Design of Library Furniture

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THE PHYSICAL ENVIRONMENT of a library depends on two factors: the architectural quality of the building and the design of its furniture. These closely related elements must be harmonious if a successful aesthetic result is to be achieved. Architecture and furnishings must be compatible in color, texture, material, and form. This relationship is particularly important in the library building, with its large open spaces which the eye can distinguish as a single entity; such areas appear either unified or disjointed according to the correlation of elements.

This relationship creates two problems in library furniture design. First, the design of the library building must be developed before other elements—including the furniture—are considered. Second, the design of library furniture must fulfill certain functional requirements. Aesthetic and utilitarian needs, as they relate to the design of the building and to library operations, must be determined simultaneously.

A third problem in furniture design, not related to library architecture, arises from the fact that library furniture undergoes excessive abuse and wear. Not only is it subjected to long hours of use day after day, but some users mistreat the furniture. Further, certain areas of the library may be multi-purpose, involving frequent handling of folding or stacking furniture. Janitorial services such as waxing, mopping, and vacuum cleaning are also hard on furniture. Finally, library furniture is costly and cannot be replaced frequently; normally a life span of at least ten years must be expected.

Many samples can be seen of library furniture that succeed or fail in fulfilling these design requirements. Lewis Mumford, after praising the architecture of the American Embassy in London, has this to say about its library:

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I cannot say as much in praise of the furniture. The clumsy, armless, almost immovable chairs were obviously chosen by someone with little experience in sitting or reading, much less in note-taking; they achieve a maximum of cushioned discomfort with a minimum of efficiency. . . . Here was a place for a dexterous innovation in modern library furniture, to match the high standard we have achieved in the conduct, if not always the design, of lending libraries.[1]

Fortunately, such criticisms of library furniture are becoming less valid. Manufacturers are beginning to explore new materials and technologies. Furniture makers from other fields are showing increased interest in the expanding market of library technical furniture, thus creating keener competition and introducing new concepts in design. The stigma of sameness is disappearing from the American library scene as each year sees more examples of imaginative library furniture. Creativity and functional design in library furniture are not only overdue, these qualities are now vital to future library planning.

At the Institute for Library Consultants held at the University of Colorado in the summer of 1964, the effects of mechanization upon library planning were discussed. Of particular interest to the participants was the manner in which computer development and improvements in the miniaturization of graphic information might enable libraries to provide a type of service hitherto impossible. It seemed possible that such developments might lead to complex carrel designs for individual study that would require more space than traditional types of study space. Designs incorporating some of these ideas have already been developed by Ralph Ellsworth and others.[2] The use of these and similar designs may mean that the accepted formula of 25-30 square feet per reader may no longer be adequate for such situations.

Despite the extended discussion of these subjects, there seemed to be no general agreement of what the future would bring in this area of concern. Some of the best known authorities in library planning could not predict the future requirements of certain types of library furniture and equipment. This suggests the need for additional study and research on the part of the library profession, both by individual librarians and by such agencies as the Library Technology Project of the American Library Association, as well as on the part of the manufacturers of library equipment and furnishings.

The principles of library furniture design include six factors.

1. *Function.*—This relates to comfort, convenience, efficiency of operation, and serviceability. How well a unit of furniture performs

its function determines its degree of usefulness. Comfort, for example, implies a state of ease free from distress or pain. Furniture of proper dimensions, proportions, and materials is pleasant to use for reading, working, and lounging. Comfort in library furniture requires proper pitch and height of seating units, adequate area allowances of work surfaces, comfortable colors and light-reflecting qualities of top surfaces, and easy-moving working parts such as doors and drawers.

2. *Construction.*—Durability and resistance to wear are important. Surfaces must withstand abrasion and impact. Joints should not loosen. Moving parts should be sturdy and simply designed to minimize complex mechanical failure, as, for example, in folding furniture that is handled frequently and sometimes roughly.

3. *Materials.*—Increasingly rapid development of new materials such as synthetics (plastics and other man-made derivatives), as well as new methods of handling and fabricating traditional materials, have opened endless opportunities in the selection of furniture materials. Materials in furniture are selected for the following characteristics: beauty, versatility in forming and fabricating, strength, resistance to wear, resistance to dirt, adaptability to various finishing techniques, and cost.

4. *Finish.*—The main purpose of the finish is to protect the surface of the material and to enhance its natural beauty. Finishes may be surface-coated, penetrating, or integral. Surface-coated finishes include paint, lacquer, varnish, epoxy, and metal plating. A typical penetrating finish on wood surfaces is linseed oil. Integral finishes are those in which pigment is introduced into the material before it is formed and hardened, e.g., molded fiberglas chairs.

5. *Scale.*—This defines a certain value in size or degree within a group or system of related items. Furniture should be scaled to pleasing proportions with relation to the size and bulk of surrounding furniture, the dimensions of the room in which it is placed, and the mass of related architectural elements.

6. *Proportion.*—Whereas scale relates to other elements, proportion is an inherent quality in the design of a unit of furniture, implying the relationship of the parts to the whole. Proper proportions among the various parts result in aesthetic overall balance and symmetry.

The quality of beauty has been deliberately avoided in the above list because aesthetic values cover all aspects of furniture design. To a competent designer this quality underlies all other considerations. There is library furniture on the market which satisfies all the re-

quirements listed above, including aesthetic compatibility with certain styles of architecture, but still lacks beauty. Beauty is the abstract feature that adds the final touch and brings pleasure to the senses. It is the mark of true design excellence when all of the practical requisites are met, yet overall beauty still emerges. This is particularly true of library technical furniture, where functional needs carry such a demanding—and sometimes difficult—burden.

Of all the objectives to which the library aspires, comfort of the user is perhaps the foremost. It is the objective most closely associated with the design of library furniture. The trend is comparatively recent; early libraries, such as those in Europe, ignored comfort as an aspect of library service. During the last half-century, however, the idea of emphasizing reader comfort along with efficient service has become accepted. In 1934, Angus Snead Macdonald stated: "If only a small part of the money saved on the building structure is put into comfortable furniture, the best available equipment, and attractive interior decoration, it will be possible to secure an atmosphere of comfort . . . wherein a love for reading can be readily cultivated." [3] Macdonald was stating a premise that is widely accepted today—that of encouraging patrons to use the library by making it an inviting place in which to work.

Once the aim was established, modern research techniques offered some logical solutions to the problem. It has long been known that comfort in furniture design is directly related to human measurements. But the accurate determination of these measurements, particularly in a mass society, was not scientifically attempted until recent years.

An example can be made of table-reader seating. Some studies of military personnel were conducted during World War II, mostly to determine human measurements for use in the design of military clothing, equipment, and aircraft seating. In 1945, the Heywood-Wakefield Company instituted a study by Earnest A. Hooton of Harvard on railway coach seating.[4] The main purpose of this survey was to determine the dimensions and proportions of seating required to fit the majority of passengers. A more general survey of seating was conducted by Bengt Akerblom at the Karolinska Institutet in Stockholm in 1948.[5]

Perhaps the most revealing and comprehensive study of seating and seat-to-table relationships was made at the University of Arkansas in 1959.[6] Whereas the Hooton studies relied on sand molds to determine restful spinal curvatures in the sitting position, and the Akerblom

survey employed the bone structure to arrive at human measurements, the University of Arkansas tests utilized a unique seating contraption.

The experimental "chair" consisted of metal plungers inserted into holes in a wood frame (seat and back). The plungers, or pins, were in rows placed 1½ inches apart, supported on springs and capped by rubber discs. The angle between the seat and back frames was adjustable. For purposes of the study, basic sitting positions were established for the following activities: dining, writing, card playing, talking, and relaxing. For library use the most important of these are reading, writing, and relaxing (lounge seating).

Exhaustive tests were first made to determine average or mean dimensions of the human body. Both age and sex were considered and tabulated separately. Activities that involved table use, such as reading and writing, included studies on seat-and-table relationships. A summary of the conclusions covering the proper dimensions of chairs to be used for reading or writing follows:

Height of seat: 17 inches at front at highest point.
Slope of seat: 0.5 inches from front to back.
Depression of seat: 2.5 inches from highest to lowest point.
Depth of seat: 16.5 inches from front to back.
Width of seat: 17 inches at widest point.
Height of chair back: 17.5 inches from seat to top of back.
Width of chair back: 13.5 inches across top; 10 inches across bottom.
Slope of chair back: 2.4 inches backward, or 15 degrees from vertical.
Included angle (seat-back) 103.3 degrees (Derived from data furnished, not given in this form in the report.).

Depth of chair back: determined at 1½ inch intervals up the center of the back starting 4.5 inches above the seat:

16.3 inches at 4.5 inches above seat.
16.6 inches at 6 inches above seat.
17 inches at 7.5 inches above seat.
17.3 inches at 9 inches above seat.
17.8 inches at 10.5 inches above seat.
18.3 inches at 12 inches above seat.
18.7 inches at 13.5 inches above seat.

In addition, data on the height, free depth, angle, and distance apart of arm rests were determined.

Another interesting test, made during the University of Arkansas survey, compared preferences of the most comfortable table height for reading or writing among the subjects cooperating in the tests. Table I summarizes the results:

TABLE I

Percentage of Subjects Selecting Varying Heights of Tables

Height (inches)	*Percent of subjects*
23.0 to 23.9	1.9%
24.0 to 24.9	9.9
25.0 to 25.9	22.8
26.0 to 26.9	31.5
27.0 to 27.9	22.8
28.0 to 28.9	7.4
29.0 or more	3.7

Mean height (in inches): 26.5

From these data the investigators concluded that table heights for the tested seat heights should be 27 inches, or 10 inches above the highest point of the seat. For readers above average in dimension, a one-inch increase in this dimension was allowed. This table height allows a two-inch top thickness, to permit adequate knee space or clearance.

Another factor in table reader requirements is the amount of work surface required per user. Again human measurements serve as a guide. For activities such as seminar discussion (talking), a minimum width based on the width of the human torso plus a clearance allowance between seats can be established. Thus one recent investigation specifies a minimum table width of 15 inches for knee space, plus 6 inches on each side, or a total clearance of 27 inches per user.[7] *Anatomy for Interior Designers* suggests a minimum width of 24 inches for such activities as typing.[8]

Obviously, the usual library activities such as note-taking and the spread of reference materials require more table surface than typing. The most logical measure for library use is the span from elbow to elbow with arms akimbo—that is, spread horizontally. The Damon studies of military personnel give a median span of 36.5 inches, while an earlier study by Brackett offers a median span of 39.25 inches.[9] However, these studies were conducted solely on military males; it can be assumed that female measurements will be less.

Analysis of data from the above studies indicates the following table widths are desirable for library use: (1) discussion and seminar activities: 24-27 inches per person, (2) general library-reader use: 36 inches per person, and (3) for graduate students in academic libraries: 42 inches per person.

Statistics generally support the accepted table depth dimension of 24 inches per user. For example, the Damon studies of military males show a mean anterior arm reach of 34.8 inches;[9] this means the distance from wall to tip of middle finger when the subject assumes forward reach with his back to the wall. Subtracting the average chest depth or thickness of 8.2 inches, a clear arm reach of 26.6 inches results. The reaching distance of women will be somewhat less. Thus we can scientifically accept a work surface depth of 24 to 26 inches per person.

The above examples are intended to illustrate the trend toward the use of the scientific method in determining standards of comfort and efficiency in library furniture design. An analytical approach to such problems is important, both to improve library furniture in its present functional role, and to prepare for unforeseeable future requirements in this field of design. These future requirements include not only the question of electronic miniaturization potentials, but the expanding scope of library services as well. Increasingly, the library is becoming a center in community or academic life, with facilities for such things as exhibits, graphic art collections, music listening, language laboratories, special meeting rooms, and the like. Library furniture manufacturers must remain abreast of these trends and be prepared to meet new functional requirements on sound principles. In library furniture, the day of hit-or-miss design is past.

References

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