds, determining priorities for capital developments, and making long-range plans.

3) University authorities are placing increasing emphasis on planning as a separately identifiable function. The establishment of planning departments and the appointment of university vice-presidents or assistant vice-presidents for planning (e.g., at Pennsylvania State University, the University of Michigan, Temple University), and the establishment of planning offices or departments in state-wide offices of higher education (e.g., at the University of California), has led to procedures that demand planning several years ahead rather than merely budgeting a year or two ahead as has been customary in traditional budget procedures. When such demands for program and space projections come to a library director’s desk, he is often unsure as how to proceed.

4) In some institutions, the planning procedure has become standardized to the point of involving an annual filling out of a special form. An example is the University of Oregon’s “Form W,” on which data for the past three years and estimates for the forthcoming seven years have to be submitted to the University’s Office of Business Affairs. The form covers assignable square feet for reader seating (based on projected enrollment), library volumes, and services and administration. By comparing available with required square feet (based on accepted or assumed standards), the additional space required or the surplus expected to be available is determined for each year. The form compiled in 1967-68, for instance, shows that the deficit on the Eugene campus will amount to over 10,243 square feet in 1971-72; 23,461 in 1972-73; 37,177 in 1973-74; and 51,315 in 1974-75; the completion of proposed capital construction providing space for an undergraduate library of 50,000 net square feet in 1974-75 is expected to reduce the deficit to 1,315 square feet. This example demonstrates the demand for orderly planning with which library managers are increasingly faced.

Another less quantitatively oriented example is Pennsylvania State University, where an elaborate “planning packet” must be filled out by the director of libraries and returned to the vice president for planning. Questions asked include the following:

What is your overall long-range view of what your department or office should be doing? How does this differ from today’s objectives or missions (please state them) and those of 10 years ago? What opportunities do you have or do you foresee that, if you
could take advantage of them in the next five years, would help you fulfill your mission(s)? What are the specific goals you are currently undertaking or would like to undertake in the next five years, in working toward the objective(s) stated above? How do they relate to opportunities? From the goals given above, identify the goal to which you would assign highest priority. If you were to attain this goal as desired, what would be the consequent effects (good or bad) on your area, on other areas in the university, and on areas outside the university?

These questions call more for narrative than merely statistical answers, and the answers given relate, in part, to library plant expansion needed. Library administrators can expect to become increasingly subjected to this sort of routine—periodic probing about future needs—and if their answers are properly responded to by university and budgetary authorities, the sort of space crises often found in university libraries are likely to be averted.

5) There is a growing awareness of the need for campus planning to include libraries as an integral part. Librarians are all too familiar with the helter-skelter type of campus enlargement that has taken place on many campuses in the past. Buildings have been erected without sufficient regard to the subjects which would be taught there; library spaces have been routinely included in new classroom buildings without regard to possible consolidation of library services within a given campus area; library buildings have been placed in locations that, over a span of years, became too remote to be useful.

In the future, we can expect increasing emphasis on long-range campus planning that takes proper account of library needs. On new campuses, such as the University of California at San Diego, and on campuses that are developing at highly accelerated rates (of which Southern Illinois University, Michigan State University, and the University of California at Davis may serve as past examples and Northern Illinois University as a current illustration), total campus-wide library systems can be made to develop in a more rational manner than was true of slowly growing, established institutions, many of which, even today, are saddled with seemingly unalterable library accretions that keep them from evolving into effectively coordinated library systems.

Matters would be more comfortable if we could clearly see the future campus and the future character of higher education. In a book like Campus 1980; The Shape of the Future of American Higher
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Education, edited by Alvin C. Eurich,¹ one finds a prediction that universities will be very different in the future. Eurich says, “Buildings that will grace or disgrace the campus in 1980 are being built now—but the needs of a college may change drastically in the next decade.”² A contributor to the volume, Harold B. Gores, the president of Educational Facilities Laboratory, predicts “that the library will no longer be buried physically in the heart of the campus simply because symbolically information is at the heart of the enterprise. More likely, especially in commuting institutions, the library will be located on the perimeter of the campus, there to provide maximum access at all hours and at all times.”³ If such is to come true, many libraries are currently being placed in the wrong spots; Gores’ prediction, however, may not necessarily come true. What of his other prediction, that “the physical campus will respond by becoming mostly library and living room”?⁴ If so, what are the implications for library building planning? This sort of prediction does not help us avoid designing library facilities that may in ten or twenty years turn into white elephants as several library buildings completed in the 1940’s and a few in the 1950’s are today.

The present unrest among a portion of college students may also exert an influence in a way that one would not have predicted a short time ago. The freedom and openness of recently built library buildings may give way, in part, to greater concern for protective devices. A head librarian of a campus of the University of California writes: “I can sense as I believe all of us do, great impending changes. If one certain trend continues, of course, libraries may have to revert to the old closed stack system and be more or less set up as fortresses, but I sincerely hope that this will not be necessary.”⁵ Libraries and their catalogs have become targets of vandals and disruptive militants. The difficulty of properly protecting dispersed and open collections may force libraries, in part, into more centralized patterns although it may also be argued that a decentralized library system is less visible as a target and, therefore, harder to destroy or mutilate.

A related concern is expressed in speculation on the future at Harvard University where it is felt that the physical security of the collections will require restriction of use of books to the library building. This will entail much more space for readers than has been needed in the past.

On the quantitative level, space planning for libraries involves estimating space needs for the book collection, reader seating, service
ROBERT H. MULLER

areas, and staff work space. If present facilities are inadequate, the first task is to determine what the presently available space amounts to and then to indicate what the size of the present space should be if agreed-upon standards were to be met. (There are various standards for book volume space requirements, for the percentage of the enrollment to be provided with seating, for the number of square feet per reader, for the number of staff members in technical services required for a given rate of acquisition, for the number of square feet per staff member, etc.) The next step is to project the space requirement into the future. Such projection is most frequently done for ten years hence, but in some cases for fifteen or twenty years.

The size of the future book collection can either be arbitrarily set in terms of what is considered desirable or necessary for the envisaged educational and research program on the basis of some accepted formula, or it can be a mathematical projection of past growth into the distant future. Such projection, if it followed the technique of the study by O. C. Dunn, W. F. Seibert, and Janice A. Scheuneman, The Past and Likely Future of 58 Research Libraries, 1951-1980, is most likely to reveal a parabolic increase rather than a straight-line growth.

For seating requirements, one would have to know future enrollments for undergraduates and graduates, and the size of the faculty for the various subject fields. The percentage to be seated would vary from campus to campus.

Work space needs in technical services would be closely tied to the anticipated rate of acquisition, arrearages, and special projects (such as reclassification). It would vary with the types of material expected to be acquired.

There are considerable variations in detail, method of justification, and refinement of technique followed by different universities. It is beyond the scope of this essay to review and evaluate such variations. Those searching for models or samples to guide them may find the plans prepared at or for the following ARL institutions informative and instructive: University of Alberta, University of Arizona, University of British Columbia, Harvard University, University of Illinois, Joint University, University of Kansas, University of Kentucky, M.I.T., the University of Michigan, Michigan State University, University of Oklahoma, University of North Carolina, Ohio State University, University of Minnesota, Syracuse University, Prince-
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Noteworthy in these examples of master planning for university libraries are not so much the specific techniques used in quantitatively estimating future needs, but rather the configurations of library service envisaged for the future.

The controversy of centralization versus decentralization is still unresolved on many a campus, with librarians tending to favor maximum feasible centralization in order to provide improved and more sophisticated machine-based services, to encourage and facilitate the interdisciplinary approach in research and education, and to avoid wasting the institution's funds through excessive duplication of materials and excessive service points that must be manned for increasingly long hours of opening. In some cases, campus geography makes branch libraries unavoidable, of course; but there is an increasing recognition of the inefficiency resulting from excessive dispersion of library collections because of the extra labor it imposes on those research workers and students who need to use more than one branch library. The faculty member requiring only the use of a single library in a narrow subject specialty will become a rarity. One Harvard professor of sociology reported that he had used fifteen different units of the Harvard Library's "coordinated system."

Only a few campuses have achieved substantial centralization. Examples are Johns Hopkins, Iowa State, Michigan State, Oklahoma State, Southern Illinois, and Tulane.

Whether a degree of centralization is achievable depends on the size of the campus, although less so if frequent bus transportation is available at all hours on a large campus and if parking facilities are adequate. Some of the emerging large universities of the future, such as Northern Illinois University, may attempt centralization. Once departmental libraries become established, as at such large universities as Michigan, Ohio State, University of California (Berkeley), UCLA, University of Washington, Yale, Harvard, etc., it becomes exceedingly difficult to consolidate them in the face of faculty resistance. For instance, a consolidated central science library had been considered at Stanford University, but plans are reported to have been shelved.

A more realistic possibility than centralization is what, at the University of North Carolina, has been termed "planned decentralization" in contrast to "expedient decentralization." Planned decentralization
means the establishment of large area libraries serving the subject disciplines or schools located within a given area. Such multi-disciplinary libraries have also been referred to as "cluster libraries." It would obviously be better if a campus would group its instructional buildings by subjects that are broadly related (physical sciences, biomedical sciences, social sciences, humanities); campus planners attempt such groupings but have not always succeeded because they came to the scene too late. In a letter to this writer, Chief Librarian Robert H. Blackburn, of the University of Toronto, put it succinctly: "If we could start from scratch, to build a complex university of 25,000 students, I should try first of all to get the teaching divisions clustered in three or four groups, each group centered on a large subject division of the centrally administered library system." He feels that "a single large central library becomes too unwieldy and inflexible and distant to provide what is needed, and a large number of small departmental libraries do not add up to anything useful." The trouble is that most universities cannot start from scratch and are not prepared or able to undertake massive relocations of academic facilities. A very large central campus library of, say, a million square feet gross, may or may not be an unwieldy monstrosity, depending on outside transportation facilities, parking, ample vertical transportation inside, adaptability, etc. Of course, such a central library would have to be supplemented by duplicate working collections near classrooms, laboratories, and offices.

A few general observations and comments may be in order on the various segments of the library systems in existence or planned for.

The central research library remains the focal point of the library system. In many cases, however, it is being restricted to the humanities and social sciences. It is unusual to find humanities housed separately from the social sciences as is planned at Yale University.

The undergraduate library concept has found wide appeal. At least forty ARL libraries operate undergraduate libraries, are about to open one, have one under construction, or are planning or considering one in the future. In only a few instances is there outright rejection of the idea, e.g., at Northwestern University, but even there the idea of a non-circulating "core library," a duplicate collection of 50,000 titles (but without reference tools or periodicals) incorporates much of the undergraduate library concept. The same can be said for the planned very large "intensive-use" collection planned at Yale Uni-
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The ideal location of an undergraduate library is somewhat controversial, with a central location near, or in the same building with, the central research library a distinct favorite. Three ARL libraries (University of Wisconsin, Pennsylvania State University, and Ohio State University) expect to have their undergraduate library services in three separate locations on their respective campuses; such dispersion is understandable on a large campus, but for budget reasons it is likely to result in much smaller collections being available in any one of the three locations.

The idea of a combined or consolidated science library has won wider acceptance than one would have expected a few years ago. The health sciences are usually separately provided for and may be found combined with biological sciences into a biomedical library (e.g., at UCLA). A division into a physical sciences and technology part and a biological sciences part also is planned or proposed in a few instances. Chemistry and mathematics are two disciplines that tend most to resist consolidation with the other sciences. There are still relatively few consolidated science libraries in actual operation, among them: a physical science library at the University of California, Davis, with a biological science library planned, science library services at Florida State University, at the University of Georgia, at Wayne State University, and a physical science library at Yale University. At least twenty-three science libraries are in the planning or consideration stage. On some very large campuses, a combined science library (e.g., at the University of California at Berkeley or at Indiana University) is considered impossible because of the wide geographic dispersion of science departments, but on new or developing campuses the idea of combining the science library collections deserves encouragement since the resulting services, many of which will be machine-based in the future, are likely to be far superior to those currently available in small departmental libraries. At the University of Massachusetts, a physical sciences library is under construction, and a biological sciences library is planned.

The storage library concept also seems to be spreading. Storage is unpopular with the faculty; but several libraries were forced into storage situations due to delays in planned building expansion. Converting an outmoded library into a storage library is occasionally suggested (the University of Arizona is an example). Existing storage libraries, e.g., at the University of Michigan (400,000 volumes, two
miles away), and at the University of California (400,000 volumes, twelve miles away), have proved to be useful, but storage placed closer to the main campus would be more desirable. Harvard University stores some overflow in the New England Deposit Library. The University of Texas also has a deposit library. The desirability or necessity of storage is touched upon in 12 of the documents received. At Princeton University, for instance, removal of 25 percent of the collection to storage is considered essential for bringing about relief from space shortage.

Technical services (acquisitions and cataloging staffs) have traditionally been housed in the main library and preferably near the public catalog. With space on the central campus becoming increasingly scarce and expensive, it comes as no surprise that the idea should occur to campus space planners to find less expensive space at some distance for technical services. The idea has been tried at the University of Toronto where technical services have been one and a half miles away for five years as a temporary unavoidable expedient. According to Chief Librarian Robert H. Blackburn, it "has not proved as disastrous as originally predicted, but is unhandy enough that we plan to centralize them again in the new building."
The University of Michigan has a $2.3 million technical services building on its priority list of capital expenditures; the building is expected to be located some distance from the main campus. Another large university library expects to look into the possibility of removing technical services from its main building. Such relocations may increase operating cost and lower staff morale, but on many a crowded campus there may be no alternative.

A separate rare book and special collections library is found on a few campuses and is generally considered desirable, especially if a donor can be attracted, as has been done at Harvard, Yale and Indiana University.

Where there are large dormitory or residence hall complexes, a need is felt for a moderately-sized undergraduate dormitory library nearby to encourage liberal education through readily accessible reading materials. However, the placement of the main undergraduate library near dormitories is generally not recommended.

*Underground construction* to create additional central space is proposed in a few instances (e.g., Harvard, Yale, University of Illinois,
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Johns Hopkins). The question of whether such construction is more expensive or not is still in the debating stage among architects, but on most campuses cost will be less of a decisive factor than the need for expansion in a given location and psychological considerations.

Unsupervised study halls without books outside of libraries, as a way of relieving library space needs, do not seem to find much favor, except possibly near dormitories. The justification of library seating used by students reading their own books rather than library books is a moot question. At the University of Minnesota, a strong case was presented to justify such use of library space on psychological grounds because of the quiet environment associated with book resources. The economic implications of such use have not been given much attention.

The incorporation of audio visual and automated dial access facilities ("learning resources") into libraries has not received as much emphasis in planning studies of ARL universities as one might have expected. At some libraries built in the past (e.g., Purdue University, Southern Illinois University), the multi-media approach is evident, but this aspect is not too prominently reflected in planning studies.

One of the questions addressed to directors of university libraries related to a possible ideal pattern. Herman Fussler, of the University of Chicago, commented that "the inability to transfer such a concept to an existing institutional environment makes the exercise probably of relatively little benefit." Nevertheless, certain elements of an ideal pattern may be worth listing. Among them, expressed in composite statements, are the following:

1) As much centralization as is logically feasible plus decentralized units in largest possible staffed segments. Controlled decentralization.

2) Consolidation of science branch libraries into a single library to be kept open twenty-four hours a day. The collection should contain what scientists actually need. Personalized services by library specialists with science backgrounds. Computer linkages and other machinery.

3) Holdings of small current-awareness working collections near faculty offices, duplicated in the main library if the institution can afford the expense. Not to be limited to a few sciences. Opposition to full-scale, non-duplicated branch libraries, except medicine, law, and a few other professional fields.
4) Compact storage for infrequently used materials if storage decisions can be made almost automatically and correctly so as to avoid too many returns.

5) Separate service to undergraduates, preferably in the main library or nearby. Long hours of opening.

6) Separate service to each graduate department or program, in the main library.

7) Duplicate residence hall libraries, on a large campus, each containing a selection of what can also be found in the central undergraduate library.

8) Readers access to regional and national collections through machine-based interinstitutional cooperative schemes, eventually resulting in limiting the size of collections on individual campuses.

9) Greater attention to the multi-media approach.

10) Campus-wide quick delivery of library books to faculty departments, with quick, sure access to central records.

11) An interlinking rapid-transit system between libraries.

12) Campus planning to aim for subject groupings of instructional buildings, so that area libraries can serve broad subjects. (Applicable to new and developing campuses.)

Some institutions may have put off planning in the expectation that the new technology will somehow solve the space problem of libraries. Yet the consensus seems to be that, for the next decade at least, no great help can be expected as far as space is concerned, from micro-reduction, computer applications, cooperative networks, and facsimile transmission.

Too often, needs appear before facilities are available. The motto for planning should be, as University Librarian Jerrold Orne wrote in his annual report for 1961-62 at the University of North Carolina: "... facilities must precede the need, or very serious consequences follow."⑨

References

2. Ibid., p. viii.
4. Ibid., p. 298.
5. From a letter to the writer dated February 19, 1969.
6. Metcalf, Keyes. Planning Academic and Research Library Buildings. New...
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Financing and Cost of University Library Buildings

JERROLD ORNE

Academic libraries have enjoyed an extraordinary expansion over the past ten years. The past two years probably represent the highest peak of academic library construction in history. Thanks to the generous provisions of recent national library legislation, both gift and loan funds reached an unprecedented high level in 1967 and 1968. The relative affluence of our country, whether real or inflated, also has led to private benefactions, both individual and collective, of extraordinary proportions. These, plus other lesser factors, have resulted in a large number and a broad range of new academic libraries.

In a field so charged with unpredictables and variables as academic library costs, it is difficult to obtain factual data of the past record and perhaps foolhardy to predict any future directions. Only recently have there been extensive compilations of factual records. These are limited in content, providing only a framework upon which a newly-involved administrator can pin his own problems. As these collections of data become more numerous and as they are refined, there will be a more reliable span of planning elements available.

In his recent compendium on academic library building, Keyes Metcalf arranges all considerations of financial matters in four categories: (1) the provision of funds required; (2) the costs involved in the new construction; (3) the special items which affect building costs; and (4) the financial implications arising from new construction. This is basically a sound categorization. Another possible division would also include all of Metcalf's considerations, gathered in three stages of development, but should give particular emphasis to a fourth period during which evaluation is the paramount issue.

There are three major steps in what may be termed the pre-building
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phase. The first has to do with the concept and involves preparation of documentation which demonstrates the library’s need, making the administration aware of the need, involving faculty and administration in a concentrated effort to promote funds for such a purpose and all the other considerations of fitting a proposed library structure into the academic community in which it is to live. This may appear at first glance to be outside the realm of cost. However, the character of the concept will have a very powerful effect upon the cost of the building and its importance should not be underestimated. This will require thorough consideration of the over-all campus plan and the place of the library in it. It requires complete understanding of the character of the student body, the extent of faculty research, and the ability of the administration to provide for both. It may well involve determination between a separate building or an addition. It may have to do with the selection of a storage library or a separate functional unit. It will certainly include thoroughgoing measurement of the workload anticipated from the various sources of academic concern. A further development of the concept will in some way involve the faculty, administration, and library together with the architect to assure appropriateness of the external as well as the functional or operational capacities of the interior.

In one sense this does not involve a very large part of the cost of a library building but there are costs which are specifically assignable here that cannot be denied. The expenses of a library building committee to visit other libraries or even to travel to conferences with architectural staff may amount to a sizeable sum. The architect may require payment for initial planning towards a concept; he may also have special expenses in connection with site planning or investigation, for preliminary drawings, or even scale models to assist in reaching an acceptable concept.

Also in the pre-building stage are all the problems of obtaining funding for a new library building. There are fundamentally only three sources of funds possible for such a purpose. These are in order of importance, (1) institutional funds, (2) private funds, and (3) government funds.

Institutional funds may be represented by assignment from income, whether this be endowed income or earnings. The amounts available from this kind of source will vary considerably depending upon the size of the institution and upon the location as well as the number of its students and alumni. These funds may include a
Jerrold Orne

collection, over a long period of time, of minor gifts and assignments from endowment which are initially private funds, but are not precisely the same as very large gifts for the specific purpose of building a library. The latter represent private funds specifically.

One of the most outstanding examples of large-scale private funds in recent years was the gift of $10,000,000 from the Regenstein family in Chicago toward an $18,000,000 building now under construction at the University of Chicago. Earlier examples are found in the Beinecke Rare Book Library at Yale where not only the entire building but a large part of the collection was paid for and continues to be financed by one family. Another example is the magnificent general library and its additions at Princeton University which over the past ten years has enjoyed certainly not less than $10,000,000 in support from the Firestone family. There have been myriad other private library donations in the character of $500,000 to $2,500,000 for academic library buildings over the past ten years. Good examples can be found among the libraries reported for recent years in buildings issues of the Library Journal.

Although there has been some support by foundations for academic library buildings, such cases are exceptions rather than the rule. The Olin Foundation has provided support to Washington University, Wesleyan University and Cornell. The Babock Foundation has been notably helpful to the library at Wake Forest University in North Carolina. Except for isolated examples, however, libraries have not succeeded in attracting large sums from many private foundations. A great deal more can be done in this area; it deserves increasing attention.

One comprehensive statement from an academic administrator may serve to illustrate the travail of current financing in our field:

The plan for financing of the construction was divided into three parts: A grant under Title I of the Higher Education Facilities Act, a loan from the same Act of 1963, Title III, and funds from the College Development Fund.

The grant in the amount of $300,000 had to be approved by the Vermont Commission on Higher Education Facilities which was established by the Governor of the State of Vermont. The State Commission will accept any application from any of the institutions, provided such applications are submitted on forms provided by the Commission.
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The State Commission verifies the validity of the data contained in the application and will verify that the institution and project proposed in the application appear to meet basic eligibility requirements set forth in the Act, and the regulations governing administration of the Act. The same Commission has established a system of priorities, so that each of the institutions will have a fair turn each year at the amount of funds granted. The Commission annually has more requests for funds than are available.

When the bids for the construction of the Library were opened June 9, 1966, it was revealed that the lowest bidder of six was $265,500 higher than had been anticipated.

The College set about trying to reduce the figure and arranging for the additional financing. We subtracted from the contract alternatives in the amount of $72,000. We adjusted the architect’s fees according to the new contract and on the advice of the New York Office of Housing and Home Finance Agency, we allowed only 2% instead of 5% construction contingency. We also found we could reduce the amount allocated for equipment cost in our original application by $20,000. Thus the original application for a loan of $595,000 was increased to $723,000 and the share of the College increased.

On October 16, 1968, Certificates of Project Costs were approved by the Office of Education. The eligible development costs were $1,349,895 (Title I) and $1,358,355 (Title III). This supported the Federal share of the grant of $300,000 under Title I and a loan of $718,000 under Title III of the Higher Education Facilities Act.

Thus the financing was as follows:

<table>
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<tr>
<th>Description</th>
<th>Amount</th>
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<tr>
<td>Grant—Title I, Section 104</td>
<td>$300,000</td>
</tr>
<tr>
<td>Loan—Title III Section</td>
<td>$718,000</td>
</tr>
<tr>
<td>St. Michael’s funds</td>
<td>$345,307</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$1,363,307</strong></td>
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</table>

The financial problems in the construction of the Jeremiah Kinsella Durick Library were like putting your last one dollar bill on the dice table and knowing that the sevens and the elevens had to keep coming up with each roll.

Special arrangements with the Office of Education in Washington were reached so that an escrow agreement establishing the account
in a New York Bank where funds that were to be approved by the Federal Government would be protected and the contract obligation of the College be fulfilled. With this protection established, the contract was signed and ground broken. A short sixty days after the footings had been put in place, the Federal Government froze all construction funds and it was unknown, at this time, just when Washington might approve the additional funds for Educational Construction.

The College now had to demonstrate to the United States Commissioner that interim financing could not be obtained at reasonable terms and thus consider our requests for advances in anticipation of the delivery of the Bonds. Thus just before Christmas, in 1966, our stocking was filled with a check from the Federal Government for 75% of the original loan of $595,000. Construction funds were now available for the next few winter months ahead when this type of work is slow.

As the first flowers of Spring, "the Snowdrops," showed their faces, the most welcome news came from Washington that our increase in the loan of $128,000 had been approved.

Under the Higher Education Facilities Act of 1963, Public Law 88-204, the applicant could initiate and prosecute to completion all proceedings necessary to the authorization, issuance and sale of the Bonds within the ninety days from the date of the award of the prime construction contracts. Thus in June of 1967, the College was ready to take advantage and did sell the Bonds before construction had been completed. Thus the road from this point was easy and financial difficulties faded into operational problems.

Government funds have taken a much larger place in meeting the costs of academic library buildings over the past five years. These funds have been both gifts or loans and in some cases both types of funding have been provided. In a few instances, close examination of the funding for a library reveals almost a total involvement by the government with a combination of two grants. In most cases, however, government funds have been involved exclusively as outright grants, usually amounting to approximately one-third of the total construction cost. Though federal grants now can amount to as much as one-half of the total building cost, the over-all availability of federal funds is rapidly shrinking and other sources will have to be found to fill the need. Statistical tables of recent academic library buildings do not report in detail on this fairly large source of fund-
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ing. However, for the years from 1965 to the present time, virtually every academic library built has enjoyed partial or very sizeable contributions from the government.

The final step of the pre-building stage represents the conversion of the concept into stable formulation of plans. This involves costs for detailed drawings, for engineering planning, for site development, for consulting services of various kinds, including possibly electrical, ventilation, heating, landscape architecture, and interior design. There will be modest costs connected with bringing together all of the people who should contribute to the formulation of the final form of the building plan. The architect will have certain requirements for funds to cover the costs of the various engineering services required to assure proper light, heat, and cooling and any other details not already accounted for within the architectural firm. One or more library consultants should participate in planning and, if possible, an interior design person should review internal planning. The entire pre-building stage may stretch over as much as five years or more, but in no case should any attempt be made to plan a library in less than two years; hasty planning is usually extremely expensive and quite unsatisfactory in its results.

For a discussion of actual building costs, I have selected twenty examples of academic libraries built within the past two years in each type of size ranging from libraries costing (1) more than $2,000,000, (2) between $1,000,000 and $2,000,000, and (3) under $1,000,000. These libraries offer examples in each type in a wide range of costs and institutional character. They are chosen to include representatives from all parts of the country and a fairly wide range of service requirements. It may be useful later to compare relative costs by type of building; this could conceivably suggest an ideal size of library construction for the greatest possible economic value.

The first glance at the table for the very large libraries, that is, those costing more than $2,000,000, reveals at once an astonishing range in the cost per square foot in construction. In two buildings of quite similar total cost there was a square foot cost of $21.21 at the University of Indiana and $47.05 at the University of Pittsburgh. This leads us to our first determination of the essential distinction between project cost and building cost. At the University of Indiana, the building cost amounted to 90 percent of the project cost. At Pittsburgh, the building cost was only 66.7 percent of the project cost. There is not such great variance in the equipment cost for these two build-
## Selected Library Projects Over $2 Million

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<td>Indiana Univ., Bloomington</td>
<td>$13,871,000</td>
<td>90.3%</td>
<td>603,000</td>
<td>$21.21</td>
<td>$12,525,000</td>
<td>10.0%</td>
<td>$1,250,000</td>
<td>2,500,000</td>
<td>5,000</td>
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<td>12,000,000</td>
<td>66.7%</td>
<td>255,280</td>
<td>47.05</td>
<td>8,000,000</td>
<td>14.5%</td>
<td>1,160,000</td>
<td>1,200,000</td>
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<td>Univ. of Minn.</td>
<td>10,080,000</td>
<td>89.0%</td>
<td>343,000</td>
<td>29.00</td>
<td>8,969,000</td>
<td>12.4%</td>
<td>1,112,000</td>
<td>1,500,000</td>
<td>2,200</td>
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<td>Duke Univ., Durham, N.C. (Addition)</td>
<td>7,400,000</td>
<td>89.2%</td>
<td>219,000</td>
<td>30.00</td>
<td>6,600,000</td>
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<td>800,000</td>
<td>1,300,000</td>
<td>1,250</td>
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<td>6,200,000</td>
<td>89.4%</td>
<td>220,000</td>
<td>28.18</td>
<td>5,500,000</td>
<td>11.8%</td>
<td>655,000</td>
<td>1,100,000</td>
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<td>Stanford Univ. (Undergrad.)</td>
<td>5,250,000</td>
<td>69.0%</td>
<td>135,350</td>
<td>27.00</td>
<td>3,625,000</td>
<td>19.2%</td>
<td>695,000</td>
<td>140,000</td>
<td>1,943</td>
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<td>88.2%</td>
<td>105,000</td>
<td>48.50</td>
<td>4,500,000</td>
<td>13.3%</td>
<td>600,000</td>
<td>170,000</td>
<td>600</td>
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<tr>
<td>Clark Univ., Worcester, Mass.</td>
<td>4,800,000</td>
<td>79.2%</td>
<td>134,500</td>
<td>28.25</td>
<td>3,800,000</td>
<td>9.5%</td>
<td>360,000</td>
<td>600,000</td>
<td>1,000</td>
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<tr>
<td>Bowling Green, Ohio</td>
<td>4,535,333</td>
<td>72.8%</td>
<td>193,865</td>
<td>23.39</td>
<td>450,000</td>
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<td>California State Poly. Coll., Pomona</td>
<td>4,170,000</td>
<td>72.8%</td>
<td>144,460</td>
<td>21.00</td>
<td>3,034,000</td>
<td>12.2%</td>
<td>370,000</td>
<td>266,000</td>
<td>1,662</td>
</tr>
<tr>
<td>Mankato State Coll., Minnesota</td>
<td>3,829,457</td>
<td>89.6%</td>
<td>167,408</td>
<td>15.00</td>
<td>3,430,000</td>
<td>11.6%</td>
<td>399,457</td>
<td>550,000</td>
<td>2,100</td>
</tr>
<tr>
<td>Univ. of Wisconsin, Milwaukee</td>
<td>3,680,000</td>
<td>78.5%</td>
<td>149,000</td>
<td>22.41</td>
<td>2,800,000</td>
<td>10.4%</td>
<td>300,000</td>
<td>600,000</td>
<td>2,050</td>
</tr>
<tr>
<td>Univ. of Illinois, Urbana (Undergrad.)</td>
<td>3,585,862</td>
<td>88.1%</td>
<td>98,689</td>
<td>34.35</td>
<td>2,958,862</td>
<td>13.5%</td>
<td>400,000</td>
<td>150,000</td>
<td>1,905</td>
</tr>
<tr>
<td>Univ. of Houston (Addition)</td>
<td>3,319,860</td>
<td>77.2%</td>
<td>126,000</td>
<td>26.35</td>
<td>2,562,192</td>
<td>7.7%</td>
<td>196,252</td>
<td>1,000,000</td>
<td>2,000</td>
</tr>
<tr>
<td>Loyola Univ., Chicago, Ill.</td>
<td>2,915,627</td>
<td>85.1%</td>
<td>121,000</td>
<td>26.26</td>
<td>2,480,985</td>
<td>17.5%</td>
<td>434,642</td>
<td>540,000</td>
<td>1,200</td>
</tr>
<tr>
<td>Swarthmore Coll., Pa.</td>
<td>2,700,000</td>
<td>85.0%</td>
<td>95,000</td>
<td>28.42</td>
<td>2,300,000</td>
<td>10.4%</td>
<td>300,000</td>
<td>600,000</td>
<td>2,050</td>
</tr>
<tr>
<td>Univ. of Florida, Gainesville (Gr. Res.)</td>
<td>2,250,000</td>
<td>80.0%</td>
<td>123,790</td>
<td>14.50</td>
<td>1,800,300</td>
<td>25.0%</td>
<td>449,700</td>
<td>600,000</td>
<td>910</td>
</tr>
<tr>
<td>Shippenburg St. Coll., Pa.</td>
<td>2,232,434</td>
<td>75.6%</td>
<td>72,416</td>
<td>26.41</td>
<td>1,886,947</td>
<td>19.0%</td>
<td>320,000</td>
<td>250,000</td>
<td>1,200</td>
</tr>
<tr>
<td>Univ. of Kansas, Lawrence</td>
<td>2,141,193</td>
<td>80.4%</td>
<td>100,000</td>
<td>21.41</td>
<td>1,850,748</td>
<td>15.7%</td>
<td>290,451</td>
<td>668,100</td>
<td>314</td>
</tr>
<tr>
<td>Dickinson Coll., Carlisle, Pa.</td>
<td>2,125,000</td>
<td>83.2%</td>
<td>72,463</td>
<td>29.32</td>
<td>1,768,000</td>
<td>17.0%</td>
<td>300,000</td>
<td>315,000</td>
<td>800</td>
</tr>
</tbody>
</table>

Average: 82.1% $27.40 14.0% 726,955 1,622

* BC is building cost, PC is project cost, EC is equipment cost.
Financing and Cost of University Library Buildings

ings. Indiana University spent 10 percent of its building cost on equipment, while Pittsburgh spent nearly 15 percent on equipment. Calculating the averages for the whole group of large library buildings, the equipment cost comes to 14 percent of the building cost. Either of the first two examples mentioned are within the range or close to it. The old rule-of-thumb—approximately 15 percent of building cost for movable equipment—can be verified not only in this size of library, but in all three.

Continuing with the analysis of the two most costly libraries of Table 1, it will be noted that Indiana designed space for 5,000 readers, whereas Pittsburgh designed for only 2,027—less than half. The same is true in volume capacity with Indiana providing for 2,500,000 volumes and Pittsburgh for 1,200,000. Certainly there must be unusual circumstances to account for these wide differences in costs and yields. Perhaps this will be more evident if we look at a few more examples. Note Radcliffe College at a cost of $5,100,000 developed at a square-foot cost of $48.50, the highest of any library in this group. Its building cost was quite appropriately slightly less than 90 percent of the project cost, but its volume and seating capacity are both extremely low for a building of such high cost. To go a little further in comparison, consider three state institutions in three widely scattered parts of the country, California State at Pomona, Mankato State in Minnesota, and the University of Florida at Gainesville, with square-foot costs at $21.00, $15.00, and $14.50 respectively. In fact, the square-foot cost at the University of Florida is the lowest in the entire table. There is a wide variation in building cost compared with project cost. The California library had a low building cost and a high project cost. The other two varied by nearly 10 percent as between building cost and project cost. Equipment cost in Florida amounted to 25 percent of the building cost, a very high figure. This is even more difficult to explain when one notes that Florida provided for only 600,000 volumes and 910 seats. The Minnesota library provided for 550,000 volumes and 2,100 seats and California State for 266,000 volumes and 1,662 seats. It may seem impossible to compare these costs with one another. For one reason or another, every academic institution is a new problem with highly variable inputs. For example, the University of Florida library is a graduate research building which definitely does not plan for a large undergraduate service area, there being another and separate establishment for that purpose. California State and Mankato State libraries each represent
the central and main library for their particular campus. In each case, they must provide seats for the entire student body, whether undergraduate, graduate, or faculty. Radcliffe College is quite another academic type, being a women's college with a limited enrollment for which a massive number of seats is not required. At the same time, both Pittsburgh and Indiana are accompanied by satellite libraries so that even the very large numbers they account for do not represent the total available seating for the campus in libraries.

In summary, it may be useful to note here the wide range of square-foot cost, from $14.50 to $48.50 with an average square-foot cost of $27.40. The average building cost, as compared with project cost for this group of libraries, is 82.1 percent. The average equipment cost is 14 percent. The range of seating capacity varies from a low of 314 to a high of 5,000. It is far easier to accept a building cost of $12,500,000 for a library that will seat 5,000 than that of a library costing $1,850,000 to seat 314. There are, of course, mitigating factors. In the last cited case, the building is designed essentially for graduate study. Even so, the number seems extremely low.

It is also interesting to compare some of these figures for libraries of the middle group; that is, those costing between $1,000,000 and $2,000,000. In terms of square-foot cost, the range again is extremely wide, going from $11.31 to $41.89. The two highest cost institutions, Lehigh University and George Mason College in Virginia, both are in a geographical area of high labor and building materials cost. It will be noted that both of these institutions have built modest seating capacity, being 350 and 450. In book capacity, they are also quite limited, 150,000 and 60,000. There is a surprise in the equipment cost, with Lehigh spending very close to an average figure with 14.3 percent, but with George Mason College only 5.4 percent for equipment. On the low side, Western Michigan University with a flat $2,000,000 project cost and far less than the highest building cost of $1,574,500 and Ft. Hays Kansas State with $1,192,312 project cost and $982,065 building cost, have both built for sizeable seating capacity and about the largest volume capacity for this group of buildings. Western Michigan planned for 450,000 volumes and 2,000 seats, while Ft. Hays spent a little more than the average figure. There are no surprises in the building cost compared with project cost in these two libraries. Neither is very far from 80 percent, which appears to be close to an average. The average building cost as compared with project cost for buildings in this class is lower than that of the larger
<table>
<thead>
<tr>
<th>Institution</th>
<th>Project Cost</th>
<th>BC*/PC*</th>
<th>Total Area</th>
<th>Sq. Ft. Cost</th>
<th>Building Cost</th>
<th>EC*/BC</th>
<th>Volume Capacity</th>
<th>Seats</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Western Michigan Univ., Kalamazoo</td>
<td>$2,000,000</td>
<td>78.7%</td>
<td>147,054</td>
<td>$13.60</td>
<td>$1,574,500</td>
<td>07.9%</td>
<td>450,000</td>
<td>2,000</td>
</tr>
<tr>
<td>2. Barry Coll., Miami, Fla.</td>
<td>$1,901,500</td>
<td>80.4</td>
<td>86,535</td>
<td>21.00</td>
<td>1,529,500</td>
<td>24.3</td>
<td>372,000</td>
<td>800</td>
</tr>
<tr>
<td>3. Newark State Coll., Union, N. J.</td>
<td>$1,885,391</td>
<td>93.0</td>
<td>65,065</td>
<td>22.26</td>
<td>1,753,391</td>
<td>07.5</td>
<td>132,000</td>
<td>700</td>
</tr>
<tr>
<td>4. Florida Tech. Univ., Orlando</td>
<td>$1,865,000</td>
<td>90.6</td>
<td>122,000</td>
<td>15.29</td>
<td>1,690,000</td>
<td>10.4</td>
<td>175,000</td>
<td>950</td>
</tr>
<tr>
<td>5. Wells Coll., Aurora, N. Y.</td>
<td>$1,855,173</td>
<td>90.6</td>
<td>50,800</td>
<td>29.50</td>
<td>1,680,565</td>
<td>10.4</td>
<td>174,608</td>
<td>316</td>
</tr>
<tr>
<td>6. Wisconsin State Univ., Superior</td>
<td>$1,812,500</td>
<td>77.9</td>
<td>70,000</td>
<td>25.89</td>
<td>1,411,670</td>
<td>13.9</td>
<td>217,000</td>
<td>600</td>
</tr>
<tr>
<td>7. Western Conn. State Coll., Danbury</td>
<td>$1,783,740</td>
<td>87.8</td>
<td>47,533</td>
<td>37.53</td>
<td>1,566,740</td>
<td>10.4</td>
<td>225,000</td>
<td>584</td>
</tr>
<tr>
<td>8. Kalamazoo Coll., Kalamazoo, Mich.</td>
<td>$1,750,000</td>
<td>71.4</td>
<td>52,900</td>
<td>33.08</td>
<td>1,250,000</td>
<td>12.8</td>
<td>160,000</td>
<td>500</td>
</tr>
<tr>
<td>9. Northeastern State Coll., Tahlequah, Okla.</td>
<td>$1,735,000</td>
<td>92.2</td>
<td>96,000</td>
<td>16.30</td>
<td>1,600,000</td>
<td>08.4</td>
<td>135,000</td>
<td>2,000</td>
</tr>
<tr>
<td>10. Lehigh Univ., Bethlehem, Pa.</td>
<td>$1,717,240</td>
<td>87.5</td>
<td>41,000</td>
<td>41.89</td>
<td>1,502,240</td>
<td>14.3</td>
<td>215,000</td>
<td>350</td>
</tr>
<tr>
<td>11. St. Mary's Univ., San Antonio, Tex.</td>
<td>$1,694,520</td>
<td>76.7</td>
<td>103,362</td>
<td>16.40</td>
<td>1,300,000</td>
<td>17.3</td>
<td>225,000</td>
<td>1,108</td>
</tr>
<tr>
<td>12. Univ. of So. Dakota, Vermillion</td>
<td>$1,500,000</td>
<td>72.200</td>
<td>18.92</td>
<td>222,329</td>
<td>300,000</td>
<td>800</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Lewis and Clark Coll., Portland, Ore.</td>
<td>$1,500,000</td>
<td>50,000</td>
<td>30.00</td>
<td>185,000</td>
<td>450</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Austin Peay St. Coll., Clarksville, Tenn.</td>
<td>$1,390,320</td>
<td>85.6</td>
<td>78,000</td>
<td>17.82</td>
<td>1,189,482</td>
<td>11.6</td>
<td>138,023</td>
<td>740</td>
</tr>
<tr>
<td>15. St. Michael's Coll., Winookski, Vt.</td>
<td>$1,364,231</td>
<td>87.5</td>
<td>43,000</td>
<td>34.72</td>
<td>1,193,731</td>
<td>14.3</td>
<td>170,500</td>
<td>604</td>
</tr>
<tr>
<td>16. George Mason Coll., Fairfax, Va.</td>
<td>$1,223,554</td>
<td>86.1</td>
<td>31,460</td>
<td>38.20</td>
<td>1,053,600</td>
<td>05.4%</td>
<td>56,754</td>
<td>450</td>
</tr>
<tr>
<td>17. Louisiana State Univ., Shreveport</td>
<td>$1,200,000</td>
<td>72.9</td>
<td>63,716</td>
<td>13.72</td>
<td>874,464</td>
<td>37.2</td>
<td>325,536</td>
<td>300</td>
</tr>
<tr>
<td>18. Ft. Hays Kansas St. Coll., Hays</td>
<td>$1,192,312</td>
<td>82.4</td>
<td>105,404</td>
<td>11.31</td>
<td>982,065</td>
<td>15.6</td>
<td>153,685</td>
<td>1,022</td>
</tr>
<tr>
<td>19. Hendrix Coll., Conway, Ark.</td>
<td>$1,133,686</td>
<td>90.2</td>
<td>30,682</td>
<td>30.34</td>
<td>1,022,686</td>
<td>10.9</td>
<td>111,000</td>
<td>400</td>
</tr>
<tr>
<td>20. College of the Virgin Islands, St. Thomas</td>
<td>$1,014,000</td>
<td>92.1</td>
<td>27,500</td>
<td>37.00</td>
<td>934,000</td>
<td>08.6</td>
<td>80,000</td>
<td>130</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>76.2%</strong></td>
<td>$25.24</td>
<td><strong>13.1%</strong></td>
<td><strong>208,794</strong></td>
<td><strong>740.2</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*BC is building cost, PC is project cost, EC is equipment cost.*
TABLE 3: SELECTED LIBRARY PROJECTS UNDER $1 MILLION

<table>
<thead>
<tr>
<th>Institution</th>
<th>Project Cost</th>
<th>BC*/PC*</th>
<th>Total Area</th>
<th>Sq. Ft.</th>
<th>Building Cost</th>
<th>BC*/RC</th>
<th>Equipment Cost</th>
<th>Volume Capacity</th>
<th>Seats</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Univ. of Tulsa, Oklahoma</td>
<td>$982,777</td>
<td>73.8</td>
<td>51,310</td>
<td>$28.02</td>
<td>$724,827</td>
<td>16.9%</td>
<td>$122,710</td>
<td>304,950</td>
<td>639</td>
</tr>
<tr>
<td>2. So. Carolina St. Coll., Orangeburg</td>
<td>972,343</td>
<td>86.9</td>
<td>40,000</td>
<td>19.74</td>
<td>844,583</td>
<td>12.4%</td>
<td>127,760</td>
<td>104,960</td>
<td>479</td>
</tr>
<tr>
<td>3. Marylhurst Coll., Marylhurst, Ore.</td>
<td>877,217</td>
<td>92.6</td>
<td>30,000</td>
<td>29.25</td>
<td>812,217</td>
<td>08.0%</td>
<td>65,000</td>
<td>150,000</td>
<td>350</td>
</tr>
<tr>
<td>4. Alabama Coll., Montevallo</td>
<td>875,493</td>
<td>86.2</td>
<td>52,631</td>
<td>16.70</td>
<td>754,367</td>
<td>16.1%</td>
<td>121,128</td>
<td>280,000</td>
<td>685</td>
</tr>
<tr>
<td>5. St. Francis Coll., Loretto, Pa.</td>
<td>800,082</td>
<td>90.4</td>
<td>33,810</td>
<td>23.23</td>
<td>786,082</td>
<td>10.6%</td>
<td>83,000</td>
<td>175,000</td>
<td>300</td>
</tr>
<tr>
<td>6. Murray St. Univ., Ky.</td>
<td>830,000</td>
<td>85.9</td>
<td>26,800</td>
<td>31.71</td>
<td>739,093</td>
<td>11.7%</td>
<td>89,142</td>
<td>150,000</td>
<td>327</td>
</tr>
<tr>
<td>7. Wesleyan Coll., Macon, Ga.</td>
<td>949,074</td>
<td>89.5</td>
<td>43,000</td>
<td>19.75</td>
<td>759,931</td>
<td>16.9%</td>
<td>10,000</td>
<td>50,000</td>
<td>945</td>
</tr>
<tr>
<td>8. Dunbarton Coll. of Holy Cross, Wash., D. C.</td>
<td>841,500</td>
<td>94.1</td>
<td>26,244</td>
<td>30.16</td>
<td>791,500</td>
<td>06.3%</td>
<td>50,000</td>
<td>100,000</td>
<td>360</td>
</tr>
<tr>
<td>9. Georgia Coll. at Milledgeville</td>
<td>836,000</td>
<td>78.8</td>
<td>41,483</td>
<td>20.15</td>
<td>659,000</td>
<td>20.5%</td>
<td>135,000</td>
<td>140,000</td>
<td>633</td>
</tr>
<tr>
<td>10. Upper Iowa Univ., Fayette</td>
<td>732,961</td>
<td>77.4</td>
<td>33,387</td>
<td>23.22</td>
<td>583,034</td>
<td>21.3%</td>
<td>124,356</td>
<td>106,000</td>
<td>420</td>
</tr>
<tr>
<td>11. Pacific Univ., Forest Grove, Ore.</td>
<td>672,811</td>
<td>90.8</td>
<td>42,390</td>
<td>15.87</td>
<td>610,875</td>
<td>15.0%</td>
<td>91,889</td>
<td>240,000</td>
<td>350</td>
</tr>
<tr>
<td>12. Louisiana St. Univ., Alexandria</td>
<td>661,400</td>
<td>89.0</td>
<td>39,000</td>
<td>16.96</td>
<td>661,400</td>
<td></td>
<td></td>
<td>150,000</td>
<td>650</td>
</tr>
<tr>
<td>13. Chapman Coll., Orange, Cal.</td>
<td>657,505</td>
<td>77.4</td>
<td>32,000</td>
<td>20.50</td>
<td>509,047</td>
<td>19.1%</td>
<td>97,113</td>
<td>118,000</td>
<td>350</td>
</tr>
<tr>
<td>14. Elon Coll., Elon, N. C.</td>
<td>643,665</td>
<td>83.1</td>
<td>34,127</td>
<td>19.00</td>
<td>534,850</td>
<td>20.3%</td>
<td>108,815</td>
<td>110,000</td>
<td>610</td>
</tr>
<tr>
<td>15. Univ. of Minnesota at Duluth</td>
<td>582,115</td>
<td>78.4</td>
<td>26,000</td>
<td>22.89</td>
<td>456,385</td>
<td>13.1%</td>
<td>60,000</td>
<td>50,000</td>
<td>400</td>
</tr>
<tr>
<td>16. New England Coll., Henniker, N. H.</td>
<td>570,000</td>
<td>83.4</td>
<td>18,000</td>
<td>28.00</td>
<td>487,000</td>
<td>06.8%</td>
<td>33,000</td>
<td>65,000</td>
<td>214</td>
</tr>
<tr>
<td>17. Southwest St. Coll., Marshall, Minn.</td>
<td>527,000</td>
<td>84.6</td>
<td>17,000</td>
<td>31.00</td>
<td>527,000</td>
<td>17.1%</td>
<td>90,000</td>
<td>50,000</td>
<td>450</td>
</tr>
<tr>
<td>18. Little Rock Univ., Arkansas</td>
<td>520,000</td>
<td>84.6</td>
<td>19,000</td>
<td>27.00</td>
<td>440,000</td>
<td>18.2%</td>
<td>80,000</td>
<td>100,000</td>
<td>340</td>
</tr>
<tr>
<td>19. Wiley Coll., Marshall, Tex.</td>
<td>485,000</td>
<td>87.6</td>
<td>21,351</td>
<td>22.72</td>
<td>425,000</td>
<td>14.1%</td>
<td>60,000</td>
<td>61,400</td>
<td>289</td>
</tr>
<tr>
<td>20. North Carolina Wesleyan Coll., Rocky Mount</td>
<td>457,800</td>
<td>89.7</td>
<td>15,260</td>
<td>30.00</td>
<td>410,800</td>
<td>11.4%</td>
<td>47,000</td>
<td>67,000</td>
<td>200</td>
</tr>
</tbody>
</table>

Average: 85.1% $23.79 13.7% 128,615 450

* BC is building cost, PC is project cost, EC is equipment cost.
Financing and Cost of University Library Buildings

libraries. This suggests that the middle-sized college or university has more involved site problems and perhaps less access to available space and greater expense for service equipment installation, with the result that the project cost ends up much higher than the building cost. It may be interesting to note that the average square-foot cost for the middle-sized building is $25.24. The average equipment cost remains slightly under 15 percent, not greatly different from the previous group.

The final group of small colleges or universities includes those libraries which were built at a project cost between $400,000 and $1,000,000. Again there are a few isolated examples of high and low costs. The highest-cost building was that of Murray State University in Kentucky, with the next highest being Southwest State College in Minnesota. A rapid review of the percent of building cost compared with project cost of buildings of this size produces an average building cost of 85.1 percent of the project cost. We have only one figure for Southwest State College in Minnesota of $527,000 for both project and building cost, but Murray State University arrives within a fraction of the average. The two low square-foot cost libraries were Alabama College at Montevallo, Alabama, and Pacific University in Oregon, with square-foot costs of $16.70 and $15.87 respectively. In both cases, these building costs were higher in percent of project cost than the norm, being 86.2 percent and 90.8 percent. These examples also offer us the extremes of seating and volume capacity in each pair. Murray State University with a high square-foot cost still provided for 945 seats, though a modest-sized collection. Southwest State College in Minnesota built only 450 seats and the same minimum-sized collection of 50,000 volumes. In the low-cost buildings, Alabama provided 695 seats and 280,000 volume capacity, while the Pacific University provided only 350 seats but 240,000 volume capacity. It seems evident from these and other examples that there is a direct connection between the provision of a large number of seats and a low square-foot cost. Equipment cost in any of these buildings of the under one million dollar class again confirms the average equipment cost as lying close between 13 percent and 15 percent of the building cost. Considering all of the examples offered in the three tables, it seems quite reasonable to say that a librarian can calculate quite soundly on the basis of 15 percent of the total building cost for its movable equipment.

These tables, and the figures cited above from them, are a pre-
liminary and rough measure and provide only the basic point of departure for further analysis of what makes up building costs and what must be considered in planning well for academic library buildings. The factors which make up the total cost of a library building are subject to various kinds of categorization. They are affected in total and individually by geography, by time, by the simple ups and downs of money values, by availability of men or materials, by the character of architecture and the goals developed in the concept for quality or space. These, and many other factors, must be considered; in fact, each one could serve as a subject for a separate study. Some of these factors may now be usefully reviewed with reference to the buildings cited for the last few years.

From the reader's point of view the ideal would be to provide a reasoned inventory of all known cost factors, together with precise weights or percentages to be assigned to each one. Add to this a short series of unequivocal standards for units of space required by person (user) and function (staff and services), and one could conceivably arrive at a basic figure. This is not really possible because of known variables and also because of the wide range of unpredictables in the future. The best we can hope to do is to make careful note of all aspects of academic library planning and building one can glean from the experience of the recent past, and then observe or suggest those trends certain to affect future planning.

With respect to the site for an academic library, we can readily see the results of reduced space availability. Many libraries are going up, piling one floor upon another in towering structures; others, after thorough study, have sought their space below ground level. It is now certain that financing the site will be an increasing cost in the future. Although the institution may own the site, the very cost of exploiting it will usually amount to a fair sum. If the soil is unstable, as was the case at Louisiana State University and at Simmons College, there will be added cost for establishing the base. If it is rock (Duke), excavation will be costly. If it is centrally located, as at Illinois, the cost of relocating underground service lines will be high. If, as at Emory, the most useful site is in a ravine, problems of access may add to the often unseen or unrecorded site costs. When such costs are recorded, they may be designated as site clearance, site preparation, or almost any other convenient euphemism. Only one fact is certain here; site problems will be increasingly more complex and will indeed affect costs more.
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Similar complexities now suggest a far broader range of what might be grouped under the title administrative costs. These are of two kinds, 1) professional services, and 2) operational services. The primary cost element in the first is, of course, the architectural firm or the architect. Depending upon the size of the firm, there will be a greater or lesser need for consultant services in a wide range of fields. A large architectural firm may have competent electrical as well as mechanical engineering staff. More often than not, even large architectural firms do not have full-time work for a lighting specialist, or an acoustical or communications specialist. If these present serious problems of design, then either the architect or the owner must employ consultants, as needed, for whatever special competence is necessary. In addition to the standard areas of lighting and interior design, consideration should be given to getting the best available advice on acoustical treatment, landscape architecture, audio or audio-visual, or any other needed. We live in a period of steadily increasing complexity growing out of great technological development. We are far beyond the time when any one man, no matter what his training, can know the best and latest developments in all of these fields. The net result is that in addition to planning for 6 to 8 percent for architect's fees, you will have to calculate on 8 to 10 percent for professional fees, including specialized advice.

There are operational expenses of less professional but no less critical character at all stages of the building process. Beginning with preparation of the program, estimates of cost, financial arrangements including bonding, insurance, legal counsel, preparation of proposal documents, surveying, borings, the list continues with supervision and inspection at each step in the construction. Even after the building is delivered, there are the expenses of moving and the official opening to account for.

Examples of all of these cost items and many more can be readily found in the literature of library building. A notable audio installation was reported for Meyer (undergraduate) Library at Stanford University. The Countway Library of Medicine at Harvard required special acoustical advice. The University of Guelph in Ontario used a consultant on urban design. In our time it is customary to have at least one consultant for planning, and often another for interior design. Lighting and air-conditioning are two other specialities that should stand high in the list of requirements.

In discussing the structure itself, the variables here are probably
the best known aspects of the whole subject area. The old questions of form versus function, of artistic versus useful, of monumentality versus practicality have been thoroughly chewed over in our library literature. The present trend is steadily toward the functional, enforced by ever-rising labor and materials costs. There are still a few extraordinary libraries built each year, with cost no object. In the past year St. Michael's College built a circular library; Marywood College completed an octagonal building. In 1966 Oral Roberts University produced a six-sided building; a year earlier the Maritime College spawned a hybrid half modern/half medieval library. These special cases notwithstanding, the major trend of design affecting library building costs has been toward more effective specific use of available funds. There is now no lack of understanding among architects and librarians of the cost factors involved in various types of wall construction, or of the vast sums that can be invested in monumental or exotic forms of architecture. Happily for us the literature of academic library building is now profuse and readily accessible. Qualified library building consultants and usually the operating librarian who reads can ask the right questions if given an opportunity. Since this is the largest single cost item, it also provides the best opportunity for saving effectively or making the most of whatever is available. The initial determination of the form and function of the structure will be the most critical single decision bearing upon the cost of the library. This one decision in large measure sets the pattern for lighting, heating, cooling, acoustic treatment and many other elements of the total building cost. A high-rise building involves increased elevator provision, high ceilings alter lighting requirements, large expanses of glass alter air cooling problems; these are only a few examples of the numerous factors affecting costs involved in the basic decision.

Problems affecting costs of equipping the building usually come back to one point: standard library equipment is costly. One of my respondents reported with aggrieved astonishment that a card catalog drawer now costs nearly $14.00, and he thinks this ought to be investigated! Regardless of cost level of individual items, however, all recent reports still put the average movable equipment cost for an academic library in the range of from 10 to 15 percent of the building cost. This percentage will likely remain static, although the overall cost will go up with general inflation. Parenthetically, and without reference to cost, it should be stated that the crucial problem in
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equipping is obtaining timely and complete delivery by contractual date. This is another area deserving critical attention.

Decoration, the last cost factor in construction, includes landscape architecture and art, where they are used. One authority\textsuperscript{4} points out that 1 percent is the usual allowance for art, when it is allowed, but suggests that 2 percent would be more appropriate. I have found no statement concerning an appropriate percentage for landscaping, and it is not likely that one could be made. Notre Dame budgeted $250,000 for art work on an eight million dollar building, but many libraries built recently show no allowance for art or spend far less than 1 percent. Though it is often very difficult, the inclusion of an appropriate amount for ornamenting and finishing a fine structure both inside and out, should be earnestly sought. It is far easier to do it well when it is funded and planned together with all of the other functions. The architect can include it in his responsibilities and will usually be happy to account for it.

In the early paragraphs of this paper the general area of post-building evaluation was suggested as an integral part of costs or financing of a library. This is a topic often glossed over deliberately or even completely forgotten once a building goes into use. The importance of measuring, observing, and evaluating a new building in use should not be underestimated. In its first year at work, a new building will prove the ability or disability of its planners. It will merge into its ambience or stand out as an anomaly without merging. It will be joyously used or ignominiously misused. It will demonstrate its fitness throughout or reveal multiple inadequacies. In all of these ways and others, it should be possible and it is necessary to determine how well the funding for the building has been used. The manner and extent of post-building evaluation is the final measure of costing and will often provide the best possible basis for assuring favorable consideration of funding for libraries not yet planned.

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3. Letter from Mr. John Buchan, Assistant to the President, St. Michael's College, Winooski, Vermont, dated March 20, 1969.
Urban University Library Building Problems

CHARLES F. GOSNELL

The key word here is "urban" and a score or more of years ago this paper would have been much easier to write, at least in retrospect. Then everybody understood what "urban" meant, and what it was or was not at that time. "Urban" obviously implied a crowded city setting with all the problems and disadvantages that seemed so clear to rural-minded people.

Because of its setting the urban university was thought to serve a large proportion of part-time students and commuters. We tended to look upon these people as "hit and run" operators whose draughts at the Pierian Spring were minimal. The urban university was relatively new, or newly and enormously expanded, rich in numbers of students, but poorly endowed and meagerly equipped with library resources.

Today even Harvard and Yale have discovered that they are in urban settings. Once the least urban of all, the agricultural and mechanical colleges have become state universities, sacrificing their farms and broad fields to building projects, and involuntarily, perhaps, but inevitably, finding themselves in the midst of urban development. The once impoverished and over-expanded "urban" universities finding new sources of funds, state, federal, and even wealthy alumni, have raised admission standards, built dormitories and otherwise blurred or softened the harsh features which once so readily identified them.

In our so-called "affluent society," "working one's way" through college is almost a thing of the past. Scholarships and other forms of student aid are widely available, and academic authorities actively discourage the part-timer. Even summer sessions are falling victims to vacationing and overseas travel.

The differences today are differences of degree, or of twilight

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zones, with the old-fashioned “country club” college at one end of the scale, and the tightly packed downtown big city university on the other end. Thus it is possible to discuss “urban” problems in general terms and tendencies as reflected in library buildings.

Problems of Site

The site problem is severe. The urban setting implies a definite, predetermined street pattern, which can be changed only with difficulty. The blocks may be irregular in size, and too small. Land may be extraordinarily difficult to acquire, and expensive (a million dollars an acre or more). Some plots have been assembled through urban re-development procedures, and sold to universities at more advantageous prices.

The presence of city streets implies the easy availability of utilities such as water, sewers, telephone, gas, and electricity, but these lines may be already overburdened. Merely closing a street does not automatically permit easy site expansion, because the cost of moving the utility lines may be a half million dollars or more. Sometimes, as at Brooklyn College and the University of Pennsylvania, the new library building must be bridged over the existing lines.

Traffic problems are notorious: vehicles are dangerous and noisy, pedestrians resent rigid controls, parking facilities may be insufficient or virtually non-existent for faculty and staff, as well as students. Only the major cities possess adequate transportation by buses and subways.

Immediate proximity to other buildings, with perhaps only a street in between, looks economical on the plot plan. There will be a minimum of landscaping, of walks and driveways to construct, and utility lines may be shorter. Since central heating is the general practice nowadays, central cooling can easily follow, permitting the library building to be freer of these space-consuming and sometimes annoying mechanical facilities. The lack of broad and lengthy vistas may discourage excess monumentality in exterior design. Conversely there are aesthetic values in space on a spread-out campus. Certainly more generous amounts of land permit plans for future expansion of a building.

Zoning

In congested areas the well-planned library building will have a bay or two for off-street truck loading and unloading. Often this must
be at the sacrifice of space within the shell of the building, but it is a real necessity. The time may come when cities will require parking space as part of a library building as they now do for many office buildings and apartments.

The impact of zoning is increasingly evident in urban areas. Primarily zoning determines land use and density: whether residential, and, if residential, various classes ranging from one family dwellings on large plots of land to high-rise apartment buildings. Business zones may be for retail stores, office buildings, light manufacturing or heavy industry. Although there are often special exemptions for educational institutions, a university library is not likely to be permitted in an exclusive residential area, nor would it be desirable in a heavy industry area. Zoning regulations vary widely in local jurisdictions, and adherence to them is largely a matter of local politics.

Zoning rules may require that the building be set back from the street line and may determine the height of the cornice line or prescribe other limitations. The total height of the building may be restricted. Its total capacity may be governed by a “floor-area ratio.” For example, at New York University, Washington Square, only six and one half square feet of building can be constructed above ground for every square foot in the building plot.

Articulate neighbors may seek to express themselves with regard to the style, size and height of the proposed building as they did at Washington Square. Apartment dwellers on the second block from the Square objected that their view of the Square would be cut off if NYU erected a library on the intervening vacant block, cleared in advance for this very purpose. They further sought to prevent the university from building on a forty foot wide strip on the west side of the block which had once been earmarked by the city for street widening (a proposal which neighbors had defeated some years earlier).

Construction Costs

Once the site is obtained and the principle of a building is approved, the architect of an urban university library building is likely to find himself controlled in great measure by rather strict and often rigid building construction codes. Under the primary guise of safety, these codes may require obsolete construction materials and methods, prevent the use of newly developed materials, and mandate practices or even certain materials favored by local trade unions. The con-
trovery between the lath and plaster interests and the modern “dry wall” gypsum board advocates is familiar even to readers of the advertisements in subway cars in New York and Chicago. Frequently electricians will insist on rewiring, or will refuse to install, lamps not made in factories employing favored unions.

The freedom of architectural design may be restricted in many ways. The size, number and location of exits and particularly of exit stairways is often predetermined regardless of what both architect and librarian may desire in an efficient interior circulation pattern. These extra stairways and exits, which may well be essential in emergency situations, can consume a great amount of space, and be a constant source of difficulty in everyday use of the building. These emergency exits must also be protected with various devices such as “panic hardware” and alarm systems.

Installation of special devices such as automatic sprinklers may be mandated. Sprinklers are much feared by many librarians, but experience shows that the sprinkler which is quick to report and extinguish fires at the very beginning, does much less damage to books than the later application of heavy streams of water from fire hoses.

Code requirements almost inevitably increase the cost of a building. Many believe that these increased costs are greater than can be justified by the resultant improvements, if any, in the quality of the building. This differential in application to urban buildings is continuously being reduced as rural areas, or even states, adopt building codes. Conversely, state-constructed buildings are often exempt from local codes.

The contractor bidding on construction of an urban building must take into account the added costs of traffic delays in the delivery of his materials. The limitations of the site may leave him without an adequate work area and storage space further increasing his costs of operation. Wages are often higher, hours of work shorter, and productivity per man lower. The proximity of streets and other buildings may necessitate extensive shoring of the excavation until permanent foundation walls can take the burden. The use of cranes may be restricted, and operations creating excessive noise and air pollution may be restrained. Even the removal of debris may be much more expensive.

If limitations of available land have forced the design of a high-rise building, the cost per square foot for construction immediately jumps. Elevators are costly to build and maintain. The new Elmer
Holmes Bobst Library at New York University will have nine elevators with complex (and expensive) programming to serve fifteen floors. As the number of floors increases an increasingly greater proportion of the cubage of the building must be devoted to vertical circulation such as stairways and elevators.

The city air may be so polluted as to require more expensive precautions against deterioration of stonework and other exterior surfaces. Air-conditioning systems must have heavy duty equipment to remove acids, soot and other pollutants from the air.

Without question, the urban university library tends to be more expensive to build for a given capacity. The principal factors in the added cost are acquisition and clearing of the site, and construction costs, due to labor, building codes, site limitations, and high-rise design. The librarian will need to work with lawyers as well as architects and engineers.

**Design of the Building**

The functions and capacities of the urban building may vary from the norm, or be subject to special requirements to the extent that the demands of its users may differ. Unfortunately, there are no formulae to measure these differences. In general we may suppose that a student body resident in dormitories on campus in a rural setting will have a demand on library facilities more evenly distributed hour by hour and day by day, and that the demand will average heavier than that made on the urban library by an equal number of part-time commuting students.

The commuter will tend to make more use of local public libraries or other resources, and will tend to concentrate his demands in the late afternoon or early evening hours. He will insist on the privilege of taking out “two-hour reserve” books for a day or two until his next return to the campus. For those who would reduce all this to formulae and “full time equivalents” the moment of truth comes when one “full time equivalent” arrives simultaneously in the form of three students, each demanding services and seats. Indeed it would seem appropriate not to discount the commuter but to make special efforts that “he who runs may read.”

It cannot be said that a given number of commuters make fewer demands upon a library building than their full-time equivalent in dormitory on-campus residents, but rather that the commuter load has more sharply marked peak periods. Because of these peak de-
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mands and because the urban situation usually has neighboring libraries with substantial resources, the urban university library is often characterized by a higher ratio of seats to books. The nature of these peaks of demand suggests a low, spread-out building, which the cost of land prevents. The City College Library in New York has extensive pedestrian ramps between lower and upper floors which were designed to take some of the load off stairways and elevators but they have not proven to be successful (perhaps because they look too long and steep). At least two libraries located in high-rise buildings (Pittsburgh, formerly in the Cathedral of Learning, and Hunter, in New York) have had serious elevator problems.

In New York City and Chicago, for example, the presence of many special libraries and extensive public library systems, together with working cooperative programs does indeed suggest that any given university library can limit its collections in some areas without depriving its readers to the extent that a similar limitation would in a single isolated institution. Here at least is one potential source of economy to offset so many extra costs already enumerated.

The near presence of bookstores such as those of "lower Fourth Avenue" and of "The Village" near Washington Square at New York University are factors too. "The Village" presents other influences too, which need not be enumerated here. Certainly the urban institution is usually marked by the easy availability of nearby diversions, cultural and otherwise.

Classical architecture in libraries and other buildings as well is often characterized by the fortress-like facade of the ground-floor exterior. The heavy bronze doors and smaller, often barred windows contrast with the great reading room windows on the floor above. In recent years, these features have not gone unnoticed by activist students such as those who found the old Low Library at Columbia so easy to occupy and defend. In contrast, at the urban universities still occupying more humble quarters such as the former store-fronts at Washington Square, the students were quick to observe that a plate-glass window is little, if any, defense for a sit-in. Our modern library buildings are more open in construction and relatively defenseless, therefore, librarians should hope that the days of street rioting are gone again.

No comment on the urban library can be complete today without reference to the politically explosive issue of safe streets and its effects on evening attendance. Many urban institutions have been
forced to curtail hours, close all but one entrance to a building, and station security guards.

A final word about "future expansion." Time was when every well-planned library building had provisions for future expansion, but now it is a rare urban institution that can afford to retain vacant land for this purpose for long periods of time. Our hope is that the development of cooperative networks, facsimile transmission, and improvements in micro reductions may prolong the useful life of our land-locked urban university library buildings.

In summary, although we disclaim any rigid definition of what is "urban" we do find many readily observable characteristics which have an impact on the urban university library building. The seating capacity of such a building should be determined by the usual formulae, with special attention to peak loads. The book capacity may be modified with an eye to the easy availability of neighboring collections on a cooperative basis. Land for the buildings may be subject to many restrictions contributing to higher costs. The building itself may be smaller in ground area, and higher in number of floors, and it is almost certain to be more costly per unit of capacity, and more costly to maintain.
1. Arizona State University Library

2. University of California Library, Santa Barbara (Photo by Ansel Adams)
3. Joseph Regenstein Library, University of Chicago (Model showing main entrance)

4. University of California Library, San Diego (Photo by Marvin Rand)
5. Undergraduate Library, University of Michigan (Main floor)
6. J. Henry Meyer Memorial Library, Stanford University (Second, or Main floor)
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12. Reading pavilion, Meyer Memorial Library, Stanford University
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Undergraduate Libraries in a University

WARREN B. KUHN

The past ten years have witnessed a radical increase in the number of major libraries on large university campuses designed specifically for undergraduates. Between 1960 and 1968 at least a dozen such libraries were opened, and almost as many more are on the verge of occupancy or in various stages of construction or serious planning. All evidence points to a fair continuance of this pace in the decade ahead.

Rising enrollment, space pressures in existing buildings and genuine concern for undergraduate education are factors responsible for this current acceleration, yet each new library still traces its lineage back to the opening of Lamont in 1949. Design, size and location may change, but the Lamont pattern of enlarged, carefully planned and centralized undergraduate services has been a dominant influence.

At most institutions with undergraduate libraries, the single central building concept has given way to a two-building central library, one of which is especially devoted to undergraduate service. However, not all institutions have accepted the separated two-building approach. Some have continued large-scale undergraduate libraries within expanded or new main buildings. Some have endorsed the "college library," an open-shelf collection of commonly used materials serving the entire university; for less frequently consulted items, the user is referred to the research stack. Others have been strong proponents of the educational value for undergraduates in using the research collection as opposed to smaller undergraduate collections. Even here, there is little quarrel with a sizable separate collection such as Lamont for a larger university such as Harvard; it is questionable mostly for smaller institutions with libraries of less than a half million volumes. Since those major undergraduate libraries established in the past decade have been at universities whose research collections contain more than a half million volumes, sheer
size of collection is a prime factor. Of equal importance has been the serious need for additional library space at these institutions. Another determining element involves the desirability of dividing collections and users into smaller, more manageable units when a library system becomes overwhelmingly complex. For some institutions this latter device may conceivably also provide an economical solution to a difficult capital funding question.6

Compounding the problem is the impact of increased enrollment. The conflict between graduate and undergraduate students for the same space is one that predictably will intensify as the trend toward independent study sends undergraduates to libraries with increasing frequency.7 Undergraduate libraries are seen as partially alleviating this by improved service through separate facilities. While the main collection concentrates on graduate students and faculty, both libraries would remain open to all, and the character of the two collections is viewed as encouraging transition from one to the other as need arises.8 Present experience at Stanford seems to bear this out. There use of both library collections has increased, and undergraduate library circulation has not reduced main library circulation, of which 23 percent is to undergraduates. In addition, 1968 fall quarter circulation figures at Stanford's undergraduate library were up 20 percent over the same period in 1967.9

Undeniably the undergraduate library has its attractions for decentralizing large university collections and services. Such rationales have persuaded an increasing number of universities to adopt major undergraduate facilities. For that reason much of the remainder of this article is compiled from answers to a detailed questionnaire forwarded to those universities where extensive undergraduate libraries were known to be in existence, in construction, or in various stages of planning.

New and separate libraries have been erected on the campuses of Michigan,10 South Carolina,11 Texas,12 North Carolina, Stanford,13 Ohio State, Pennsylvania State, and Illinois.14 A similar building at Tennessee15 is now on the verge of occupancy. At Cornell and UCLA the original main library buildings have been remodeled and reopened for undergraduate use, while new buildings at Washington, Wisconsin, Maryland, Berkeley and Oklahoma16 are well along in planning or under actual construction. Nebraska is remodeling an older campus building as its separate undergraduate library,17 Michigan State has constructed a new research library and remodeled its
original building for undergraduate library use, joining both by a common service core, and Emory is planning to renovate its present library building to house a proposed undergraduate library once its new library for advanced studies is completed.18

The major portion of the ground floor of the University of Miami's main library is designed as an undergraduate reading room with centralized services and general reading rooms on two floors above and controlled stacks on six floors of a nine-floor tower. Indiana's new library employs a similar three-in-one principle with one tower designed for undergraduate students, a taller tower containing the general collection for advanced students and faculty use with both sharing a common base for services needed by all.19 Notre Dame's library utilizes two floors for more commonly used books to serve undergraduates and the general campus and eight floors of a tower for the research library. Present plans at the University of Iowa call for creation of an undergraduate library on the whole of the second floor, including both existing and new space, in a projected new addition to its main library. Two lower floors in the new high-rise library at New York University will be devoted to undergraduate services. That such facilities are almost a universal concern is evidenced by the fact that the University of British Columbia is seriously planning a new undergraduate library20 and that a separate undergraduate library building is being planned for the University of Leeds, presumably the first of its kind to be opened in Great Britain since 1939.21

The separate undergraduate library, however, has clearly been the trend in recent years.22 Fifteen universities have chosen it to meet the needs of their large undergraduate populations and as a response to the growing complexity of university libraries and the increased emphasis on faculty research and graduate education. These separately housed libraries differ from traditional university libraries by providing more open access to the collection, by focusing and simplifying services to undergraduates, by providing a specially selected collection, by attempting to make the library an instructional tool, by providing additional services and by designing a building with an undergraduate's habits of use in mind.23

If enrollment, at least for large public universities, is an important factor in the establishment of undergraduate libraries, geographic dispersion of the modern university campus is an equally important
factor for branch locations that supplement central campus lower-
divisional libraries. Ohio State’s master plan calls for three separate
libraries for undergraduates, while at Wisconsin the new college
library, the largest library for the entire undergraduate student body,
is to be supplemented by limited collections and seating in combina-
tion with two science libraries, one providing facilities for students
at the west side of the campus and another for those living south of
the campus. Pennsylvania State has a unique system of four under-
graduate libraries—a main collection in the central library in the
heart of the classroom area and three branch collections in each of
the three residence hall areas of the university. Two branches are not
now in separate buildings, but priority consideration is being given to
construction of a separate library building for the east halls area.24
Residence hall libraries are still another dispersed mechanism of sup-
port, although they are not truly undergraduate libraries of the type
considered in this article, being generally smaller and without pro-
fessional staff. These latter run the gamut from the Harvard “house”25
and Yale “college” libraries and those of Indiana26 or Princeton,27 to
small collections of a few hundred books and periodicals in dormitory
wings and residence halls.

The largest number of undergraduate libraries in separate struc-
tures on the central campus are located immediately adjacent to or
within reasonable walking distance of the main library. Distances
range from a few hundred feet to several blocks. Those at greater
distances are admittedly located for maximum student convenience
to dormitories or classrooms. Nebraska’s undergraduate library, one-
half mile from the general library, is central to dormitory complexes
and commuter parking. Ohio State’s West Campus Library/Learning
Resources Center is one and a half miles west of the main campus
and near classes and parking; its East Campus undergraduate library
is one quarter mile from the main library and equidistant from two
of three dormitory complexes with access to “Greek” houses and to
public transportation. South Carolina’s separate library is two blocks
from the main library; Pennsylvania State’s Pollock-South Branch is
four blocks from the main undergraduate library. Intermediate or
longer distance does create some time loss for staff returning to the
main building for record consultation, meetings and other purposes;
transfer of books and materials from the main library is listed as a
disadvantage in at least one instance. Mail service consisting of one
or two daily pickups and deliveries is used in most cases for the distant locations. UCLA's undergraduate library also has a pneumatic tube for books linking it with the main building.

With access by students emphasized, the ideal site for undergraduate libraries is on or at mainstreams of student pedestrian traffic, although with enlarging campuses, site problems may not appear until the future larger campus pattern develops. Nearness to student unions is also sought. Since the philosophy of the undergraduate library is to encourage use of backup resources in the main library, reasonable proximity to the central building has been stressed. Stanford’s Meyer Library rests astride a direct route from residence areas to classrooms and the student union and is adjacent to the main library building. Student traffic to or through the library from three directions is possible at ground floor level, with entrance via a bridge to the second floor on a fourth side.

An unusual situation was faced by the planners of the University of Illinois' new undergraduate library. Site studies pointed to the north-south mall directly east of the main library as an ideal location in relation to undergraduate classrooms and residence halls, as well as for access to central library resources. However, to maintain the openness of the mall and to avoid shading of venerable adjacent agricultural research plots, the new undergraduate library was set below grade. Exterior lighting and outdoor seating are provided through a large sunken central courtyard, and the whole is surrounded by a lighted and landscaped plaza at campus level. An underground tunnel links the central library basement with the new library's upper level.

One minor disadvantage of proximity to a main building is a tendency by undergraduates to go to the main library with needs that could be answered by the undergraduate library. Another problem is that of congested parking for both structures in the central campus.

Rising construction costs and regional variance in labor make meaningful listings of project costs difficult. In some cases, only estimates are available for buildings still under construction or in various program stages. A selected table of reported costs, nevertheless, may be useful for planners. Figures shown are for new separate structures only.

Lead time planning ranged from two to four years for most buildings, with actual construction requiring from two to two and one-half years. About half of the finished buildings were completed on time.
### TABLE 1
UNDERGRADUATE LIBRARIES
(New, Separate Buildings Only)
Comparative Costs, Sq. Ft., Seating and Collection

<table>
<thead>
<tr>
<th>Date</th>
<th>Total Proj. Cost</th>
<th>Furnishings</th>
<th>Gross Sq. Ft.</th>
<th>Net Sq. Ft.</th>
<th>Seating</th>
<th>Maximum Shelf Capacity (Volumes)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Completed Bldgs.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Illinois</td>
<td>(1969)</td>
<td>$4,240,125</td>
<td>$400,000</td>
<td>98,689</td>
<td>67,121</td>
<td>1,905</td>
</tr>
<tr>
<td>Stanford</td>
<td>(1966)</td>
<td>5,250,000</td>
<td>695,000</td>
<td>115,400</td>
<td>91,400*</td>
<td>1,943</td>
</tr>
<tr>
<td>Texas</td>
<td>(1963)</td>
<td>4,451,262</td>
<td>550,000</td>
<td>214,933</td>
<td>179,956**</td>
<td>1,978</td>
</tr>
<tr>
<td><strong>Planned Bldgs. (Estimates)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ohio State</td>
<td>(1969 est.)</td>
<td>4,330,000</td>
<td>500,000</td>
<td>240,000</td>
<td>190,000</td>
<td>6,075</td>
</tr>
<tr>
<td>Washington</td>
<td>(1967 est.)</td>
<td>4,204,094**</td>
<td>500,000</td>
<td>148,000</td>
<td>128,000</td>
<td>2,184***</td>
</tr>
<tr>
<td>Berkeley</td>
<td>(1969 est.)</td>
<td>4,800,000</td>
<td>125,000</td>
<td>78,781</td>
<td>1,800–2,000</td>
<td>150,000+</td>
</tr>
</tbody>
</table>

* Within building walls; includes first floor lobby; excludes 136 outdoor seats on roof terraces.
** Includes research collections and other services on three floors; net assigned to undergraduates: 86,450.
*** Includes food service facility; seating for 960 in this area is not included with library seating figures.
Remodeling an older building for undergraduate use has a certain immediate attraction for planners in view of reduced construction costs. Interior remodeling of UCLA's original building (ca. 1929) totaled $914,500. This included enclosing the central core for turnstile control, opening and air-conditioning the stacks, dividing the main reading room into reading alcoves and improving the lighting in all public areas, all of which was completed in 1966, and recent installation of a small audio room ($53,000) to be open for service this year. Approximately $80,000 of the total was spent for furnishings. Cornell's cost in 1962 was $1,087,787, with $158,961 for furnishings. These are substantial reductions over new building costs, but net square footages obtained are also somewhat lower.

The real values of remodeling, however, are perhaps less apparent. It is true that older buildings possess eccentricities of interior design, walls are of enduring load-bearing quality and not easily moved, and there is less flexibility in relating or transferring functions. Yet in their essentials they were designed for collections and services far more appropriate to undergraduate library uses than to modern and massive research centers. Both UCLA and Cornell expect their buildings to be suitable for reader and book needs for the foreseeable future. There is also a charm and character expressed that is rarely possible in newer and more formal architecture. Uris' Clock Tower and the Powell Library's rose-colored ornamental brick partly inspired by Milan's San Ambrogio are still landmarks on the central campuses. UCLA has "discovered an unexpected bonus in the excellent acoustics of the second floor rotunda which has become the setting for a quarterly series of concerts." 28

Despite the monumental interiors, imaginative remodeling has scaled what were formerly veritable rabbit warrens for books into something similar for readers.29 In so doing, these structures have returned intimacy and study privacy to the undergraduate, a need for which new buildings have striven by including alcove shelving, individual seating and reading pavilions. Future remodeling is in store at UCLA with a fine editions and poetry room, a periodicals area and complete air-conditioning.

On the reverse of the coin, adequate remodeling poses problems in electrical wiring, plumbing and general refurbishing. Improvements in lighting usually must be extensive, and noise control demands attention. Cornell, for instance, has carpeted its former main reading room and feels it "is clearly the best choice of floor covering
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for all but entrance areas and stairways” due to “its noise suppression qualities as well as the aesthetic advantages.” Relatively inflexible interiors pose problems in the flow of reader traffic. Service desks need centralization, something not always possible in older buildings, and there is expressed preference for distribution of the collection throughout rather than the distinct separateness enforced through continued use of older bookstacks.

For undergraduate libraries housed within main buildings, access to research collections and a more complete range of services are seen as advantages. Some economies in staffing costs are indicated, particularly to the degree all services are centralized.

At Michigan State the original building was remodeled with an undergraduate library confined to two floors and with building access to an adjoining new research library addition. Total project cost for both buildings was approximately $4,200,000. Indiana’s new centrally located building has a separate area of five floors for undergraduate students and a twelve-floor, high-rise unit with eight of the upper floors for advanced research use. Total project cost is listed at $14,871,000. At Notre Dame, the college library occupies the first two floors of the central library building with controlled access to the research collection. Total project cost was $12,000,000.

Some real problems have apparently been encountered at institutions in which both the undergraduate library and the general library share the same building and where some attempt has been made to regulate use of each by different groups of users. Difficulty has been experienced in reader orientation to the two different types of collections in such close proximity and in a lack of understanding by the library public of the differing purpose, function and use of both collections. Undergraduates, graduate students and faculty often see no real distinction between libraries located in the same building. One undergraduate librarian sharing such a building reports that after a year’s operating experience with specific problems encountered over and over again she and her staff “are increasingly convinced that Undergraduate Library facilities should be physically separate from the Main Library building.”

Notre Dame cites problems with its combined building in breaks in periodical runs and some confusion over location of materials; Michigan State indicates that the proximity of the main circulation desk has caused problems in returning reserve books. Pennsylvania State’s main undergraduate library in its central building has become
almost too popular with faculty and graduate students who at times desire special privileges. At Stanford good seating in attractive surroundings as well as access to duplicate core material have proven to be strong lures for faculty and graduate students.

Facilities shared with other agencies in separate buildings offer both problems and opportunities. At Texas, temporary quarters are provided for the education-psychology library; no disadvantages are seen if space is released for ultimate undergraduate library expansion. A unique concept also occurs at Texas where contemporary rare book materials and special collections are organized around an outdoor reading room terrace on the fourth floor of the undergraduate library, while the University's Campus Teaching Materials Center with classrooms and general offices is located on the ground floor with separate access. A large octagonal lecture hall, featuring sophisticated seating and audio-visual devices for experimental teaching, is in an adjoining structure. Together these are intended to combine library and related facilities under circumstances designed to encourage wider educational activity and independent study by undergraduates.

UCLA's college library shares space with two branch libraries and the library school; Michigan shares its separate building with two branch libraries; and Wisconsin will share its new building with the library school, two academic departments and two lower levels given over to general campus parking. Maryland also plans some shared space. Some sharing is undoubtedly inevitable with modern campus space being at a premium, although libraries generally hope eventually to expand into some or all of these shared areas. Sharing demands careful building design, especially as to user access, and phasing-out schedules of other agency space may not always match library growth and need.

Nebraska will use the second and third floors of a 1928 building, the largest building owned by the University. No library floor space will be shared as such, but the University Museum will use the fourth and fifth floors of the same building, and there will be offices and classrooms on the ground floor. The ground level will also house a bookstore and a small automat for food service. None of these areas is seen as presenting problems at present. Lamont provides some classroom space, and, due to lack of space in Widener Library, the documents division and map collection are now housed in the lower levels of Lamont. The basement of the Meyer Library at Stan-
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ford was planned for double-deck stacking from the beginning; all of it is now used as storage overflow with controlled access for main library collections. however, it can be used for undergraduate expansion if necessary, as can a future fifth floor which could be constructed within present building walls and elevations. berkeley is considering a small classroom wing for its library expansion space.

the language laboratory at stanford, consisting of four classrooms and an audio-control center, occupies approximately one-quarter of the ground floor level of the meyer library. it is not administered by the library. initial experience involved some problems of class scheduling conflicts, keying, building security and exit traffic control, as well as service arrangements in maintaining equipment. an unfortunate flash-fire in the laboratory's control room made necessary strict adherence to "no smoking" policies which had been established throughout the rest of the building but had not been completely enforced by the separately administered laboratory. however, no problems are now reported after two and one-half years of occupancy.

a food service facility seating approximately 900 will occupy the lower level of the proposed combined undergraduate library-food services building at the university of washington. primary function is to provide pleasant dining space for students and staff during the noon hour rush and to allow snack and "coffee break" convenience as well as complete lunches. small dining-seminar rooms are intended for group study and discussion, and to augment library seating during non-peak food service hours. meeting room space, hard-to-find elsewhere, will also be included, as will a retail paperback outlet. both food service and library areas are to be well separated; each will have independent ventilation systems. noise control is receiving special attention. the majority of daily food service use is expected to be by undergraduates and campus commuters. access to the facility is available from both the library and the building exterior.

indiana's new building will provide a cafeteria and snack area operated by its union and located on the ground level in the central part of the structure joining the undergraduate and research library towers. at ground level of the undergraduate tower are quarters for indiana's graduate library school. both school and cafeteria have separate outside entrances, but may be entered from within the library building. stanford provides a small vending area at ground level which is, however, completely independent of the building en-
trances. Both Berkeley and Wisconsin plan small vending areas. In some cases proximity of the student union makes more complete vending service unnecessary.

Vending areas create their own special problems of odors, trash removal and clean-up. Coffee and other non-can liquid dispensing machines require water lines, and advance planning is necessary for these and for electrical outlets. Sand urams placed nearby often become handy garbage disposals and other waste containers of sufficient size must be available and kept clean. Inflammable containers are essential. Flat-top types with center disposal holes should be of dark colors as a protection against cigarette burnmarks and spillage.

Individual building programs for undergraduate libraries provide a running theme of the importance of the carefully selected collection as the essential heart of the student library. There has been some acceptance of approximately 40,000-55,000 monographic titles (50,000-60,000 volumes) as being a valid initial undergraduate library collection.35

The quantitative factors involved in actual construction of a number of published lists of undergraduate library holdings have been used in a recently published formula estimating minimum holdings for academic library collections. Threshold adequacy for a basic undergraduate collection is suggested as being 35,000 titles (42,000 volumes), 250 periodical titles (3,750 volumes) and 5,000 document volumes, a total core of 50,750 volumes.36

Opinion as to optimum size of undergraduate collections varies among institutions; maximum ceilings at present or projected libraries now range from 120,000 to 200,000 volumes, with the upper limit normally at those universities with very large student populations.

The University of Michigan collection presently stands at 145,000 volumes (70,000 titles) with a maximum of 160,000 possible. Lamont now houses 120,000, Wisconsin has an estimated maximum capacity of 130,000, and Cornell of 125,000; Berkeley is planning for 150,000 plus, and Meyer has space for 140,000, not counting future expansion. One hundred thousand volumes are planned for Indiana, 150,000 for Illinois, Texas, North Carolina and the new East Campus building at Ohio State. Washington is estimating 180,000 volumes at maximum, and Notre Dame, Michigan State, UCLA and Maryland, 200,000. South Carolina, now serving a campus undergraduate student body of 12,000, has a current maximum of 65,000. The University of Miami's undergraduate reading room has a maximum shelf
capacity of 50,000. Pennsylvania State’s central library contains the major reserve collection and is building a general collection that will stabilize at 75,000 volumes. Each of its branch libraries will have book collections of approximately 15,000 volumes.

Most undergraduate libraries, both present and projected, have some expansion possibilities. These range from fair to good, with individual problems generally related to shared space. However, many libraries also indicate plans to control growth and maintain useful collections by extensive weeding. Lamont weeds its collection every three years with faculty cooperation and uses one full-time professional in this project. While this has been successful, Lamont can, if necessary, add a significant amount of additional shelving within the present building.

Reference collections have been centralized in most undergraduate libraries; holdings range from 550 to 4,500 volumes. Stanford’s “reference alcoves” act as entryways to academic subject collections located in eight reading pavilions and in two open areas on the fourth floor. These alcoves contain subject bibliographies and current periodicals germane to nearby subject collections. Maryland will provide a small reference collection at each service desk with considerable duplication, including major bibliographic tools and indexes so readers may be sent to the main library with proper citations. Stanford houses its general periodical indexes at a central location with subject indexes in reference alcoves. Cornell reports long-standing concern over a relatively low demand for reference services.37

Generally accepted standards for determining book, reader and staff space have been used by the majority of undergraduate library planners. Most often quoted have been ten volumes per square foot with twenty-five to thirty square feet per reader and from 100 to 200 square feet per staff member. The larger universities with large undergraduate enrollments, however, have not provided seating ratios to the recommended minimum standard of 25 percent of student enrollment. Admittedly, a severe problem here is the need to maintain maximum seating and an appropriately sized collection without overcrowding. Michigan had to add 370 seats due to increases in undergraduate enrollment; for this reason and other service changes, its first floor does not represent what they consider an ideal arrangement. Long hours offset some seating limitations. Undergraduate libraries are open from 107 hours weekly to as long as 124 hours in some instances. Building use has been universally high.
Some libraries have peripheral areas open for late-hour use. Stanford has seven seminar rooms in a separate wing which can double as late-hour facilities. Maryland plans a glassed-off area with its own entrance.

Space for reserve books is basic. Shelving for an average of 10,000-15,000 volumes has been usual with varying room for expansion in approximately half of the libraries. A few indicate controls on reserve expansion; others indicate dissatisfaction with the lack of expansion. Texas has a maximum capacity of 12,000 volumes and notes it could use double this space. Michigan has a maximum of 20,000. Wisconsin is planning reserve space for 65,000 volumes. Reserves are usually returned to open shelves in the undergraduate libraries after course use, although in-building storage is available in some libraries. Some reserves are returned to other libraries on campus.

Staff office space has been generally arranged for individual desk seating. At Stanford need for more desk space away from open public areas was found necessary and a group study room with a lockable door, as well as an unused secretarial office, were adapted for staff members. Staff lounges, kitchenette facilities and staff lockers are found in most large separate structures. In present buildings staff rest rooms, except for female staff in three libraries, have not generally been provided. Maryland, Wisconsin and Berkeley are planning for separate staff rest rooms in each of their new buildings. Staff conference rooms have not been included as a rule. Staff lounges, group study rooms or other multi-purpose rooms have served instead, although this creates scheduling difficulties. Since centralized processing is used in almost all instances, staff work space has been kept to a minimal level. Some staffs have felt that perhaps too minimal a space has been allowed. Work concentration is on reserve book processing, catalog maintenance, periodical and binding records and phonorecord processing. Staff bulletin boards in non-public areas are essential. While head librarians' offices have been fairly ample, waiting room space has often not been sufficient.

The sizes of staff varies greatly in present buildings, from one professional and five non-professionals at South Carolina to thirteen and seventeen at Michigan. Average total staff size ranges from sixteen to twenty. Maryland is planning for twenty professionals, twenty to twenty-five non-professionals, and Illinois, two professionals, eight non-professionals. Student staff runs from fifteen to a
planned forty-five at Maryland. Illinois is planning for seventy to ninety students as well as ten graduate assistants.

Seating in undergraduate libraries, following the premise of independent study and inviting atmosphere, has emphasized variety and flexibility in seating patterns. One planner notes the most difficult problem is combining a relatively high number of reader stations with a fairly small collection in an aesthetic and functional manner. Individual study carrels and divided reading tables account for a significant portion of total seating. Both divided and open or plain-top tables have been used in inter-mixed groupings. Four-man or six-man tables are usual. Only one or two libraries have used the almost too large eight-man table. The latter have been refurbished older tables for the most part. The larger the table, many libraries report, the lesser used the middle seats. Individual reading tables have been included less often. Michigan has a number of enclosed tables for private study. Stanford arranged its individual tables on opposite sides of the interior light well; these carried specially designed under-table book or purse boxes, with a slightly raised edging around three sides of the table surface. Modesty panels for carrels or individual tables are useful, and individual tables and separate or paired carrels can be floor bolted to maintain seating patterns. Individual carrels and tables at Stanford were floor fastened where they abutted building or interior walls; wall fastenings were also used on interior walls or railings. One library noted unhappiness with too many multiple seating tables. Texas' design for its divided tables which it uses in place of carrels was adopted at Stanford. These have four by twelve foot tops with two by three foot individual stations made possible through eight inch high dividers. The eight inch divider is just high enough to conceal hand and reading motions from adjacent users, yet avoids the "horse-stall" isolation of carrel partitions.

Lounge seating is popular. From 100 to 200 lounge-type chairs are common, except where space is tight, or in cases of very heavy student population. Here bright, modern fabrics, informal lounge clusters and window views point up the relaxed, inviting atmosphere of the undergraduate library. Table lamps are used in a few lounge situations, particularly in smoking/reading areas. Floor lamps are relatively rare and cause floor wire, canted shade and tipping problems. Use of lamps further entails careful attention to electrical floor
plans. A minor change in outlet pattern may mean a major change in furnishing schemes. Couch seating, while allowing an extra dimension to lounge arrangements, is also an irresistible lure to the weary. Berkeley intends to divide its couches into separate seating. Padded benches in exhibit areas may also prove over-inviting. In one library a student sans shoes but with white naval blanket used one hidden bench effectively for daily naps before it was removed to a more public area. End tables and coffee tables provide inevitable footstools everywhere.

Padded vinyl seat and backs have been standard with some large libraries using wooden chairs, which though economical, do lack something in color and comfort. During initial furnishing selection at one library, chairs were provided for student sampling in the main library building. Almost universally, students preferred the deeper, roomier chair.

Outdoor seating areas have generally not been used in the east or midwest, although Illinois will provide for such an area by its sunken courtyard. Stanford has four roof terraces with wire-mesh chairs and slate tables. Berkeley will have extensive balcony area. Outdoor seating is not located in the undergraduate library area at Texas where it has been found less practical than interior seating and air-conditioning. Both Miami and Stanford have colonnaded terraces surrounding all or most of their ground floors.

Air-conditioning is standard in most present undergraduate structures, with heating usually of the forced air system variety. Berkeley is planning a “heats of light” installation with additional perimeter wall fins for heating and a forced draft chilled water system for cooling and ventilation. Uneven temperature control is a matter of concern at Stanford. Heat, rising through the center well to the fourth floor, is a problem, and some modification of air distribution is underway.

Illumination levels and types of lighting within undergraduate libraries are almost universally fluorescent, with incandescent lighting retained in stack areas of older, remodeled buildings. A range of from 50 to 100 foot-candles is maintained in reading areas. Lamont provides fluorescent lighting to maintain twenty-five foot-candles. This intensity was provided in the original 1949 installation and can be doubled by adjusting the ballasts, although after twenty years of use there has apparently been no need for change. Polarizing light
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panels have been used throughout Stanford's Meyer Library, producing glare- and shadow-free illumination.

Suspended acoustical tile ceilings or acoustical plaster are used in the newer buildings. Cornell's Uris Library utilizes suspended ceilings and, in some areas, blown-on sound absorbing material. Vinyl tile and carpeting are standard floor coverings with slate, terrazzo or concrete aggregate in entryways or lobbies. Berkeley will use slate in its main floor central area. Stanford has encountered some noise conditions in its internal light well and has recently carpeted its main staircase and third floor corridors.

Directories, visual sign devices, and publications deserve special attention, perhaps more than has been generally given. Large wall and free-standing directories of various manufacture have been used, with handbooks and leaflets for more detailed information. Michigan, Cornell, Texas, Stanford and Pennsylvania State have a number of attractively designed publications. Stanford utilizes colored plastic panels with contrasting baked-on lettering for its directories.

Interior building design has seemed to be generally satisfactory in existing buildings. Completely open shelves are standard. Free-standing and wall shelving has been used in the newer buildings to form alcove patterns.

In multi-floored buildings with open stacks, supervision is somewhat difficult. Cornell reports good supervision of its stack area, although it would have preferred all service desks on one floor. House phones have been located strategically in some newer libraries for students seeking staff assistance. At Stanford phones are in all reference alcoves, and one reference desk has been moved into a more central location. A small shelf at wall phones is recommended. Illinois will have house phones, a public address system for emergency paging and a chime system instead of the more usual bell system for classes; Berkeley is planning an elaborate intercom system; and Michigan uses a bell call system. While Stanford has installed an annunciator for its central loan desk, this is not general practice.

Entrance/exit controls are important for heavily used open stack collections. Reliance on charging desks for this duty is not too satisfactory. Single exits are ordinarily preferable, although heavy traffic and ease of access have promoted the use of second entrance/exits. Both, of course, must be adequately manned at all hours. Turnstiles have been used extensively, some are reversible. Automatic book
alarm devices are used at Ohio State and to control the total building at Michigan State. A two-level counter control desk at Stanford allows patrons to rest briefcases on the lower counter for inspection. Small lockers for flashlights and other equipment are helpful at control points, permitting these to be locked away when the desk is not in use. Magnetic chains at Meyer permit “psychological” closing of entry points while still fulfilling panic exit requirements; the chains are long enough to bar entry, short enough to prevent accidental tripping if dislodged. Main entry at Miami is through a wide concourse to a general lobby servicing all floors, with immediate access at ground level to the undergraduate library.

Internal building access is provided by at least one or two public elevators, in addition to stairwells. Escalators are included at Miami and will be used at Maryland. Washington is planning for a book lift.

Special or unique furniture designs have been included in some buildings, usually for index tables, catalog reference tables, display tables and benches for exhibit areas. Illinois is using wall-mounted reference index tables, and Stanford developed special designs for card reference tables, racks for its book catalogs, a book display table and individual study tables. A unique three-sided small directory tops the special course reserve card index tables in the Meyer Library. Also included in these tables are display slots for reference leaflets and recessed card trays for reserve book indexes, a design adapted from Berkeley. In remodeled buildings, unique older tables have been successfully refurbished, including special study tables at Cornell (ca. 1891) and bibliography tables and atlas cases at UCLA (ca. 1929).

Art galleries are usually not included, although wall and case exhibit facilities are available in a large proportion of the libraries. Stanford’s art print study alcove has been converted into a study area, presumably because its location on the fourth floor proved too remote to fulfill its original purpose. Miami has a combined lecture and exhibit hall immediately adjacent.

Group studies have been provided in a number of present or planned structures. These range from 120 to 250 square feet. Texas provides sixty-six of these, seating four readers each. Stanford has a variety of these smaller rooms, some seating two, others four, as well as larger rooms with banks of built-in carrel seating; access to the smaller units are by individual doors, off the larger area, with all interior walls of wire-glass partitions. Group study rooms have
proven very popular at Stanford, with the librarian indicating that the variety of study facilities provided, including these study rooms, account in large measure for the success of the building. "The variety of study spaces makes it possible for a student to choose the kind of seating and study atmosphere that suits his particular need." In the newer libraries particular attention has been placed on multi-purpose audio-visual use of these rooms. Under-carrel lockers are provided in some libraries; these require periodic inspection. Coin-return lockers for students are provided elsewhere in a number of buildings.

In the reporting libraries, from three to thirty-six typing carrels or typing rooms seating up to fifteen are included. On its three upper floors Stanford has utilized a small two-man study room for coin-operated typewriters in a separate typing room. Coin-operated typewriters to some degree are found in all undergraduate libraries. All libraries, with one exception, have coin-operated photoreproduction equipment. Wisconsin is planning for seven such machines throughout its new building. Varying expansion of this service is being considered by almost all. UCLA has an additional staff-manned photoreproduction service.

 Provision has been made for disabled readers in most of the libraries. Rooms for blind readers are fairly common; extensive provision has been made at Michigan with three rooms, a tape recorder and Braille dictionary. Four rooms on the ground floor are provided at Texas with an office for an advisor and equipment; some standard books in Braille are available on an upper floor. UCLA has a unique Braille map of the campus. Miami has a recording suite for the blind adjacent to its undergraduate library entrance operated by the local Zonta Club and automatic doors for wheelchairs on one side of the entrance concourse. Other usual provisions are ramps, no steps at ground level entrances, use of elevators, special height water fountains and enlarged rest room stalls with grab bars. In older buildings steps are a particular problem for the disabled.

Public telephones are available to varying degrees, as are some campus-use phones. Emergency phones in elevators are installed at Texas and Stanford. Some sound problems have been encountered with in-building phone booths.

The special problem of smoking has been met in most libraries by providing special areas, either in separate lounges or in designated parts of the building. Abuse on unsupervised floors seems to be in-

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evitable despite signs and other notices. Some distinction has been attempted by restricting smoking to non-carpeted areas. Ashtray spillage and sand urns are additional complications. Michigan, Wisconsin and UCLA allow smoking throughout their buildings, except for the main reading room at UCLA. Special areas are reserved for non-smokers at Wisconsin.

Automation in undergraduate libraries is still at an early stage, although Michigan will soon be using an automated data collection system for circulation and reserve use. Other library automation activities are centered in main library development with some undergraduate circulation/reserve programming underway, with plans to participate as present on-line systems become operating realities. Conduits are installed in most of the newer structures. Several libraries indicate terminals for both staff and reader use; others plan primarily for staff only.

Based on experiences of librarians involved in the foregoing buildings, there are several basic decisions that must be resolved in programming or designing an undergraduate library. In addition to such normal considerations as reader percentages, collection size, smoking arrangements, the degree of audio-visual access, and whether the building will be new or an adapted older structure, the most pertinent factors to be considered would seem to be:

1) Is the university of sufficient size to warrant such a library? Is there a clear need?
2) Can it be located for maximum convenience to students as well as in relation to the main library collection? Should branch locations be considered?
3) If the building is to be shared, will the library function predominate? Will sharing be temporary or permanent?
4) Will space allow variety in seating patterns with maximum privacy for study stations?
5) With maximum seating and a relatively smaller collection, will the shelving arrangement still be logical for the user? Provide flexibility for changes in emphasis? Do shelving patterns enhance seating privacy and variety?
6) Are reserves and staff space provided for in expansion?

In summary, the undergraduate library would seem to be providing a number of effective answers for today's large universities. Removed from the immediate overwhelming shadow cast by the
central research collection, spacious, attractive and offering as much individual privacy as possible under heavy enrollments, it represents not so much a lowering of limits as a more effective means of transition from the high school to the college library and ultimately to broader levels of learning. For the administrator there are corollary benefits of increased reading space and the opportunity to concentrate services to distinct groups of readers, although little reduction in main library circulation or use can be expected. Today's undergraduate is far more academically sophisticated than he was some twenty years ago when the present concept of undergraduate libraries took form. University libraries must be aware of this and plan accordingly. As one librarian emphasizes, "for an increasing number of undergraduates, the undergraduate library will be only a starting point" and the main library as well as other libraries must be equally available and accessible to the underclassman.

Understandably, not every university needs to develop a separate undergraduate library. One librarian of a building often visited by library planners and architects warns that local situations must be carefully studied, possibly through the use of outside consultants, a practice not always followed. Medium-sized collections remain a stimulating challenge for the undergraduate exposed to them, but in some situations space or enrollment pressures may be so overriding as to make a distinct facility imperative. However, mere provision of a handsome, well-stocked library catering to thousands of undergraduate students is not enough. The undergraduate library particularly must take the lead in developing not only fresh relationships with the faculty and the curriculum but in developing its own potential as an educational mechanism.

While librarians through introduction of undergraduate facilities have shared present academic concern in paying fresh attention to the needs of student learning, these same facilities are undoubtedly just a first step toward smaller and more personalized library-learning environments. This progression is likely to be even more pronounced as decentralized campuses and satellite colleges place their own share of wedges into the cracks of the mammoth central library. If the university experience is to be one in which the profound relationship between books and life-long learning can be initiated for students, the undergraduate library would seem a valid means of stimulating and reinforcing this process and in opening up for students the wider bibliographical territory beyond.

OCTOBER, 1969
WARREN B. KUHN

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Undergraduate Libraries in a University


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Branch Library Planning in Universities

ROBERT R. WALSH

Twenty years ago, Joseph Hudnut, then Dean of Harvard's Graduate School of Design, wrote of the dramatic and threatening rate of growth of the Harvard University Library, and foresaw a great mound of books, as high as the Pyramids, covering the famous Harvard Yard. He also observed Harvard's pattern of branch and departmental libraries, noting that the library "does not grow like a melon, enlarging its periphery in concentric rings, but like a strawberry plant which sends out creepers which take root and blossom into baby libraries." ¹

The Harvard University Library is the oldest university library in North America and the largest university library in the world, and it is probably no coincidence that it is also highly decentralized. For although other factors play a part, it can be generalized that the older and larger a library, the more decentralized it will tend to be. With almost 100 departmental, special, and graduate school libraries, and a number of new ones in the planning stages, the Harvard University Library is highly decentralized, not only from the point of view of space needs and the needs of users, but also because of its fiscal and administrative structure. "Every tub on its own bottom" sums up, as accurately as any metaphor can, the University's organization.² The Harvard University Library reflects the decentralized structure of the University, and by the judicious coordination of these ninety-odd libraries through the Office of the Director and the University Librarian, a workable pattern of branch libraries developed.³ Keyes Metcalf stated explicitly the policy of coordinated decentralization and further expressed this development with the construction of the Houghton Library for rare books and manuscripts, the Lamont Library for undergraduates, the New England Deposit Library for storage of infrequently used materials, and further de-

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centralization through the transferring of several subject collections from the Widener Library to other Harvard libraries.\footnote{4}

Although the reasons behind a policy of decentralization, in whatever form and to whatever degree, are not as relevant here as are the implications of such a policy for building planning, the two are not unrelated and a brief discussion of these reasons is appropriate. A detailed history of the decentralization of academic libraries can be found in an article by Lawrence Thompson,\footnote{5} and Arthur McAnally has discussed the administrative aspects of such a pattern.\footnote{6} Basically there are two \textit{species} of decentralization. The first is an operations-oriented pattern based on kinds and forms of materials which occurs in separate libraries for map collections, rare books, documents, audio-visual materials, non-Western languages, and so on. The second is a user- and subject-oriented pattern, occurring as graduate and professional school libraries, laboratory collections, storage libraries and separate undergraduate libraries. There are also two main \textit{causes} of this branch pattern. One is the sheer bulk of a collection in which, when there is no more room in a central building, something has to give. The other is the accretion of materials within a small office or laboratory collection until it becomes a substantial library. Conscious decisions on developing and controlling this branch pattern must be made, taking into account such factors as campus geography and services to users. Any pattern of branch libraries creates administrative, fiscal, and collecting problems, as well as its own distinct buildings possibilities and advantages. It can be generalized that any university library of substantial size will be decentralized to some degree. The questions are how much decentralization, and the decentralization of what. Although the answers will vary with different institutions, we can identify major factors, common to all institutions, which will affect the final decision. These and some general planning conditions and constraints will first be discussed before turning to specific building arrangements and details of facilities.

One is the degree to which the central library is able to house the main collection. If there is serious overcrowding and no chance of making more effective use of existing space, there will be pressures to move part of the collections to another location. The needs of the library's clientele is a second factor. On a small campus with a strong central library, pressures from users for scattered service points will be minimal; if the campus is extensive or the main li-
library is less accessible to some segments of the university, there will be demands to provide service in more locations, as exemplified at M.I.T. with its linear campus configuration. In addition, departmental policies and politics may create needs, whether real or imagined, for separate libraries; the existence of a separate library collection is sometimes recommended or required by an accrediting board, and it is a fact of academic life that it is also often a status symbol. Even when these needs are shown to be unrealistic and the costs of supporting such decentralized collections shown to be high, these demands become very difficult to ignore.

Another factor affecting decisions on decentralization is the availability of space, either within existing buildings or as sites for new construction. An addition to the central library would logically be undertaken if adjacent land were available, as is the case with the general library at Illinois, where the bookstack has been expanded four times, and is about to be expanded again, gradually taking over an adjacent parking lot. On the other hand, the existence of a suitable site for a branch library would affect the librarian's decision to decentralize. The ability of a department to offer suitable space and facilities closer to home would also put it in a strong bargaining position. This was the case with the fine arts collection at Harvard, where an addition to the library of the Fogg Museum of Art was constructed at the time another building was being erected on adjacent land, and the main research collections in fine arts were moved from Widener into the new facility.

A similar factor is the availability of funds to build or renovate. Funds must be sufficient to construct a facility which provides better quarters than those presently available, and the decentralized library should be sufficiently justified to warrant this expenditure. Then, too, it might be difficult to embark on a major fund drive for a large facility rather than a few smaller ones to be built over a longer period of time. There are some easily decentralized segments of the collections which could be described as "glamor items," such as rare books, or certain subject areas—music or fine arts, for example—which might be attractive to specific donors and which could more quickly attract money for construction as a branch library.

These and other factors, such as general university policy or the attitude of the faculty towards the library, will affect the final decisions on the degree and kind of decentralization to which a library will commit itself. It can be generalized that, in most cases, the
policy decided upon will be either one of relative centralization or one of relative decentralization. The general characteristic of the former is that there are fewer and larger library facilities, as at Brown; that of the latter is a greater number of libraries, varying in size, as at Illinois. In older institutions where many small collections have, over the years, grown into de facto branch libraries, a third pattern can be found. This is a pattern of consolidation, with a number of small, related collections being merged into larger and more satisfactory units, as exemplified by the libraries which became the Countway Library of Medicine at Harvard. This is an example of the interesting pattern of pulsation in academic library growth—a contraction at one point where major facilities permit the consolidation of elements and a decentralization at another point in time. The construction of the Widener Library permitted a number of elements, including the Business School Library, to be brought together. After twenty or thirty years a major facility becomes cramped again and the forces toward decentralization begin to work. Another example is the University of Chicago, where branch libraries moved out of Harper into other locations and many will now be moving back into the new Regenstein Library.

The size of the branch collection is one of two critical variables in planning a facility. Many elements in the planning process will be strongly influenced by the size of the facility being planned, and their treatment by the planner and the decisions he reaches will vary greatly. The amount of research and program preparation spent, the decision to call in an outside consultant and for how long, the stack arrangement and configuration, and the proportions of various kinds of seating will all be affected by the size of the new library. The other variable is the form the accommodation for the branch library is to take. Three forms can be distinguished. In one, the library will be housed in its own separate new building. In the second, the library will occupy some space in a new building to be shared with other occupants. Finally, part of an existing building can be vacated and renovated for library purposes. The size and form of the library affect four elements in the planning process which are particularly important and especially relevant to branch libraries. One such element is the "efficiency" of the library. This is a building term defined as the ratio of space usable for library operations to total space, or, in other words, net square feet to gross square feet. The difference between the two is the space given to circulation elements like hall-
ways and elevators, utility spaces like rest rooms and mechanical rooms, and architectural spaces like foyers and open courts. Generally speaking the larger the branch library being planned, the higher its efficiency can be. Ten smaller, separate libraries may need ten lobbies, ten elevators, twenty rest rooms and so on; one library ten times as large may need only two elevators, one large lobby, etc., resulting in more net square feet in the same amount of gross. As to the type of accommodation, a library sharing a new building with other occupants could easily achieve a higher efficiency than if it were to occupy its own building or renovated space in an existing structure. A high proportion of the utility and mechanical spaces could be located elsewhere in the building, allowing a high degree of net library space. This could also be true of a library which occupies converted quarters in an existing building, but constraints of the existing structure may negate some of the benefits.

A second building characteristic which is affected by the size and form of the branch library is expansibility. And although all libraries must take the need for expansion into account, branch libraries are more vulnerable to having it become a sudden crisis. A small library of 20,000 volumes with space for an additional 25 percent is less prepared to accommodate the sudden influx of 7,000 volumes because of a gift or new collecting demands than is a library of 200,000 volumes, even if the latter had space for only a 15 percent increase. As to the form the facility takes, a library which has its own building can be planned to have a high potential for expansion, and the highest number of options as to the directions this expansion can take. It can build on available adjacent land, or under that land if there is a need to retain open space. It can build another floor or floors if the building is constructed to allow this (as can be done, for example, with the library of the Harvard Divinity School). However, a library building so symmetrical or hemmed in by other significant structures can often encounter more difficult expansion problems than a library which is part of a larger building.

A library sharing a building can expand into existing space, provided other occupants are relocated, so long as this possibility was considered at the time of original planning and areas adjacent to the library were designed and constructed to accommodate library functions. This need not mean that a department or professional school must compromise its own space needs just to permit future library expansion. The construction of adjacent areas with strong enough
floors to carry the live load of bookstacks, with few fixed, load-bearing interior walls and with service elements consolidated in cores, is as prudent a decision as that ensuring enough flexibility for changes in electrical wiring and the introduction of communications cables, and requires just as few compromises with present use plans. In addition, a library in a shared facility should be located so that it is against an outside wall where any future addition to the building might logically occur. If this cannot be done, another solution is to buffer the library with offices or classrooms which are capable of conversion to library purposes. The library which opts for renovated space in an existing building must take all of these into consideration as well as whatever problems the physical constraints of that building imply.

The spatial relationships of the internal elements of the library are another characteristic to be considered. Here the smaller branch will have fewer problems and will be easier to plan, if only because the problem of relationships tends to diminish with the size of the library. For example, the spatial relationships between and among the entrance, the circulation control point, and the reference and bibliographic area need little discussion when a small library is under consideration. Their positioning will be almost automatic and the options for location are reduced; these areas become a single grouping. However, in a larger branch, say one of 15,000 square feet or more, the options are much more numerous, and considerable thought must be given to the location of each area in relation to the others so that the most efficient service and operation is achieved. The higher the number of options and the greater the degree of freedom for design, the better these relationships can be developed. The branch library occupying its own building is in the best position to achieve this.

The library sharing part of another building will of necessity have certain constraints upon it, and runs the risk of being located in an area of the building less suitable or amenable to its functions and role. The location of bearing walls, service cores, and so on, which might make sense for the building as a whole, may present a real problem from a library point of view; the librarian should be allowed an adequate voice in the over-all planning so that the restricting effects of these can be minimized. The librarian often has great difficulties in planning space within a building which is in very large measure the home of one or more academic departments. Planning...
a facility such as this can often be more complex and take longer than planning a separate library building. For example, an elevator core can make sense for the entire building except the library, with the rest of the building committee ignoring or dismissing the librarian’s objections. These same difficulties are likely to be met by the librarian planning the internal features of a branch library in converted quarters. The constraints of existing bearing walls, the live load of floors and the size of rooms may all have to be accepted as they are in the conversion of a lecture hall or laboratory into a library.

The last major characteristic affected by the size and type of branch library being planned is flexibility. Modular construction provides a degree of built-in flexibility for any building, and this potential should be fully exploited to obtain the maximum benefits. The use to which any part of the library is originally put may change drastically in time, and the building must be able to accommodate these alterations without major structural changes and without compromising the ability of the library to function as an effective facility. The larger the area with which the planner can work, the easier it should be to incorporate flexibility into the design. A smaller branch library provides less opportunity for experimentation with alternative interior arrangements if many of the major building elements are fixed. However, the planner may be more willing to experiment with new ideas and unproven operations designs in a smaller branch, thus allowing for later change if these do not prove satisfactory, than he might in a larger, more expensive library. As with the internal relationships problem, the higher the degree of the librarian’s involvement in the planning process, the more flexibility he should be able to incorporate into the library; the branch library in its own building is in the best position for this. Slightly less opportunity exists for the librarian planning to share a new building with others, some of whose needs may limit the flexibility of the library, but the task of designing flexibility into the constraints of an existing building is considerably more difficult, and the results usually unsatisfactory.

Just as there are no easy answers to the questions of how much or what kinds of decentralization, there are likewise no easy answers when the buildings planner is asked where the proposed decentralized facility should be placed. New buildings on expanding campuses must jockey for the dwindling number of most desirable sites.
When the decentralization is done on the basis of subject areas, the geographic positioning of the branch library is dictated by the location of the particular department. In those relatively few cases where a branch subject library will have its own building, the only requirement is that it should be adjacent to, and if possible, physically connected to the department's own building or complex of buildings. This connection need not be in the form of a completely attached extension to an existing building; a connection by enclosed walkways or tunnels would be adequate and in some cases preferable. At Harvard, for example, the Countway Library is connected with other Medical School buildings by means of a tunnel; the Houghton Library is connected to Widener by both a tunnel and a bridge. Care must be exercised here, however, so as to avoid the problems created at the Baker Library, which has so many connections to other Business School buildings that it is riddled, and has become a major pedestrian thoroughfare. A more recent variation of this occurs in the total planning of a larger complex of which a branch library is a part. The components of the new Science Center will all be connected by a system of enclosed walkways or pedestrian "streets," with the library located near a "crossroads," giving it a prominent location as well as ease of access.

More frequently a branch library will be housed in part of another building, and whether this is a new building or renovated space in an old one, the position of the library in it is important. Generally speaking, a branch library which is in a part of a departmental building will be of such a size that it can be accommodated on one floor, and for reasons of convenience and accessibility this should be the main floor of the building. A number of levels of small size should be avoided; a library of 12,000 square feet is more efficient, both in space utilization and to the users, on two levels of 6,000 square feet each than on four levels of 3,000 square feet.

In the case of a branch library which requires two floors, either because of its size or the need to include other functions at the main level of the building, the public area should be at the main level and another level can become the general bookstack. In many instances this will logically occur with the main library level at grade and the bookstack on the first floor below grade level. However, there is no single location which can be called the ideal one for all libraries; each decision as to location may be influenced by many...
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departmental needs and factors outside the librarian's control. But in a number of matters, such as means of access and the architectural expression of the library, the librarian must take a firm stand to ensure that the building is not built at the expense of the library.

The location of the library should not subordinate its basic practical needs to an architect's desire to express in his design some vague philosophical concept he may have of the library's place and function. It should not, for example, be imprisoned in the center of a building just because its function is central to the department's teaching and research, and it should not be on the top floor solely to represent the uplifting nature of its contents. On the other hand, the librarian should welcome and urge any attempts to express the library in an open and visible manner; many active areas of the library, such as the card catalog, reference, and current periodical areas can be appealing and visually attractive to passers-by.

As already mentioned, the location of the library which is part of a larger building must allow for easy expansion, either into other space in the building or into an addition. Also the library must be easily accessible, and unless it is a small and highly specialized collection used by a limited clientele, it should ideally be positioned near a major circulation path. Since the hours during which the library is open may not always coincide with those in which the building is open, the library should have its own outside door or be so placed in relation to the building's entrance that readers can gain access to the library with the rest of the building secured. Similarly, the library area must be able to be closed off if the building remains open when the library is not. In this context it will be necessary to ensure that building elevators which penetrate the library can be operated to the library only by key when the library is closed.

Although the library should usually be located near a main circulation path, it is important that the library itself does not become a traffic artery, either by accident or design. The building should not be designed so that users are forced to pass through any part of the library to reach a non-library area. And the planner must also take care to ensure that the positioning of the library and its entrances (if there are more than one) in relation to non-library parts of the building do not make the library a convenient but unintended shortcut to some other place; building users will not walk around the library if it has a door at each end and they can save steps by cutting through. Similarly the library should not have the most conveniently
accessible rest rooms in the whole building. One other matter to which the librarian should pay close attention in a library within a larger building is the shared facilities. Their location in relation to the library can be critical. There should be easy access from the building's loading dock and shipping and receiving room to the library; deliveries should not have to be trucked all over the building to get to the library. Often the library can benefit by sharing a staff room or a photocopy area elsewhere in the building, thereby relieving itself of the maintenance problems these entail and perhaps gaining as additional space the areas they might have occupied within the library.

The separate storage library for lesser used materials is a special kind of branch library, and is an alternative to relocating subject collections and creating departmental libraries as a solution to the problem of overcrowding. The storage library can provide economic advantages over other types of branch libraries, and it presents its own possibilities from a buildings point of view. Because there will be few readers and minimal public services, the problem of internal relationships between staff, readers, and books is minimal, as is the need for a high degree of flexibility since the building's only use will probably continue to be the storage of books. In the matter of efficiency, the storage library will be able to achieve a high ratio of net to gross square footage because of the reduction of stairways, halls, and service spaces to a minimum and the lack of any need for architectural space.

Expansibility is as necessary for a storage library as for any other, but if this cannot be accomplished by one storage library there is no reason why one or more cannot be located somewhere else as needs demand. The same three types of accommodation can be identified for storage libraries as for other branch libraries, with the observation that a storage library may often be partly or totally underground. An underground facility may complicate the building problems, and special care must be taken to control seepage, humidity, and so on. Expansibility may also be complicated. An underground facility, however, will have less heating and maintenance costs, and will do away with deteriorating effects of sunlight on paper.

A storage library built expressly for that purpose, like the New England Deposit Library, the storage facility at the University of Michigan, or the auxiliary facility at Princeton, can be highly efficient since it can be planned to meet the requirements for maximum stor-
age, either with conventional or compact shelving. However, there is no reason storage cannot occur in any and all cellars and attics the librarian can lay claim to, or even in rented warehouses as was done at the University of Chicago, as long as the environmental conditions are adequate and the physical access problems can be solved. The Harvard Law School has built basement storage space for its library into no fewer than three of the buildings it has constructed in the last eighteen years, thus providing an additional 15,000 square feet of storage.

As in the case of storage libraries, branch libraries can be based on a kind of material rather than a subject, separated either because of form or because of use. Undergraduate and rare book libraries are obvious examples, as are audio-visual centers, which have their own sets of building implications.

Although the question of what subject materials are most suitable for separation into branch libraries is primarily one for the administrator, it is not without implications for the building planner. Historically, these subject libraries have occurred in the sciences, medicine, law, and other professional schools. In the sciences this has tended to mean a large number of small specialized libraries near the laboratories, with all the problems of duplication, overlapping, and staffing that this creates. Over the years these collections tend to grow far beyond the capacity of the library to house them. Because of the inter-disciplinary nature of the sciences, and the fact that the scientist does not need ready access to the retrospective materials which often form the bulk of these collections, there is potential for consolidation. Examples of this consolidation are the Kline Library at Yale and the proposed Science Center Library at Harvard, where the large bulk of the collection is housed in a larger library of 25,000 to 40,000 square feet, leaving the departmental libraries with the basic and current research materials the scientist needs at hand.

Branch collections in the non-scientific disciplines are, by nature, less suitable for consolidation. The basic compatibility between collections in chemistry and biology has no equivalent between divinity and business administration, so the professional school libraries will tend to remain independent and to grow into large research libraries, sometimes to the point of requiring a separate building of their own, as at Chicago's Law School and Harvard's Graduate School of Edu-
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cation, with all the implications which such an arrangement has been shown to have.

Finally, it has been observed above that the decentralization of certain materials may facilitate or encourage the solicitation of gifts. Rare books and manuscripts are an obvious example and among the more important buildings which have been financed by private donors for such collections are Harvard's Houghton Library and Yale's Beinecke. Separately established libraries in subject fields can also attract donors, as was the case for the new Tozzer Library at Harvard's Peabody Museum of Archaeology and Ethnology which received one million dollars to construct a new library; indeed, a department is likely to develop a pride in its branch library and actively assist the library administration in bringing its needs to the attention of prominent alumni and donors.

Joseph Hudnut, who likened Harvard's library to a strawberry plant, rather than a melon, also predicted a fantastic growth of its collection. "The [Harvard] Library holds 5,600,000 books and doubles in size every fifteen years. In 1962 it will have 11,000,000 books; in 1977, 22,000,000; in 2060, 1,400,000,000. By that time it will have expanded to the edges of the Yard, having thrown all the other buildings over the fence into Harvard Square. The space now occupied by Philosophy Hall will be devoted to 30,000 items on the literature of the Congo; University Hall will be sunk under 400,000 on Oceania; and the Appleton Chapel . . . will be remembered as the site afterwards consecrated to 500,000 incunabula on Imitatio Christi." Although Hudnut's mathematical reasoning was based on a faulty premise and the threat he saw has so far failed to materialize, there is no doubt that the development of a coordinated branch pattern has reduced this threat to the Harvard University Library, and that similar decentralization has achieved the same for other academic libraries.

Some have argued that "Future developments in science and in library techniques indicate that even more centralization will take place and that rapid transmission of printed material through new electronic devices will eliminate the necessity for outlying groups of library materials." However, even in a rather highly automated system, students and faculty will continue to need reference sources, current journals, and basic research and monographic literature close at hand—in a branch library. Branch libraries must still be built, and the planner must be prepared to deal with them.

October, 1969
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Quarters For Special Collections in University Libraries

CECIL K. BYRD

The rate at which rare books, special collections and manuscripts have migrated from the shelves of the private collector and the bookseller into university libraries during the past three decades has not only dismayed certain segments of the private book world, but has created difficult (but not unsolvable) housing and service problems for library planners. The movement of these special materials from private to institutional ownership seems likely to continue at an accelerated pace. The planning of building facilities for special collections and rare books requires an unusual degree of specialization and knowledge. If university libraries acquire rare, expensive, and special materials, an implied responsibility for proper housing and service is assumed.

A few universities have responded admirably to their rare book obligations during the past thirty years by providing special space facilities for these rare and related materials. Collectively the building quarters have been varied although not always indicative of intelligent, foresighted planning. The most evident and certainly the most revolutionary development has been the construction of separate rare book, special collections and manuscript library buildings. (The semi-autonomous libraries such as John Carter Brown, Clements, and Clark are not considered within the scope of this article.) It is also obvious that careful and detailed consideration has been given to initial and future book storage capacity, reader and teaching facilities and over-all space arrangement for many special collection facilities. Exhibit accessories and space programmed for this function has received much attention and is now considered essential for a viable special collections program. There is also widespread use of mechanical equipment for the preservation and security of special materials.

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The discussion that follows is not based on a nation-wide survey of rare book and special collection quarters in university libraries. The libraries mentioned were selected to illustrate the contention that there has been improvement in the disposition of space, that careful planning has gone into exhibit facilities, and that complex mechanical equipment is widely used. Any trends or innovations in providing quarters for special collections stem, for the most part, from the practical planning process that has developed for university library buildings in general.

Four universities have constructed separate, specially designed buildings to house and service the bulk of their institution's rare and special materials. In order of construction these buildings are Houghton (Harvard), Lilly (Indiana), Beinecke (Yale) and Spencer (Kansas). At least two universities (Brown and Northwestern) will use renovated portions of the old, general library building for special collections. The majority of universities possessing rare books and special collections have provided quarters within the general library building with results that are frequently aesthetically pleasing though not always completely functional.

The question of a separate building versus quarters in a central building for rare books and special collections has not been a topic of lengthy investigation by the library profession. More universities with respectable collections and an active program might opt for a separate building if donor funds were available for construction, and more especially so if funds for continuing activities were pledged.

There is no insurmountable obstacle preventing inclusion of appropriate rare book quarters in a general university library building. The top floor quarters for special collections at Hofstra University are not only functional but meet most of the requirements considered essential for servicing and protecting special materials. The new general library building at the University of Chicago, not yet occupied, includes main floor quarters for special collections. This building should demonstrate, in theory until operational, that with careful and knowledgeable planning special collections can, adequately and ideally, be accommodated in a central building.

A separate rare book building inevitably leads to certain operational problems, even when it is connected or near the central building (underground passage at Yale, above ground as well as underground at Harvard, about one block away at Indiana and Kansas). Separation increases the duplication of reference and bibliographic
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material, frustrates the user who must inevitably range between two buildings and increases general operating costs. On the plus side a separate building seems to attract more attention and, it is contended, lures gifts to the university. But appropriate quarters in a central building can also attract and be alluring.

Duplication of materials is not entirely eliminated when the division of special collections is located in the central building remote from the reference and bibliography collections. In a giant central library, time and motion is lost if the scholar must shuttle between divisions located on different floors and at opposite ends of the building.

The renovated old buildings to be used for special collections at Brown and Northwestern will in effect constitute separate buildings. Comment on this type of facility must await completion of the projects.

There would appear to be no acceptable norms for establishing storage requirements for rare books and special collections. Keyes D. Metcalf observed that the growth factor of rare book collections is greater than that of general collections in research libraries.¹ There is a discernible growth pattern in rare and special materials and a realistic approach to this problem is visibly evident in recently constructed facilities.

In the Lilly Library initial shelving was provided for 300,000 volumes. The building was also planned for a further addition to the rear which can double the present storage space. Stacks in the Beinecke at Yale were provided for 800,000 volumes, allowing tripli cate growth of collections.² A west underground extension exists for possible future expansion. The Spencer Library at Kansas has shelving capacity for 670,000 volumes. A planned stack addition can accommodate an additional 110,000 volumes. Current holdings in Spencer amount to 150,000 volumes and approximately 860 linear feet of manuscripts. When Houghton was opened in 1942, it contained storage space for 225,000 volumes. Seven years later shelving for an additional 250,000 volumes was provided on an upper stack level beneath Lamont Library. Two stack levels in the planned underground addition at Harvard will connect with Houghton and be used for rare book shelving. The department of special collections in the new Regenstein Library now under construction at the University of Chicago has a capacity for 250,000 volumes, with possible expansion planned for a below ground level area.

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space for twenty-five years was planned. The department will move collections totalling over 100,000 volumes and 3,000,000 manuscript pieces into the new building. Shelving will consist of 1,758 standard double-faced sections with some special shelving.

The department of special collections in the new building at Hofstra University contains stack storage for 60,000 volumes, enough for at least ten years’ expansion. Contiguous space above the department is available for another decade of growth.

Further examples of space provided for shelving by selected institutions cannot establish a generally applicable formula. Past and anticipated growth rate, the importance of special collections and rare books in the educational program of the university, finances, and possibly wholly extraneous factors, have determined the space allocation for shelving.

Metcalf stated that the optimum size of the rare book reading room should be limited to the visual range of a desk attendant. Furthermore a small room was justified by limited patron use. He did not recommend, for purposes of security, separate typing and microfilm reading rooms. He thought thirty-five or preferably forty square feet per reader should be provided in the reading room. The reading room in the Houghton, constructed while Metcalf was librarian at Harvard, is thirty by fifty-five feet and contains seats for thirty-five patrons. It conforms in all respects with his specifications for a rare book reading room.

Annual registered users in the Houghton for a five-year period beginning 1963-64 was 1,024, 1,047, 1,325, 1,370 and 1,320. These figures do not reveal daily room use. For the corresponding period in the Lilly, annual room use by daily count was 3,168, 2,998, 4,392, 4,619 and 3,908. Metcalf’s observation on limited patronage is confirmed by these select statistics.

A few examples of reader provisions from selected institutions reveal slight or wide variations from the Metcalf dicta. The Lilly Library at Indiana contains a reading room measuring twenty-eight by forty-eight feet with twenty-eight reader stations. An attendant observes all patrons from a desk at the south end of the room. A small enclosed room for reading microforms or for typing is located at the south end of the reading room. The room connects directly to the closed stacks and permits rapid paging. The north and east walls of the room are lined with open bookshelves containing bibliographies, encyclopedias and standard reference works.
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The Beinecke Library contains a reading room thirty-six by seventy-eight feet which accommodates sixty readers. Enclosed rooms for typing and microform reading are located at the north end of the room. Patrons using the reading room are observed through a glass wall from the circulation desk outside the reading room. In a far corner of the reading room a patron is about seventy feet removed from the circulation librarian. This feature and the enclosed microform and typing rooms have been criticized as a compromise of security by Ellsworth Mason.4

Provisions for patrons in the Spencer Library may represent the ultimate in accommodations. The building contains separate reading rooms for rare books, manuscripts, maps, regional collections and university archives. One hundred and nine seats are provided in the five rooms which contain approximately 7,333 square feet of floor space. There are also sixty-seven individual studies of about 100 square feet each. Eight of these are assigned to rare book readers, nine to regional collection patrons and four to university archives users. There is no staff supervision of these studies other than visual inspection upon entering and exiting the building. The remaining studies are assigned by the main library to patrons who cannot be accommodated in that building. Four seminar rooms, each seating twelve people, are available in Spencer for teaching purposes. Patrons in all reading rooms are observed by staff through glass partitions.

The reading area in the central library at the University of Illinois consists of a reading room and an exhibit room. The latter doubles as a reading room. The combined rooms seat eighty-three readers. A microform reading room is located at the west end of the exhibit room. Glass panels in all partitions permit supervision of readers from a desk in the exhibit room. Open bookshelves line the walls of the reading room and scattered shelves are found in the exhibit room. Stacks, occupying two floors, sealed off from general library stacks, adjoin the reading room.

The reading room in the new building in Chicago will seat twenty-four readers. Attached to the reading room is a small room for typing and microform reading. Both the reading room and the typing room will be controlled from a staff office, partitioned with glass, attached to the reading area. Three small seminar rooms are located just outside the reading room. Basic reference works are shelved in an area outside the reading room. Three small studies will also be available,
attached to staff work space, on the level below. These rooms will be supervised from the staff room.

It would appear from the foregoing examples that there is a trend to provide teaching seminars, typing, microform and individual study rooms for users of rare books and special collections separate from reading room facilities. It should also be apparent that there is an attendant loss of security in some of the libraries selected for purposes of illustration. Security for rare materials is not a bugaboo trotted out to influence administrators. Security can be defended on the basis of a long and tragic history of damaged, cut and altered rare books by apparently reliable people left to themselves in isolated surroundings.

Metcalf offered little guidance in the most complicated problems of spatial arrangement for special collections. He recommended that exhibit and reading areas be separated, that stacks be as close as possible to the reading room and warned that separate rooms for donated collections complicated supervision and control.¹

A functional spatial arrangement, one in which all the dynamics of operations are effectively fused, is simple to verbalize but difficult to obtain, particularly so in a central building where there is strong competition from other library functions. It should be comparatively easy to obtain the ideal in space arrangement in a separate building if planners are thoroughly familiar with the operations and functions of rare books and special collections.

The ideal spatial solution may be defined as an arrangement for exhibits, shelving, staff and readers in such a pattern that the various functions occur with economy, minimum effort, and without mutual interference. The serious user should not be disturbed by exhibits, viewers, or staff. Staff should be so positioned as to perform their duties with minimum physical movement. Traffic patterns should be planned to avoid serious congestion.

The Beinecke and the Lilly approach nearer to this ideal in spatial arrangement than any libraries observed. Mason, however, has pointed out that incoming traffic in the Beinecke is not under rigid control.⁵ Moreover paging in Beinecke from the multi-tier stacks underground at the south of the building is slightly tortuous. The location of staff space for the manuscript division in the Lilly, in the basement, two floors from the reading room, is a handicap to staff who must consult with patrons in the reading room. These are minor flaws; both buildings are excellent examples of harmonious spatial arrangement.
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The Spencer Library is an example of a prodigality of space arranged in a manner that is most expensive to operate. It is difficult to defend the multiple reading rooms and triple service points on the grounds of frequency and diversity of use.

Space arrangements for the department of special collections in the new central library at the University of Chicago also approach the ideal. Although the building is a few months from occupancy, space has been assigned for some time. From information supplied by Robert Rosenthal, curator of special collections, it would seem that a harmonious and functional solution has been developed for all departmental operations.

There is no agreement on the location of rare book and special collections quarters in a general university library building; quarters currently exist on all levels from the basement to the top floors. In buildings which have undergone additions, some rare book quarters are so cunningly located that a guide for both entering and existing would be useful. The inaccessible quarters for rare books in some universities can lead to the conclusion that location was an afterthought, hurriedly determined in desperation. Library building planners, in general, have given priority locations to such competing library functions as card catalogs, circulation, reference, reserve, reading rooms and technical services. The rationale is to minimize vertical traffic and conserve staff and patron time by locating services with high frequency use as close as possible to the ground floor. This philosophy of planning has frequently dictated a remote location for special collections.

The department of special collections in the new building at the University of Chicago is located on the first floor directly off the main entrance to the building. This location was selected because it affords expansion possibility in the future, it is most accessible for users and the public in viewing exhibits, and is near to the bibliography stacks and the preparations divisions. At Illinois the department is located on the third floor of the general library. The department blocks access to future expansion of the north wing of the building and must be replanned when the wing is expanded. Quarters at Rutgers and Princeton are on the first floor; upper floor locations are noted at Columbia, Kentucky, Pennsylvania, and Wisconsin. New quarters at Michigan will be provided on the top floor of the addition to the general library. At Hofstra University the department of special collections was placed on the ninth floor, because of higher priority functions on the main, lower and second floors. The
ninth floor was finally selected because of low frequency use of special collections and the exciting view from this elevation.

Exhibit space is an indispensable and integral part of rare books and special collections programs. Special exhibits related to curricular offerings or those mounted to memorialize a significant event or person are intellectually stimulating adjuncts to the classroom and laboratory. There would appear to be a direct correlation between the depth and variety of institutional collections and the extent of space devoted to exhibit areas. Since exhibits attract many people who are not necessarily book users, the area should be planned so that the viewer and the user do not collide in their respective missions. The following descriptions of institutional exhibit space may be considered ideal in that adequate space is separated from all other rare book functions.

The most dazzling, expensive and elaborate exhibit case yet designed is the central book stack in the Beinecke. This and other less breathtaking features of Beinecke have been described in detail by Ellsworth Mason. Mason noted that exhibit cases should conform to the following specifications: be dust free, properly ventilated, at a height for easy viewing, easy to load, and have a background that will contrast with a variety of colors and textures.

The Lilly Library was designed so that a major portion of the first floor may be devoted to exhibits. Patrons enter a foyer containing flat exhibit cases on either side, then move to an exhibit room measuring twenty-eight by forty-eight containing flat floor cases and two wall cases. Viewers are free to look at exhibits in the room, which is supervised by a staff member from a desk at the entrance. Book users enter the reading room from the west side of the exhibit hall by pushing a buzzer for admittance. The staff lounge, entered from the east of the exhibit room, contains wall cases and is used for changing exhibits. When a large exhibit is mounted, special rooms containing built-in lighted exhibit cases, entered from the south of the exhibit room, are also used. Viewers must be supervised by staff members in these instances. The wall cases contain fluorescent lights mounted inside and are ventilated. Flat cases have air ports in the side panels for ventilation and are lighted by room ceiling lights.

Hofstra has an exhibit gallery measuring approximately thirty-eight by thirty feet just outside the special collections reading room. The gallery contains an unusual walk-in exhibit case, especially de-
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signed for the area, as well as a number of flat cases. The walk-in case is eight feet high, twenty-four feet long and three feet deep. It is air-conditioned and contains internal lighting fixtures baffled by plexiglas filters above the louvres. There is no problem of heat or light reflection reported. Visitors, however, have complained of reflection caused by natural sources through exterior windows. The exhibit room is unattended when the department is open. When the department is closed a switch prevents the elevator from stopping on this floor.

The Spencer Library is entered through an exhibit hall containing 1,245 square feet of floor space. The hall contains four ventilated, reasonably dust free, wall exhibit cases lighted with fluorescent lights mounted inside. Excessive heat has not been a problem in these cases. The center of the hall contains three especially designed unventilated flat cases. These are illuminated by downlights, one for each case, suspended from the ceiling. The downlights create annoying reflections on the viewing surface of the cases. Security in the exhibit room is maintained by a desk attendant just inside the entrance.

Two of the Spencer stack levels are enclosed in glass walls surrounded by a commodious hallway. Viewers may, by entering through a check point, view three sides of single-faced stacks, backed by a wooden partition, shelved with rare and special books. This permanent exhibit feature is less glamorous than the central book stack in the Beinecke library, from whence the concept was borrowed, but offers a stimulating sample of rare books and special collections.

Access to the department of special collections in the new building of the University of Chicago will be through an exhibit gallery containing wall exhibit cases. The entrance was so designed that part of the gallery cases are outside of the department's entrance door and may be viewed when the department is closed. Inside the main entrance, four alcoves will also be devoted to exhibit cases. All cases will have individual air circulation and are wired to a central security control. Exhibit space can be reduced by inserting panels matching the wood finish of the area over cases not needed for a particular exhibit. The department proper is entered from a secondary entrance via the alcoved exhibit gallery.

The knowledge that rare books and special collections need special protection from harmful gases in the atmosphere, dampness, dryness,
fire, insects and thieves is widespread. The mechanical features pro-
vided for the preservation and security of rare materials have been a most significant development during the last three decades.

More favorable control of the atmospheric environment in recent years has been possible through improved technology. Interior con-
densation, however, is still a minor problem in some libraries. Hof-
stra University has solved the problem by constructing an inner cement block wall three feet inside the outer wall and lining the walk space between the two walls with fancoil units. This has not only eliminated condensation but has protected the collections from the rays of the sun.

Filtration systems that remove gases harmful to books are neces-
sary to guarantee extended existence for rare materials. The Lilly system employs electrostatic self-cleaning filters. The Beinecke system contains a rotating screen prefilter, electrostatic filters and activated charcoal filters. Hofstra has an efficient system consisting of pad pre-filter bag strainers in front of an activated charcoal filter.

Constant temperature and humidity control, in spite of manufacturer's stated performance standards, is difficult to maintain. Some deviation from seventy degree temperature and 50 percent humidity is allowable. (Humidity may be intentionally lowered in winter to prevent dripping.) Hofstra employs a continuous-reading recorder connected to an alarm bell in the engineering department which warns when either temperature or humidity passes the permissible deviation. Temperature variation noted in Spencer was not higher than seventy-four degrees or lower than sixty-seven. Humidity de-

Considerable thought has been given to fire control in rare book quarters. The Beinecke and Spencer contain heat and smoke detection systems for early warning. In the Beinecke the area can then be flooded with carbon dioxide preventing combustion. Rice University also employs a carbon dioxide system for automatic protection. The department of special collections in the new building at Chicago will contain smoke indicators throughout the department, connected to one indicator station in the department proper and another in the building. Hofstra has sought to solve the problem by fire-proofing the walls and doors of the stacks with materials that resist fire for two and one-half hours.

Water, from inside and outside sources, is an enemy of books. The Lilly Library contains no horizontal water lines. All vertical lines are
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copper, enclosed in vertical concrete viaducts which, in the event of
leaks, empty into a basement drain. Water seepage in below grade
quarters may cause serious damage to materials. Seepage from roofs
and patios above stack areas is also a problem. To combat this problem
in the Beinecke, one floor not used for stacks was interposed between
possible source of water seepage and the stacks. At Hofstra there
are exposed patios above part of the stacks and reading room. Leaks
have occurred in the reading room. This unfortunate experience has
led Ellsworth Mason to recommend that rare book quarters in a gen-
eral library should be located at least one floor level below any roof
surface.

All the plumbing, electrical, and air-duct systems in the Houghton
Library are situated between pairs of floors with sufficient crawl
space so that they can be serviced if necessary. These can be reached
through manholes in the ceilings underneath these double floors. All
horizontal water pipes in the building have underneath them a series
of copper troughs to catch any possible leakage. These troughs in
turn lead to a system of pipes that go to a sink on the upper base-
ment level of the stacks where they emerge as a series of petcocks
and two drains. If leakage is observed coming out of either of these
drains into the sink, the petcocks can be tested in turn to determine
which part of the system is producing the leakage. There is a chart
nearby explaining the location of each part of the system; a leak can
then be tracked down with very little trouble.

Alarm systems that warn of unauthorized entry into the building
or into special collections quarters are fairly commonplace. Most
systems, highly sensitive to sound or motion, are connected to campus
security headquarters. Spencer has a system sensitive to sound that
alerts the campus switchboard when building security is violated.
The Lilly has an ultrasonic alarm system which establishes a pattern
of sound waves within the protected area. An alarm is sounded when
these sound waves are reflected by a moving body. An alarm system
that is tripped by sound can lead to frequent false warnings. Per-
cussive noises, bells, steam pipes or machinery have been known to
set off the alarms. Most alarm systems can be adjusted to tolerate
unusual noise up to a certain sound level.

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"ANY TEACHER WHO CAN BE REPLACED by a machine, should be." B. F. Skinner (Harvard University).

"Our aim is to have the computer instruct the researcher in how stored information is organized. He is led to browse in the general area of his inquiry and broaden or narrow it as he wishes. The [computer-based] system also helps him choose the best search strategy." Donald Hillman (Lehigh University).

"The dial-access retrieval system interconnects the library listening facilities with the thirty-two listening posts of the Office Practices Laboratory and forty positions of the Foreign Language Laboratory. Eighty-six students can listen at one time to any one of the selected programs over the earphones. . . . The library and all other instructional buildings are connected with the television studio by coaxial cables." Michael N. Slama (Ventura [California] County Junior College).

"Features of the library include an electronic operations system for automated circulation, teaching machines, computer and teletype consoles, and closed-circuit television. . . . The Mart Library also provides quarters for the Interdisciplinary Center for Information Science and will be central to the continuing growth of engineering and science education and research at Lehigh." Dedication brochure for the Mart Science and Engineering Library, Lehigh University.

"No surveys can be found that indicated how much the audiovisual materials are being used by our college students. Nor is there an easy way to arrive at even a guess as to the amount of use of visual materials on the college campus. There has been millions of dollars worth of research on the potential of audiovisual materials but there seems to be no research on their actual use." Richard Chapin (Michigan State University).

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"The day when reading will be a primary form of information intake is . . . passing—my advice is to plan no more buildings for library use. Library space is a concession to the past." Sol Cornberg.

As yet, no simple formulae or prescriptions exist which can be described honestly as "definitive" guides useful to those interested in designing facilities for production, storage, or use of communications media on the university campus. In his 1965 book on *Planning Academic and Research Library Buildings* Keyes Metcalf sensibly devoted just two pages out of some four hundred or more to audio-visual service areas. And, even here, the general advice given was not to accept responsibility for planning such units. Why?—To Metcalf the future must have appeared uncertain. And no wonder—witness the six statements quoted above. So then, given a desire to accept library planning responsibility, statements such as the half-dozen cited illustrate dramatically the numerous dilemmas which must be faced, and the fact is that one can no longer plan library buildings simply in terms of types of space to be allocated for traditional media acquisition, storage and use. Rather the approach which is required calls for design of a total system of communication and information service, many ramifications of which suggest that library buildings as such are, indeed, passé—not that many universities have as yet been willing to accept the advice offered by Cornberg. But perhaps this is because there has not yet (as Chapin suggests) been sufficient experience in using the newer media at such new learning center and laboratory facilities as are represented, for example, at Grand Valley in Michigan, in the Marywood College Library in Scranton, Pennsylvania, at Oklahoma Christian University, and in more recent years by the New York State University system (for example at Buffalo and Geneseo). Each of these institutions has facilities which feature electronic learning carrels and other hardware manifestations of modern learning techniques and technology. How then should the library planner proceed?

In the author's opinion, the best place to begin planning for new media is by getting answers to some fundamental questions of purpose (as enunciated by institutional size, age, avowed goals and methodologies of instruction) and to questions concerning levels of teaching and research to be served as well as clear delineations of library responsibility (such as will it provide independently or in co-
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operation with other agencies and departments prerequisite instructional and study spaces, equipment and special media service). Treatment of such factors tends either to be missing in much recent writing on the subject or to be notably ambiguous.

Next, library planners must acknowledge as a likelihood that it may be less necessary in the future to house all parts of any given media service program in one place so long as all units composing the program can be linked together in network-like systems and the resources of each can be deployed where and when needed to support over-all functions. That is—libraries of the future may not wisely be conceived as buildings at all but rather as parts of far-flung networks made up of units of varying sizes and types, each of which performs similar as well as some different functions, but all of which may be linked together electro-mechanically. Within the total system at one time can be vestiges of past service programs of interest both to bibliophiles and antiquarians and avant-garde approaches to use of communications technology which could include telefacsimile and high-speed voice transmission aids capable of sending and receiving over 1,000 words per minute; electronic carrels distinguished by their typewriter-like keyboards and connections to on-line, time-sharing computers; audio jacks and sets of earphones; individual television display units capable of being augmented electronically through use of light pens, etc.

Apropos of these points, the student of contemporary library and information system design must acquire a new and, perhaps for some individuals, an alien vocabulary (but hopefully buttressed by personal experience with examples of the technology to which new labels refer) covering a broad variety of new electronic handwriting devices and ranging from Touch Tone dial systems to WATS (Wide Area Telephone Service) line service, TELPAK, and CCSA (Common Control Switching Arrangements); amplified telephone systems such as the so-called “Tele-lecture”; passive audio devices (such as “Code-a-phone”); visual transmission by audio phone lines; DAIRS (dial-access information retrieval systems); the various new forms of TWX service; and the latest generation of computers (known as “third generation”) which features a time-sharing, multi-programming facility. Also to be considered as part of any long-range projection is Bell Telephone’s new “Picturephone” system which offers two-way voice and picture communication transmitted over present telephone lines. It should become operational before the mid-1970’s.²

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The balance of this article concentrates on a few of the primary factors and functions which must be considered in planning facilities for all types of university library service and tries to state simply some of the more difficult problems in planning library space arrangements for the use of modern media. Noted in passing will be references to a number of sources of relevant information and to experimental programs conducted by several universities.

Listed below are some basic matters to be considered in planning an academic library. Concerning professional responsibility, it seems clear that university libraries of the future will be responsible for providing a very broad range of educational communication and information media and for producing new instructional aids as well as distributing materials. Media evaluation (as distinguished from simple cataloging and bibliographic description) will be needed. Active partnership in instruction (as the “library-college” idea suggests) has major implications for design of library facilities. Regular participation in research concerned with the effectiveness of using new teaching-study-learning resources implies new roles for librarians. Switching center functions to provide access to information wherever it may be located physically, as distinguished from access only to materials housed within given buildings, also opens up the world of computer applications to libraries and librarians.

At a minimum, augmenting the existing inventory of traditional library resources published in printed formats will be at least four types of new media for which library space must be reserved and equipment provided. These include audio-visual materials (e.g., slides, filmstrips, motion pictures, phonograph, disc and tape recordings); the products of reprography (the relatively rapidly produced, convenient and inexpensive media used for exact duplication of graphical representations); miniaturized materials and equipment needed to use such material (some late developments permit direct transfer of material in microform to computer printout); and the products of automation (perhaps the most dramatic and visible of which are the cathode ray tube display image).

Provision of these media and, indeed, of all library resources must be accomplished in an environment which reflects the current trends in education. Three important manifestations of these trends are evident in 1) the encouragement of independent study by students (utilizing aids to programmed learning); 2) academic integration (represented in a growing number of interdisciplinary instructional
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programs) and 3) use of special techniques of instruction representing in many cases what Dupuy has called the "audio-tutorial" methodologies—in essence, simple extensions to other fields of the "language laboratory" idea. Use of these methodologies may be complemented by individual student and small group work with instructors or tutors who serve in advisory roles and explain, interpret, or expand upon formal presentations given in audio or visual media. The effective teacher does not simply pass along facts and information—this can often be done more efficiently by a machine, audio tape, film, slides, or a book. In recognition of this fact, the planner of modern library service will arrange the "library" programs conceived to accommodate a growing roster of library media service functions and take into account the stress now being given to methods of instruction which feature individualized approaches. The result may be a facility which through adequate design and the nature of resources provided can facilitate individualized study and teaching methods and deliver conveniently (virtually on demand, using electro-mechanical aids and systems) whatever types of new media service may be required to pursue given individual (or group) instructional objectives.

The management of such facilities requires close cooperation and joint planning by teams of specialists, all of whom are concerned, however, with the educational process and which may include as individual members some whose primary tasks will be represented in the work of advising students, others in testing, producing and/or distributing materials. Of note in this regard is the work being done in the new learning centers established at Stephens College in Missouri, at Oklahoma Christian College and Oral Roberts University. Other centers with similar goals have been established recently on the Santa Cruz campus of the University of California, by the University of Illinois on its Chicago campus, and in Florida at Florida Atlantic and at the University of South Florida. Orchard Ridge campus, one of three maintained by the Oakland Community College (located in the suburbs of Detroit), may represent the first complete campus designed specifically for individually-paced learning programs based on very heavy utilization of multi-media. Those responsible for planning libraries are urged to take cognizance of experience already gained at such institutions as those named.

Mandates given those responsible for constructing new college or university library buildings usually state that what must be provided...
is "maximum flexibility," "loft" space with a floor and/or ceiling "power grid" and, where feasible, "instantaneous access" to all specialized materials and equipment needed to assist the teaching-learning-study process.

Nor are such mandates, however vague, without merit. Contemporary thinking about university buildings and facilities suggests that any given instructional department, research laboratory, or library unit cannot be expected to remain in one physical form much longer than five years. Hence, the new Forbes Area complex of buildings being planned for the University of Pittsburgh (which is to house the humanities and social science departments as well as several professional schools) has been conceived and approved for construction as a modular, highly flexible unit capable of extension and virtually infinite rearrangement simply by changing wall, ceiling or floor locations much as one might restack boxes to permit larger, then smaller, and then again larger space utilization in three dimensions.

In the case of televised instruction, the experiences reported by Michigan State University indicate that, given the present state of the art in design and use of closed-circuit television systems, the major expense to be associated with televised instruction involves staffing costs. Of course, size of enrollment is also a major factor. But in any event, until higher education is able to redeploy significantly its instructional staffs and related resources (e.g., space, equipment, and materials), very large courses enrolling as many as five hundred individuals will be needed frequently to reach a fiscal "break even" point.

One useful review of budget considerations is represented in the three-volume study entitled Costs of Educational Media Systems, prepared by Michael C. Sovereign of the University of Illinois for the General Learning Corporation under a U.S. Office of Education grant. The study identifies cost components for a variety of educational tasks and affords a useful base for comparisons of alternate systems. However, when taken too literally, such studies can be misinterpreted so as to miss main points of technological innovation—which may involve improvements in quality as well as extension of educational opportunities, but the costs of which frequently can be evaluated only in terms of "have" or "have not" situations.

In the situation described, it really is not possible or practical to set forth basic costing principles covering such service since charges
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currently applied in schools and colleges (e.g., $1,000 to $4,000 per position for remote access video systems installed in a library) cannot be derived by simply summing figures, since once again the program of services was not conceived originally as a unified whole.

In addition to basic program conception, many technical factors must also be considered. And too much planning in the past has proceeded "by guess and by God" because it has been essentially "additive" rather than being conceived from the start as a total communication service planning task.

A first requirement to be noted immediately when "total" planning is undertaken is the need to provide more than normal power if television or computer equipment will be involved. The need for controllable incandescent lighting plus other requirements can easily lead to demands for an available current of 300 or more amperes. Additional air-conditioning tonnage required by new electronic resources and by heat generated from lights and equipment which must be carried off by some means suggests giving special attention to ventilation. Because audio recording may require "low pressure" air distribution systems and special ductwork to avoid noise factors, unusual ceiling heights may be specified.

Flexible use of a power grid system requires attention early in any design effort. Because walls and ceilings used in studio recording spaces must be capable of maintaining at least a forty decible noise reduction ratio, special attention is required at an early stage of planning. Simple loft plans can prove difficult to work with when one is considering space for development and use of graphic materials. And these, in general, must have special light control and ventilation as well as a reliable water supply free of normal sedimentation and capable of very accurate temperature and rates of flow control. Since these matters are highly technical they require consideration and knowledge on the part of library consultants as well as architects and engineers if a sound "total" plan is to be realized.

Often superimposed on traditional functional or subject division plans of library construction are individual study spaces, rooms for typing and group seminars, language laboratory facilities, photocopy rooms, temporary classrooms, reading laboratories, media distribution and equipment centers, television viewing and listening areas, electronic learning service stations (i.e., "wet carrels") and/or other special rooms. These are often added without proper attention being
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paid to such technical matters as ventilation. Aphorisms such as "less glass for readers and more for staff" which take into account distraction factors and/or needed relief from monotony—tend to be "pseudo" laws rather than valid guides for development of a total concept of a communication and information center.

Thus, respecting such centers, library planners, consultants and architects may have to consider possibilities for providing a much broader range of services and facilities than any previously noted. And indeed, such rather new and unusual facilities as child care units (cf. that developed for Federal City College in Washington, D.C.) may also have to be considered to meet the problems of part-time working mothers. And this point raises a host of others which concern the places in which individual learning and methods may best be accomplished by a commuting student population as well as the growing body of adults living in a given community who may be expected to use campus libraries—ranging from high school students and pre-college groups for purposes of orientation to post-retirement, vocational learning, and enrichment programs sponsored for senior citizens.

In short, in addition to lively educational imaginations, a variety of new and very technical knowledge is required of library planners, for example, knowledge of special effects of dryness upon ultramicroforms which have high reduction ratios and which are subject to damage by unfiltered air. A planner should know the special benefits which can accrue from the use of rear image rather than front image projection equipment for microforms. (The latter tends to be more sensitive to the image-destroying effects of higher levels of ambient light.)

Among a brief listing of references, of particular interest is unique work reported by Rensselaer, an institution which has featured problems of communications service in relation to design of university facilities. A second volume on New Media in Higher Education, edited by James W. Brown, represents an essential item for any reading list. The Licklider book is obviously a "must" as are the reports of T. N. Dupuy on Ferment in College Libraries and Computers on Campus by John Caffrey and Charles J. Mosmann.

The single most comprehensive volume dealing with curriculum-related problems was issued some years ago at Stephens College. This volume indicates clearly and almost uniquely the depth to which a local study should go if it is to be truly comprehensive in identify-
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ing needs of instruction and research for provision of newer media service. The best recent book is by Ellsworth.\textsuperscript{12}

In concluding this statement on planning uses of media within the library it would seem important to offer a few cautioning words and then to suggest something positive in the way of suggestions for procedure. First, as a caution, the field suffers from a serious lack of common standards and definitions, not to mention a paucity of reliable statistical information on the basis of which sound cost effectiveness studies can be conducted. Despite ALA efforts and work being done by various bureaus of library research sponsored by universities and other non-profit organizations (such as the Systems Development Corporation in Santa Monica), planning in the area remains difficult. Obviously every effort should be made to ascertain costs responsibly and to relate these to local planning problems. But continuing study must be encouraged to derive as soon as possible the kinds of standards, definitions, and usage of terms which can be accepted generally.

A second caution has to do with the lack of sufficient experimentation on the basis of which one can truly study and project future needs, for instance, of the kinds of manpower needed to manage an optimum library program and plans for administrative organization which will operate effectively when the communications service is seen as a unified entity (as distinguished from random pieces of service which may or may not fit well together).

Finally to be offered as a positive aid, the following checklist of factors is recommended for consideration in planning future library development:

1) Educational goals of the institution and methods of instruction employed (including various levels of teaching and research to be served by undergraduate curricula laboratories, to meet graduate student or research staff needs, etc.)

2) A definition of the library function (what is to be included and what need not be considered)

3) The number and kinds of special facilities and equipment which must be provided (identified in terms of subjects, media forms and formats, clientele, and/or intended use)

4) Amounts and kinds of integrated versus decentralized media use facilities (e.g., multi-media carrels versus group listening or viewing rooms)

5) Degrees of administrative centralization versus decentralization

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to be afforded by the library system (through branches; in resource centers; by using satellite library arrangements)

6) Production and reproduction responsibilities (by whom? in what amounts? at what costs? to serve what purposes?)

7) The degree and nature of automated services (intended to help management, to provide information storage and retrieval services, to assist instruction and research. Who is to use the automation—individuals, classes, groups, et al?)

8) Such considerations as integrated versus separate cataloging of various forms of material; staffing patterns and budget arrangements; planned growth rates; special communications facilities; possibilities for cooperation with other agencies and institutions

9) Particular spaces, furnishings and equipment (needed for materials and equipment storage; maintenance and repair; office activity; individual and group study and use of library resources; previewing; conference work; displays)

10) Lighting and ventilation (incandescent, fluorescent, ultraviolet; window drapes and blinds; plans for use of microtext; dimming controls; air-conditioning requirements; special humidity and temperature regulators; need for dark rooms)

11) Communication control systems (centralized and/or remote; one-way or multi-way; dial access audio and/or video; computer access and display mechanisms; individual browsing facilities for use of audio-visual media; loudspeakers versus use of headphones; special communication equipment needs)

12) Reproduction services (graphic, photographic, electronic reproduction)

To sum up, the day has arrived when it is no longer useful to talk much about planning or construction of university library buildings as if these were independent units. The future really does not encourage such efforts. Insofar as the words "library" and, indeed, "librarian" still have meaning, they represent a heritage from the past which recalls performance of functions without which civilizations could not have developed nor endured—that is the preservation and distribution of recorded knowledge. But today these are tasks which call for a broadening diversity of arts, skills, and intellectual talents not demanded previously and for maintenance of new and changing facilities which will permit rapid production, distribution and use of a very wide range of modern communications technology.

Once the terms "library" and "librarianship" are acknowledged to
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represent functional concepts rather than specific realities, it becomes easier for those made responsible to proceed with designing of facilities to provide optimum communication and information services. But let it be recognized at the outset that such facilities may not in the future look much like the traditional libraries of which universities have been so proud. Indeed, to recall an architectural adage, if form should properly follow function, then Cornberg’s advice to campus planners quoted at the beginning of this article is worth recalling: “Plan no more buildings for library use. Library space is an anachronistic concession to the past which we can no longer afford.”

The author is indebted to David Crossman, assistant director of the University of Pittsburgh Libraries for Instructional and Research Services and nationally-known consultant on dial-access systems. Dr. Crossman provided an extensive review of current technical problems encountered in planning new media services for the college or university.

References

Lighting and Mechanical Progress in Universities

ELLSWORTH MASON

Illumination practice is presently at a low ebb. Illumination engineering has been dropped from the engineering curriculum, teachers of illumination are nearly a departed breed, and the expertise available to architects lies in the commercial engineering firms. These firms are largely geared to the demands for dramatic lighting required by the commercial world, and lighting quality is of little consequence to them. As a result, very few libraries built since the war have good lighting.

This fact is ironic since illumination engineering is an exact science, and the basics of handling lighting equipment to achieve good quality illumination have been available since 1948 in a simple forty-page pamphlet, written for the nonspecialist, entitled American Standard Guide for School Lighting. Since then similar information has been easily available in other publications.

The physiological problem is simple. The pupil of the eye contracts in the presence of glare, which causes visual discomfort. Two procedures can then be followed—the glare can be reduced to an acceptable level so that at comparatively low intensities enough light gets into the eye for effective vision, or the intensity of illumination can be increased to the point where enough light will get into the eye, even though the pupil is nearly closed. Reasonable men prefer the former procedure; lighting companies the latter. For the past decade, library lighting practice has been running heavily in the direction of the lighting companies. While severe glare is the condition of most library lighting, the tendency to provide ever higher levels of intensity, running upward of 100 foot-candles, has greatly increased, and this has exaggerated even more the glare problem.

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Glare is of two kinds—reflected, which reflects light sources immediately overhead from the work task, and direct, from light sources in the line of vision. It is impossible to eliminate glare completely, but it can easily be controlled. Reflected glare can be controlled by interposing a translucent panel, in the form of a lens, between the light source (the bulb or tube) and the work task. If you use open-bottom eggcrate louvres or incandescent down-light cans, it is impossible to control the reflected glare. Since the intensity of the source in down-light fixtures is usually greater, and its light diffusion is poor, it is the worst possible kind of fixture for library areas.

The lens used must be far enough from the light source (at least four and one-half to five inches) so that the bulb or tube image does not show through the lens to any marked degree. If it does, reflected glare can be nearly as intense as that of an unshielded source. In addition, the lens must be of a material that diffuses light from the source extremely well. (Buildings incorporating many of the mechanical and electrical features mentioned in this article are listed in Appendix I.) Properly constructed fixtures with good diffusing lenses, which control reflected glare, can still have a good deal of direct glare if the lenses used are of high surface brightness. The lenses must be of low surface brightness, and it is possible for most people to determine whether the brightness of a lens produces visual discomfort merely by looking up at it. Opalescent lenses, of glass or plastic, diffuse well, although the quality of diffusion varies, and glass lenses are the more expensive. Prismatic lenses made of glass are useless because the tubes show through them badly and they have an extremely high surface brightness.

Plastic prismatic lenses can be extremely effective, if they have low surface brightness. Many of them do not, and the fixtures proposed for a library must be inspected in a mock-up of at least four units, spaced as proposed in the plans, and containing exactly the same kind and the same number of tubes as proposed in the plans. Lighting plans must not be approved before determining that the basic fixtures in them are satisfactory.

Recently, there has been a tendency to use plastic diffusing lenses of a flat, translucent kind, above eggcrate louvres, and while this reduces the efficiency of the fixture, it solves the problem of surface brightness since the louvres effectively conceal the lenses from the eye. Parawedge louvres which have a 45 degree cut-off for the light, effectively control the surface brightness of even large or total areas.
of ceiling, but they produce an uncomfortable feeling since there is absolutely no light visible on the ceiling or upper walls of the room. These are open-bottom louvres, and, as in the case of eggcrate louvres, must be used in combination with a translucent lens to control reflected glare.

Good quality fixtures used only in limited numbers present a shadow problem. In present day libraries which use freestanding carrels with baffles, bookshelves, and often side-baffles, lighting that casts shadows makes readers feel that they are in a cell. Shadows can be dispelled by using a large number of light sources, rather than a few, high-powered sources.

Blackwell has shown that the quality of lighting improves as the portion of the ceiling covered with light increases. In the case of a luminous ceiling, in which the entire ceiling produces light, there are no shadows at all. (One must not confuse a ceiling composed of open eggcrate louvres, which is rife with reflected glare, with a luminous ceiling that uses a shield under the tubes.)

The effectiveness of luminous ceilings depends heavily on the interreflection of light within an area, as it bounces endlessly from one surface to another in a compound way. This interreflection, which begins with multiplication of fixtures, depends greatly on the reflectances of the surfaces in the area—ceilings, walls, floors, equipment, furniture—and these themselves can be a source of undesirable glare. Reflectances should be between 30 percent and 80 percent for all surfaces, none of which should be glossy. Matte finishes should be used. Carpeting, which is entirely free from glare, is preferable to any other floor surface from this point of view alone.

The centrality of quality in lighting was brought sharply to the fore by H. Richard Blackwell in papers published in 1959 and subsequently. While his discoveries were not radically new, his impressive claims for the superiority of multi-layer polarized lenses to produce high quality lighting resulted in unprecedented interest in this type of lens.

The past decade has produced attacks on his contentions that cannot be ignored, notably by Crouch and Kaufman in *Illuminating Engineering*, and by Fairbanks in two papers delivered in 1963. The evidence indicates that polarized panels are not the ultimate solution that Blackwell thought them to be.

Multi-layer polarized lenses cut illumination efficiency by about 50 percent, which requires a much higher wattage in the light sources
than comparable general diffusing lens fixtures. This adds greatly to
the heat load, to the cost of air-conditioning equipment, and to the
cost of power for maintaining the lighting system. All this is in addi-
tion to an initially high premium cost for installation of these lenses.

Nonetheless, these lenses have been installed in the libraries at
Austin Peay State College, the University of Nevada, the University
of Northern Iowa (Cedar Falls), Miami-Dade Junior College, and
the Meyer Undergraduate Library at Stanford. At least two of these
installations maintain intensity at ninety foot-candles. I have studied
the installations at Miami-Dade which is pleasant and comfortable,
and at Stanford, where the lighting, although of reasonably good
quality, contains a noticeable amount of glare. Stanford uses three-
foot square fixtures, and recent research indicates that larger fixtures
produce greater visual discomfort. But, as Fairbanks makes clear,
polarization of light results in two different kinds of polarized light,
one of which is not yet cope with by any commercially available
lens.

It is not necessary to use polarized panels to obtain totally good
quality lighting. To achieve this with other kinds of lenses requires
exploration with the aid of good consultation. The architect will
probably be of little help. If one is totally dependent on the architect,
and can afford it, he can be reasonably sure of getting good quality
lighting by the use of multi-layer polarized panels. But because they
will hold higher intensities is no reason to go above seventy foot-
candles for reading areas.

After well-designed luminous ceilings, indirect lighting produces
the best quality lighting, but it is used infrequently. It, too, requires
proper design to avoid glare on the ceilings, which becomes the im-
mediate source of light; it is of great importance to keep dust off
the ceiling surface. Indirect lighting appears in the form of cove
lighting in some buildings, but used improperly it can produce great
irregularities of intensity.

While problems of quality in lighting are easily resolved, prob-
lems of desirable intensity are not. Keyes Metcalf indicates clearly
that response to lighting intensity is a cultural phenomenon, con-
tioned by expectations generated by lighting intensities in other
buildings. Wide variations of opinions exist, and it is not clear
whether they are based on experience with good quality or bad qual-
ity lighting. In my opinion, in the kind of large, open areas that
characterize reading and stack areas of libraries, less than fifty-five
foot-candles of good quality lighting produces a feeling of dullness in the decor; more than seventy foot-candles is a waste of money. Either produces good reading light.

There is no practical necessity for varying intensities throughout the building if it has good quality light; and there are good reasons for not doing so. Many people have tolerance of a range of intensities, but I have yet to meet anyone who prefers a given level of intensity. Those who have complained about high intensity light in buildings on which I could check have been referring to heavily glaring light. At 120 foot-candles in Yale's Beinecke Library reading rooms, readers find it comfortable to study for full days on end. I have heard many complaints about low intensity light, below forty foot-candles. If intensities change between public areas, it is psychologically irritating to be constantly adjusting. In a library, where a reader wanders throughout the entire stack area to get books, it is confusing to have to pick out an intensity of lighting from more than one.

Stack lighting should not be centered on stack aisles except in large research collection stacks where it is virtually certain that the stacks will never be moved. There is now a stack lighting fixture that uses two-way parabolic baffles with a 39 degree cut-off, which distributes light with reasonable evenness over the seven stack shelves. However, these are very bad fixtures for reading areas, and if they are used, it will not be possible to convert the stacks to reading without changing the fixtures. The same kind of lighting should be used in stack areas as in the rest of the building, except in research stacks.

Rare book areas require Verd-a-ray Fadex tubes, or the use of UFII or III Plexiglas to prevent book and paper damage from the ultra-violet light from fluorescent tubes. All fixtures in these areas should have fused ballasts, to prevent the dripping of hot liquids that often accompanies the burning out of ordinary ballasts.

There has been a movement for some time to set up practical measurements that will assure the installation of quality lighting in schools. In 1962, the Illuminating Engineering Society introduced the scissors curve graph as a test for discomfort glare. Present work on a revision of the American Standard Guide for School Lighting will present, as successor to the scissors curve, an equal-area equal-glare effect diagram. Research in the field on loss of contrast between the print and the page due to veiling reflectances from overhead fixtures is underway to determine criteria for reducing it. Also underway is
research on a visual comfort probability index in the direct glare zone. These three criteria, when established and used together, will allow the determination of which fixtures are acceptable for good quality lighting and how they should be laid out.

While it is possible for an earnest layman to learn to recognize glare as soon as encountered, to distinguish by eye degrees of comparative glare, and to recognize lenses too bright for comfort, the use of an expert lighting consultant is essential in the development of lighting design for a library. The library must have a lighting consultant to represent its interests in addition to the consultant working for the architect's electrical engineers.

The consultant should be involved as soon as the basic fixture is proposed for the building. He must review lighting layout plans coded for fixtures and review independent testing laboratory spectrometric data on each fixture. He should be involved in approving samples of the actual fixtures to be used.

Specifications for the building must specify by manufacturer and number all fixtures to be supplied in the contract. If substitutions are proposed under an "or equal" clause, the consultant must be reinvolved until final acceptance is completed. Architects are remarkably inept in evaluating lighting. They work primarily with the advice of commercial firms whose main concern is selling the product; nothing is adequate to assure good lighting short of the most intensive efforts on the part of the client.

Turning now to power requirements, the most significant factor is that access to power may be required in the future at any point in the building. Total flexibility can be achieved by providing a double (hollow) floor, but the cost is prohibitive for such a floor strong enough to hold a load of 150 pounds per square foot. The alternative is to put in as much underfloor conduit as the library can afford when building in hopes that it will be sufficient for future needs. The demand for larger size conduit increases, the largest space demands coming from cables. Coaxial cable for television and low voltage wiring for some audio systems must be shielded if they are run in the same conduit with standard electric wiring; this takes even greater space. Requirements for two inch diameter conduit are not unusual, and future prospects probably make advisable the installation of something like Walker ducts, about three inches deep and six inches wide.

Although machines that require 220 volts are still used in libraries,
nearly everything, including computers, is headed for lower voltage (ordinary house current) requirements; but there are requirements for higher amperage connected with many machines, and heavier wiring must be used. An increasing number of machines require single lines (private wires, as it were), to avoid surges in the power supply. This is true for Xerox machines, Sentronic machines, and especially computers. A large number of audio-visual machines are becoming transistorized, freeing them from dependence even on electric plugs. These devices, plus wireless transmission from tape decks to local earphones, will probably make dial access capabilities not worth the cost within the foreseeable future.

More than ever these facts place a premium on writing a building program that details completely the equipment to be used in every room. It is almost mandatory to consult equipment suppliers for power and conduit requirements when writing the program. A separate detailed program sheet should summarize the special electrical requirements for each room in the library building that requires them.

Ventilation systems using overhead duct-fed diffusers, which have long been used, are now rivaled by air-supply ceilings. These hang acoustical tile to form a ceiling cavity into which tempered air is introduced under pressure. It then descends into the room through holes in the tile. Tiles which provide one-eighth inch round holes should be avoided since they tend to clog with dust. Slotted tiles or slots in the splines on which the ceiling hangs are preferable.

This ceiling must be made completely air-tight. It is therefore unsuitable if the ceiling contains much ductwork, pipes, or conduit which require frequent repair, since it is impossible to maintain airtightness under such conditions. An air supply ceiling prevents use of the ceiling cavity as an air return plenum, which is often done to remove 30 to 50 percent of the heat generated by the light fixtures before it gets into a room.

Air-supply ceilings are just as difficult to balance as those using duct-fed diffusers, and hot and cold spots result as often in the one system as in the other. However, air-supply ceilings are comparable in cost to duct-fed diffusers, and they have the advantage of being able to supply a large volume of air with minimal noise. They should be considered for high heat-generating rooms, such as computer rooms.

Overhead radiant heating systems are available which use running
hot water or electric coils as a source. The former is installed above the outer bay areas in the nearly completed library at Towson State College, Maryland; the risk of water damage will, however, make most libraries hesitate ever to place stacks under them. Both systems suffer the disadvantage that the feeling of heat radiating from overhead systems is oppressive, and that the ceiling area occupied by such equipment is not available to provide cooled air in the summer. Infra-red radiant heating is occasionally mentioned in library literature even though it is most intensely uncomfortable when radiating, and only crudely controllable.

Tempering systems for the periphery of the building include floor-distributed air systems, fin tubes, induction units, and fancoil units. Electric radiant heat can be supplied through baseboard units. If used, they should be far enough from feet to be comfortable. Fin tubes do not supply enough heat rise in very cold weather in any building I have observed. On exterior window walls, where they tend to be used, they induce convection currents that are extremely drafty.

Combinations of air-diffusion and return with light fixtures have been used in some libraries. There is an advantage in using the heat of the fixture as a supplement to the general heat source in winter, and in preventing heat from coming into the room in the summer, but in my experience the great sophistication required to take advantage of either of these factors economically has prevented any such system from providing completely good ventilation conditions. It generates a considerable problem in distributing dust over the lenses of the lighting fixtures.

The future will offer systems that use water-cooled light troffers and window blinds (see Appendix II) to reduce these two sources of heat, and the use of heat from the lighting system to produce thermo-electric cooling.

Experience with current technology as it relates to buildings makes it clear that a good ventilation engineering consultant should be used on all library buildings, beginning with the design development stage of architects' drawings and that a professional air-balancing firm should be hired to make sure that the system as installed is as specified (very many of them are not), and that it is working to its maximum capacity. The ventilation system costs about 20 percent of the total building cost, and operating it at 30 percent efficiency is a fantastic waste of money.

Our knowledge of psychological acoustics—how people react to
sound levels—is rudimentary indeed. I have seen a student studying intently for some time about twenty feet removed from a jackhammer actively tearing out an interior fieldstone wall. In an experiment with music piped through the Pennsylvania State University Library, the response of the graduate students was heavily favorable. However, most librarians over many years have had experience with the large number of students who object to sound distractions.

Sound can be masked, and it should be standard library practice to program into its ventilation system a low background noise to mask traffic noises, light-ballast hum, and quiet conversation, all of which occur in a library. Noise that originates from machines (elevators, duplicating machines, typewriters) can be controlled by removing the noise source from the distressed area, baffling it, or absorbing it.

A basic factor in acoustics, therefore, is the layout of the library elements, and if an acoustical consultant is to be used on the building (very few libraries have hired such consultants to represent them), he should be brought into the planning early in the floor plan stage. Noises in the ventilation system which can easily be prevented during the design stage, if reviewed by a consultant, can be remedied only at great cost after the building is completed.

If sound-producing areas are adjacent to areas requiring quiet, the walls separating them can be specially designed to prevent passage of noise. Frequently rooms containing dropped ceilings are so treated, with no provision for preventing the passage of noise through the dropped ceiling above the wall barrier.

The bounce of noise between the floor and the ceiling is one of the greatest noise sources. The greatest single acoustical treatment in a building is floor carpeting (which also, in one stroke, removes a major source of illumination glare). If carpeting is used, it is possible to omit acoustical treatment of the ceiling with no great hazard. Most libraries take the precaution of treating the ceiling anyway, either with sprayed acoustical plaster, acoustical tile, or perforated metal pans lined with insulating materials.

If rooms are provided in which students can generate noise—easily available small group conference rooms, smoking lounges—it reduces the incidence of distracting conversation levels in reading areas. The greatest myth in controlled acoustics in libraries is the typing carrel—an open carrel, with front and side baffles faced with acoustical absorbing materials, placed in open stack areas; it never works. If typing noise is to be confined, it has to be contained in a room,
which must either be remote from reading areas or specially treated acoustically.

Vertical transportation has become a more important factor in the number of high-rise library buildings recently built. The largest yet planned, twenty-nine stories, is at the University of Massachusetts, Amherst. A system of high speed elevators which specialize in the floors at which they land, long tested in commercial buildings, is used in these libraries. In addition, contemporary elevators which are connected to the equivalent of a baby computer have capabilities of sophisticated manipulation. They can search and creep, when not being called, two floors, three floors, whatever is desired; they can return to fixed floors; they can accept only down calls or up calls, etc.

It is extremely important to spend a great deal of time programming requirements for elevators if they are complex at all. Initial wiring of elevators is time consuming and expensive, but along with the basic wiring can be included a wide range of special requirement wiring at comparatively little extra cost. After the installation is made, changes are very costly.

Since libraries tend to accumulate the facilities receiving the greatest use on the main, second and lower floors, the use of escalators to connect these three floors can help solve problems of heavy elevator traffic. Escalators are used for this purpose at the University of Miami, Coral Gables; in the Columbia Law School building they connect the main floor with the library on the third floor in one unbroken rise. Escalators can move a very heavy volume of traffic (such as classroom surges) very rapidly. They cost less to install than elevators, and are cheaper to run.

A two-way escalator connecting two floors, however, uses more square footage than an equivalent of eight elevators. Both ends of it must mesh logically with all other traffic patterns on both floors—a very difficult goal to achieve—and it adds one more long immovable space to the inflexibilities of a building making it mandatory that it be part of a service core area. Careful choice of the equipment is necessary to assure silent and vibrationless operation. Escalators, of course, cannot be used for the transport of books or booktrucks.

Freight elevators, capable of lifting very heavy weights very slowly, are of little use to a library which requires all of its elevators to move at passenger speed. Book lifts which require loading books in and out of the lift are a waste of time, compared to moving loaded booktrucks on elevators. For small installations it is possible to supply
tiny elevators able to move only a single truck at a time, very cheaply.

A large volume of circulation in university libraries calls for the use of automatic book conveyor systems. Endless chain conveyor baskets have been used in libraries since the early 1920's. The one in the New York Public Library is a simple vertical chain; those installed in the Yale University Library and the main building of the Library of Congress at a later date combine both vertical and horizontal movement. Endless chains with the capability of popping out book containers at pre-prescribed floors are in use in a number of libraries. Vertical transportation of books between branch libraries, using pneumatic tubes, was first installed between the Library of Congress's main building and annex. It is extremely fast but hard on books transported. A similar system installed between the main library and the Graduate Research Library at the University of California, Los Angeles, has apparently solved the problem of book damage.

The Mosler Safe Company has recently announced a European-Mosler/Telelift (see Appendix II), which sounds extremely interesting. It uses electrically powered, self-propelled cars, with inside dimensions of five by twelve by fifteen inches, that run on flanged tracks and can be set to move from any station to any other station in a system of up to 1,000 locations. Since the tracks run on walls or ceilings, vertical openings in floors are very small compared to any other conveying system. There are as yet no installations in the United States.

Two-way communication in libraries is possible through closed circuit television, which is far too expensive to be practicable. Communication is mostly restricted to variations of old established devices. Clumsy intercom phone devices have largely disappeared with the spread of Centrex telephone systems which provide quick direct dialing within the building. Many libraries now provide telephone jacks in the face of their card catalogs to allow reference librarians to answer questions from the catalog drawer open in front of them.

Staff, faculty or patrons can be summoned to answer stack-located telephones by the use of a gentle chime signal system which is activated by an automatic code-setter, or by carrying a small radio receiver the size of a cigarette package, which gives out a beep tone only in the one signal receiver. These devices have a five-mile receiving radius, but women who lack pockets take less kindly to them than men. Similarly coded mono-receiving units can receive voice messages audible only to the carrier of the unit.
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One- or two-way radios or line-connected intercom systems can be used between circulation offices and stack attendents, but the noise they produce at the stack end must be carefully controlled. Public-address systems throughout the building for announcing closing time are more effective than Klaxon horns, but their transmitter must be secured to keep students from playing with it. Audio systems have been used to play music in parts or all of library buildings, with mixed results.

Transmission of written messages or call slips through cylindrical pneumatic delivery tubes has long been used, and it is now possible to deliver IBM-type call slips to stack attendents by blower systems. Light-alarm panel boards can detect the opening of any of a number of fire exit doors required on the lower level of large university libraries.

An ingenious bibliophone system in a fixed location library, the Technische Hogeschool, Delft, Netherlands, allows the patron, by dialing his book number to signal the stack page the exact book required. The system combines a dial phone and a small computer. The book is then delivered by a clever, spiral, book chute (an inverted arc in cross section) which delivers books of any weight from the stack floors to the circulation desk at a uniform, non-accelerating, rate of speed. It sounds fascinating, and a great space-eater.

A telephone located in the vestibule to give general directions about using the Delft Library has been adapted in an instructional telephone system at the Hofstra University Library. By lifting a telephone, labeled for its use, the student receives instructions on general layout and services of the library, or how to use the card catalog (accompanied by a model set of catalog cards), or how to use periodical indexes. The phones are separately connected to continuous loop tapes which are activated by lifting the telephone.

Mechanical security systems are now available to prevent the theft of books. Two now in use work on a magnetic principle; a metal wafer is placed in each book and magnetized when sent to the shelves. In the Sentronic system, it is demagnetized when the book is charged out. If anyone tries to take a magnetized book past the sensing posts at the library exit, an electric current is activated, and can be used to activate anything responsive to electricity. The most effective device is a turnstile that locks when activated by an illegal (not-demagnetized) book. In the Checkpoint system, the book is not demagnetized, but handed to a library staff member who passes it around behind the sensing posts. Illegal passage can be
blocked in the same way as in the Sentronic system. Over a period of years, these systems are cheaper than the cost of a human guard system.

The bug in both these systems arises from the fact that a number of objects commonly carried by readers contain enough metal, which has been magnetized in the manufacturing process, to activate the sensing posts. Consequently, large numbers of false alarms occur, with the expected subsequent difficulties with outraged patrons.

A new system offered by the Monere Corporation (see Appendix II) works on a non-magnetic principle. The company states that it involves radio transmission, and shorting out the transmission. In the active state, it will activate sensing posts at the exit as in the other two systems, but false alarms from metal frames are not possible. This system has not yet been tested in libraries, and it is more expensive than the other two. None of these systems can satisfactorily guard current issues of periodicals, one of the most vulnerable parts of the library.

Fire control by sprinkler heads should be avoided in any book storage areas of a library, since water is a greater destroyer of books than fire. Rather, mechanical devices to detect combustion in its early stages should be used for fire protection. The fire station that will respond to a library's fires should be briefed in advance about precautions necessary in extinguishing fires in a library, especially in connection with rare book units.

Ceiling mounted heat- or smoke-detecting units are available from a number of companies. The most sensitive, which are also the most expensive, respond to changes in the ionization of air caused by combustion. They should be connected to a light indicator recording panel at the circulation desk, or some other prominent area in a large building, so that those responsible for protection of the building can immediately see where the fire is located. Heat detection systems that drop dampers and shut off ventilation fans should be mounted in strategic locations in the ventilation duct system. The entire system should be wired directly to ring an alarm at a local security station or a fire station to insure early response to the fire.

In the case of rare book vaults which require special protection, sophisticated automatic or hand-activated carbon dioxide discharge systems which flood the area with fire-smothering gas are available. The system installed in the Beinecke Library at Yale University can discharge two full charges and still have a small charge in reserve.
Lighting and Mechanical Progress in Universities

References


ADDITIONAL REFERENCES


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APPENDIX I

Locations of Lighting and Mechanical Installations

Downlights: Brainboilers—Grinnell College Library (Circulation desk)
Swarthmore College Library (Circulation desk and top floor carrels)

Blinders—Mendel Gottesman Library, Yeshiva University
Beinecke Library, Yale University (Offices and card catalog room)
Bronfman Science Library, Williams College

Glass prismatic lenses: Loomis School, Connecticut (main floor)
Plastic prismatic lenses: Hofstra University (the lowest brightness I have ever seen)

Combination plastic panel and eggcrate louvres: Beinecke Library, Yale University (reading room)

Parawedge louvres: Banker’s Trust Building, 280 Park Avenue, N.Y.
Luminous ceiling: Miami-Dade Junior College, Florida

The best quality lighting installation: Colorado College Library, Colorado Springs
It cost $28.00 per fixture, including the two tubes, in 1960, thanks to Prof. John O. Kraehenbuehl.

Indirect lighting: Groton School Library, Massachusetts (reading room)
Cove lighting: Los Gatos High School Library, California

The best presently available stack light: Rice University Library Addition
Countway Library, Harvard University, where the baffles are of white enamel. It is run at right angles to the stacks, and this fixture does not work well that way.

Verd-a-ray Fadex tubes: Huntington Museum, Long Island
Metropolitan Museum of Art, N.Y.
Smithsonian Institution

Air-supply ceiling: Adelphi University
Peripheral induction air units: Cornell University, Olin Library
Brown University, Rockefeller Library

Fancoil units: Hofstra University Library
Typing carrels: Brown University, Rockefeller Library

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Appendix I

Endless chain systems: N.Y. Public Library (vertical)
Library of Congress, Yale University Library (vertical and horizontal)

Pop-out box system: Brown University, Rockefeller Library
University of California Library, Berkeley

Telephone jacks at catalogs: Brown University, Rockefeller Library
Hofstra University Library

Chime system: Colorado College Library
Hofstra University Library

Beep-tone system: Countway Library, Harvard University
Cornell University, Olin Library
Williams College Library

One-way radio receivers: Brown University, Rockefeller Library

Light-alarm exit detector panel: Hofstra University Library

Sentronic exit control: Western Michigan University Library
Miami-Dade Junior College Library

Checkpoint exit control: Free Library of Philadelphia,
Frankford Branch
Yale Medical Library

APPENDIX II

New Mechanical Systems for Libraries

Water cooled troffers and blinds: Lite-Therm, by Environmental Systems Corp.,
Conyers, Georgia

Automatic vertical and horizontal conveying system: Mosler-Airmatic Systems Division
415 Paterson Hamburg Turnpike
Wayne, N.J. 07470

Mechanical security system for library books: Monere Corporation
15 Hunting Hill Road
Woodbury, N.Y. 11747

OCTOBER, 1969
Automation and Building Plans

ROBERT H. BLACKBURN

The planning committee, the president, the architect and everybody else connected with a library building project will have read that computers are making possible great changes in the nature of libraries. They will react in various ways to the fact that one cannot tell precisely what the changes will be, or when, or exactly what the effect will be on their building requirements. They will probably be impatient at times, and suspect the librarian of dragging his feet, but at present there are some questions to which a librarian's only honest answer is a "definite maybe."

A part of the difficulty arises from the fact that those who write science fiction about "information retrieval" seldom make any distinction between bibliographic retrieval and textual retrieval. You may have to explain to your committee that the first operation, the identification and location of a book, is accomplished ordinarily through the use of bibliographies and catalogs and indexes, that the second operation consists of taking a book by hand from the shelf, and that computers may be applied to the first operation without altering the second.

It has been demonstrated that mechanized retrieval of bibliographic information is quite feasible technically, and adoption of the MARC II format now provides a basic standard for exchange of such information among libraries. Computer tapes are becoming available commercially for the current output of the British National Bibliography and part of the Shared Cataloging Program at the Library of Congress, and for dozens of "current-awareness" services which are unfortunately mutually incompatible. A great deal more experimentation is necessary before we have a clear picture of the most effective techniques and their economic limits, but a few of the large libraries which have been working on the problem for several years are now trying to develop "integrated" systems.

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In such a system, a library will likely have its own resident computer in which the catalog records, shelflist, order file, subscription file, and loan records will all be inter-related and available “on-line,” so that the record may be up-dated or consulted at any moment, and by many people at the same time. The cost-efficiency of an “on-line” system has not yet been demonstrated in practice, and it must be understood that the costs are high. Each installation will begin with something like a million dollars’ worth of hardware, and perhaps as much again in development work over the first three or four years, plus ongoing adjustment and operation. However, it is in terms of “on-line” operation that automation could bring about really significant changes in bibliographic control, and for the moment we must assume that the potential improvements in library operation and in library use are great enough to offset a part of the cost and justify the rest.

It seems probable that many large universities within the next decade will have on-line computers in their central libraries, with multiple outlets in the various divisional or departmental libraries, and with some means of making prompt use of bibliographic records which have been generated elsewhere. It is not clear whether smaller universities and colleges will need to have computers and systems staff in their libraries; instead they may have local off-line operations, supplemented by access over telephone lines to information in larger centers. At any rate, every new academic library building should certainly make some provision for the use of mechanized bibliographic information. These provisions, of course, do not affect the normal need for reading rooms and shelf space. They may facilitate the co-operative building of collections and co-operative use, but they will not necessarily reduce the rate of growth. A helpful booklet discussing computers and some of their implications for library building is The Impact of Technology on the Library Building.1

The storage and retrieval of text, by computer, is a more difficult problem. It is true that a number of mechanized “data banks,” mainly statistical, are now available commercially, and that the contents of some of them could be made accessible to users of university libraries. It is true also that some abstracting services and some collections of analyzed text are available commercially in coded micro-form which can be selected mechanically and projected on a screen or photocopy plate, and that these devices could be useful in handling limited bodies of data. It is true also that some knowledgeable
people foresee the library of the future as a system of bibliographic retrieval linked automatically to a stackroom full of coded microtext—but here the crystal ball becomes very dark, and illumination awaits major changes in the arts and economics of publication, and miniaturization, transmission, and reproduction of text, as well as revision and clarification of copyright laws and acceptance by users of substitutes for the book. Whether these changes will come about, or when, or exactly what their effect would be is difficult to determine. For instance, if the whole body of the world’s publications could be condensed into a desk-sized cabinet and called forth one page at a time at will, as has been seriously suggested is possible, then perhaps present library facilities such as reading rooms and stackrooms will have to be filled with hundreds or thousands of such desks. Meanwhile the annual production of print rises every year, in many languages and in many forms, and each library buys what it can to meet the most urgent local demands. Now that some factual data are being published only in machine-readable form, librarians will acquire it and find a way to make it available, but we are a very long way, I believe, from the use of computers for textual storage and retrieval of general library collections.

In planning a university library one cannot, therefore, assume that computers will make any difference, at least in the next ten or fifteen years, to the growth of the book collection or to the need for study space. After that time one may hope that some technological and social miracle may begin to dampen acceleration in the growth rate of the book collection, and that it will not create too great a demand for new and specialized study space. Given the uncertainties, a librarian will want a building as flexible and adaptable as possible, within the ordinary economic limits of flexibility. Librarians should assume that within the next few years the library may have its own computer to serve a fairly comprehensive system of bibliographic control. It will be a new and better can-opener, not a new kind of diet.

The architect planning a new library building, having accepted the above generalities concerning the future of the library, will begin to ask for facts and figures, and for these you need to seek up-to-date advice. I suggest librarians not rely on the advice of computer consultants who have not worked on library systems: they will judge correctly that bibliographic control does not make heavy demands on computing power, but they are almost certain to underestimate
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the required storage capacity and the complexity of providing adequate access to that storage. They are likely to underestimate the high volume of input and output, the sophistication of the required system, and the time and money needed for adequate planning and development. Now that there are several libraries working in the field, librarians would do well to ask for their latest findings about scale and types of equipment to do the tasks required. Having developed a general idea of the scale, librarians will find local suppliers quite eager to give them specifications as to line-load, cabling, heat-load, floor-layout, and so on. Unless the library is already committed to a particular make of equipment, it should not become obligated to any one manufacturer at this point. The library market has not yet inspired anyone to design equipment that is really suited to library operations, and a library should be free to put together machines of various makes in order to arrive at a configuration which suits its particular needs.

During the design stage at Toronto, in the summer of 1966, we invited our architects and engineers to an all-day seminar with two imported consultants who had worked and published on information systems. The consultants had not met before and had different views of the future, but by the end of the day we had reached a consensus on the points that were important to the architects. In general, we agreed to gamble on computer cables becoming lighter rather than heavier as the equipment improves, so that eventually they might be carried in the regular three-duct underfloor system which is to be laid in most of our office floors for power, intercom, and telephone. For the initial stage, we had agreed that the data processing center would be connected to a vertical coaxial cable space running from an exit port in the basement up to a possible aerial connection on the roof. It was agreed that the vertical trunk line, which could be tapped at any floor, would feed a few horizontal trunk lines laid in the floor to serve these areas in which we could foresee the need for outlets, and that other horizontal lines would have to be installed later when and where they were needed. A complete grid of coaxial cable conduits in every slab would have been the neatest solution, but was thought to be more expensive than later modification to meet specific needs.

The horizontal cable trenches will run to nearly all public service points and control points, and the public catalog areas, as well as the technical service departments. They also serve a number of
carrels in the audio-visual study area, so that we may be prepared for some preliminary experiments in the automated retrieval of text. New horizontal feeders which may have to be added in the future will be carried above false ceilings, where those exist, or else in trenches cut into the three-inch layer of light topping on the floor slabs. We may of course live to regret our gamble, and even now would sleep more soundly if we had been able to lace our floors with large cable conduits. The Library of Congress has a much safer provision in the plans for the Madison Memorial Building, which show a three-duct system laid at five foot centers in most of the floor slabs above the two basement levels. The ducts are to be three inches deep and six, six, and twelve inches wide to handle power, telephone, and coaxial cable respectively. The cost of this duct-work is estimated at about $1.50 per square foot over an area of about one million square feet.

In Toronto the computer will be near the center of the building and in a location which is convenient to staff, on the eighth floor, just above the technical service departments and just below the bookstacks. It could have been anywhere, really, and there would have been some advantage in having it in the basement next to the supply of cooled water. We were tempted briefly by a suggestion that it be on a public service floor or at grade level, with a glass wall for the convenience of sightseers, but decided that we could not afford room for it on a public floor. The working drawings show approximately 4,000 square feet of raised floor to house the "customer engineering office" (twelve by twenty-five feet), the tape-disc-program library (twelve by thirteen feet) and the Sigma 7 computer which will be moved in from its present temporary quarters. The raised area has a ramped entrance and is completely enclosed to permit special air-conditioning. The raised floor is twelve inches above the finished floor level, and the walls enclosing it are largely glass, partly for the benefit of visitors. Alongside are offices for the systems manager and staff, amounting altogether to another 4,000 square feet of assignable work space. The space is assumed to be enough for the initial installation and a reasonable amount of development; any radical expansion in this part of the operation would presumably imply a reduction in technical service staff and office space or in stack space, and could be found by substitution in those contiguous areas. Beside the raised floor is another area which could eventually be raised and given extra supplies of power and cooled water.
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I mention these details of planning at the University of Toronto not as a model to be followed, but simply as an example of what was accepted by one library in the summer of 1968. The detailed planning of our computer system is far from complete and will go on changing as we gain experience and as the machines improve. Since new generations of equipment tend to be smaller and faster and cooler, and to need lighter cables, we hope that we have provided amply for at least the near future. To be safe, before a library commits itself, however, it should get the latest prognostications from several sources.

To be absolutely safe, of course, in the face of present uncertainties, a library should tell its architect to go away and come back in twenty years, when more is known. However, if a university needs library service in the meantime, its librarian can only consult the omens, make a good guess and be prepared to find when the building is finished that his guess was not always completely accurate.

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