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Academic Library Facility Needs in Virginia's Public System of Higher Education

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ACADEMIC LIBRARY FACILITY NEEDS IN VIRGINIA'S PUBLIC SYSTEM OF HIGHER EDUCATION

Prepared by:

John E. Molnar, Coordinator of Library Planning

State Council of Higher Education for Virginia
James Monroe Building
101 North Fourteenth Street
Richmond, Virginia 23219
(804) 225-2634

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EXECUTIVE SUMMARY

The primary role of the academic library is to support the teaching and research mission of the institution of higher education. The library must provide a wide range of information resources in a variety of print, audio, visual, and electronic formats that are readily accessible to, and easily retrievable by, the academic community. Adequate facilities are required to house these resources and services.

In considering the need for academic library facilities to house and make accessible the full range of information resources for Virginia's public institutions of higher education, the Council of Higher Education concludes that:

* Collections of print and other media will continue to grow, and sufficient stack space must be provided for these collections to prevent intrusion into necessary reader and service space.

* Electronic technologies offer potential for access to new information resources, but most current collections of printed materials will not be available in electronic format for the foreseeable future.

* To ease the demand for additional stack space to house new acquisitions, rarely-used materials could be housed in local or regional high-density shelving facilities.

In response to House Joint Resolution No. 32, the Council offers a six-point plan to promote the effective and efficient use of library facilities, ensure full systemwide access to information resources through the use of advanced technological support systems, and control the need for future library construction in Virginia's public institutions of higher education. The Council proposes to:

* Continue its systemwide planning for ways by which current and future library facilities may make the most efficient and effective use of new information technologies.

* Revise its library space guideline to encourage the effective and efficient use of existing library space, account for the off-site housing of seldom-used materials, and reflect the increasing application of evolving information technologies.

* Expand its review of capital outlay proposals for new library construction to include the evaluation of the efficient use of current facilities.

* Support the construction of high-density shelving facilities for the physical housing of seldom-used

materials in order to free existing full-service stack space to house current acquisitions.

* Encourage the institutions to develop individual or cooperative projects to demonstrate and test new information technologies.

* Continuously assess the costs and benefits of new information technologies and propose appropriate adjustments to the operating budget guidelines to reflect increasing use of these technologies in the public academic libraries.

INTRODUCTION

House Joint Resolution 32, passed by the 1986 Virginia General Assembly, directed the Council of Higher Education to conduct a study of the academic library facility needs in Virginia's public system of higher education. The resolution specified that the study should lead to the development of a plan that

> promotes the effective and efficient use of library facilities through the use of advanced technological support systems to ensure full systemwide access to the library collections of Virginia's public institutions while controlling the need for future library construction.

The Council appointed a task force to investigate the specific issues identified in House Joint Resolution 32 and to provide professional and technical assistance to the Council during the preparation of the Council's response to the resolution. The task force, composed of librarians and faculty who represent the interests of the academic research community, was ably assisted by resource persons who have special knowledge of the evolving information technologies. The task force presented its findings, conclusions, and recommendations to the Council in a report that is available from the Council upon request. The Council, in preparing this response to House Joint Resolution 32, incorporated much of the task force report as well as advice from its Library Advisory Committee.

This report is divided into five parts: (1) the role of the academic library in supporting the mission of the institution of

higher education; (2) the library space requirements in Virginia's public institutions of higher education; (3) off-site housing of rarely-used materials; (4) evolving technologies for the electronic storage of information resources; and (5) the Council's conclusions and recommendations.

THE ROLE OF THE ACADEMIC LIBRARY IN SUPPORTING THE TEACHING AND RESEARCH MISSION OF THE ACADEMIC INSTITUTION

The principal mission of an academic library is to provide information as soon as possible after it is requested. All other services --cataloging and other bibliographic control, book stack collections, acquisitions, reference, circulation, on-line catalogs, optical discs, electronic delivery of information-- are designed to improve this end result. The supporting services to this basic mission may vary in complexity according to the level of research at a given institution; whether the institution offers the associate, baccalaureate, masters, or the doctorate as its highest degree; and the degree to which an institution expects its faculty to be productive researchers. But the main business of an academic library in the eyes of the faculty, especially the science faculty, is for the library to reduce as much as possible the time required for users to receive what they request. On this, the library and its services are judged.

The traditional vision of the library is space bound. The library is an hospitable place where books and journals occupy space, scholars and students read and work, and knowledgeable librarians guide them through the indexes and catalogues that locate knowledge and information in text form. Our vision is of this special place dedicated to printed material but expanded to include a space-free and transparent dimension through the medium of the computer and electronic data transmission that provides

electronic guides to information in text, disc, database, and other forms.

Information has been freed from the printed page, and the library must also be freed. The purpose of a library is to provide access to information and knowledge, to index and store information, and to retrieve and disseminate information. The college or university through its libraries establishes principles of selectivity for the acquisition of information by its collection development policies, and establishes levels of access through its indexing (cataloging) policies and circulation policies. These are fundamental decisions of the college or university community with ramifications throughout the institution.

Information should be available in several ways. For example, an immediately accessible research level of holdings in monographs, journals, and electronic formats should be maintained in areas of student and faculty research, while appropriate holdings also are maintained to support the undergraduate curricula. Holdings or access to others' holdings in print and electronic form for areas of less intense use should be available through the computer networks of the library. Retrieval should include an interlibrary loan program based on the current model with electronic access to external information sources (monographs, serials, data sets, images on optic discs, etc.) with a capacity for presentation on computer terminal or in hard copy through the library's facilities and equipment.

While the library ought to be a place with its own unique holdings and an ambience befitting its traditional role and place in a university, the library also should be the access point to an information network. The information network makes possible the transparent functioning of the library as part of the electronic switchboard which allows access to its and others' indexes through compatible computer terminals on or off campus, and provides the means to retrieve and disseminate in several forms the information sought. The libraries should be responsible for coordination within the policies for information acquisition, storage, and dissemination established by the institutions and possibly by policies linking institutions within the state.

ACADEMIC LIBRARY SPACE REQUIREMENTS IN VIRGINIA'S PUBLIC SYSTEM OF HIGHER EDUCATION

Provision of services that support the academic institution's teaching and research missions in an ambience conducive to productive scholarship requires that the academic library be housed in a facility designed and equipped for those special purposes. The Council of Higher Education identifies the need for library space through use of a guideline formula that calculates future stack, reader, and service space requirements for each of Virginia's public institutions of higher education. Comparison of these projections to the most recent inventory of library space determines current and future library space deficiencies and provides justification for construction of additional library facilities.

Application of the library space guideline in 1985 indicated that by 1997, the public system of higher education would experience a deficiency of library space of approximately 1,174,105 Assignable Square Feet (ASF), the equivalent of 27 acres of floor space. The alarming magnitude of this deficiency, together with the recognition that emerging information technologies will affect the kinds and amounts of library space needed to support them, call for the assessment of the validity and applicability of the guideline now used by the Council.

Inventory of Library Space

The Council maintains an inventory of the facilities in all public institutions of higher education in the Commonwealth. This

inventory identifies the function and use of all space within each building. All fifteen senior institutions and six two-year institutions have at least one building that is devoted primarily to the library functions. The other eighteen two-year institutions house their libraries in multi-purpose buildings, of which less than half the total space is devoted to library activities.

The facilities which are devoted primarily to the library function generally were designed and erected for that purpose and are so named. Nevertheless, many of these buildings also house space used for other functions, ranging from classrooms and faculty offices to administrative and extension space. This non-library use of space in library buildings of the twenty-one institutions currently amounts to 81,777 ASF, the equivalent of the Carrier Library at James Madison University.

It is possible that a portion of the space identified in the inventory as serving other than the library function may be incorrectly identified. If so, this should be corrected. Moreover, the intrusion of other functions into the library buildings varies greatly among the senior institutions, from 127 ASF (0.72 %) at Clinch Valley College to 11,734 ASF (16.44%) at Virginia State University. Nevertheless, the removal of the non-library functions from the facilities intended or designated primarily to house library services would reduce the 1997 projected library space need by nearly seven percent.

Library Space Guideline

Factors Affecting the Guideline. The Council's library space guideline is affected by three factors: estimated growth of collections, projected student enrollments, and faculty positions in each institution. The latter two projections are those applied by the Council to the complete set of guidelines for all types of academic facilities. For several biennia, the Council has projected little growth in enrollments and consequently in faculty, and these two factors have remained essentially stable.

The growth of library collections in Virginia's public institutions is more dependent upon the expansion of knowledge and the publication rates in the academic disciplines present in each institution than upon student enrollments. In the past, the estimated growth of the library collections has been calculated by advancing the current size of the collection of each institution by its historic rate of growth during the two years previous to the time of the calculation.

Since 1978 the projections of library collection growth have proven very accurate in short-term estimations, with actual growth varying from the projections by less than 3.5 percent for the first two years of each projection cycle. There is greater variation from the projections, however, four or more years into each cycle, with a few institutions' actual growth differing from the projections by as much as 25 percent. This possibly may be attributed to the use of a two-year historic growth rate as the basis for the projections, as this base would be insensitive to long-term trends in acquisitions policies, the erosion of

purchasing power due to inflation in costs of materials, and other factors.

Use of a wider span of years to determine the historic rate of growth of collections in each institution perhaps would establish a more statistically reliable trend line for the projections. On the other hand, given the steady enrollment levels and little change in academic curricula in the public institutions during the past several biennia and forecast for the immediate future, funding levels for library acquisitions probably will not vary significantly. The rate of growth in the past two years therefore may hold constant for some years to come.

Space Generated by the Guideline. The guideline generates three categories of library space: stack, reader, and service. Comparison to the space guidelines employed by other states indicates general similarity in the factors and ratios used in the guidelines.

The Council's guideline generates 0.0833 ASF per library volume, yielding a ratio of 12 volumes per ASF. This is a generally accepted ratio that provides floor space both for library stacks and the perimeter and interior aisle space within the stack areas. Some states employ a ratio based on a sliding scale that ranges from 10 volumes per square foot for the core collection to 15 volumes per square foot for all volumes over a certain threshold. Application of such a scaled ratio to Virginia's public institutions, other than creating a more complicated guideline, would yield a need for even more stack space to house collections of less than 300,000 volumes and would

have no significant effect on space requirements for larger collections.

The guideline generates 6.25 ASF per full-time equivalent (FTE) student and 8.75 ASF per FTE faculty. These ratios permit one-fourth of the full-time students to occupy 25 square feet of study space and one-fourth of the full-time faculty to occupy 35 square feet of study space at any one time in the library. These ratios are common to virtually all of the state space guidelines to which the Council's guideline was compared.

The guideline generates library service space by multiplying the calculated stack and reader space by 25 percent. This component, equal to 20 percent of the total guideline, provides space for administrative offices, reference and circulation services, technical processes and other support activities. The ratio is also generally consistent with that in the library guidelines of other states.

Given little projected growth in either FTE student enrollments or faculty positions, the single factor driving the projected increase in service space needs is the growth of the library collections. Neither library staff size nor the scope of services functions expand in any direct proportion to collection size, and at first glance it would appear reasonable to place an upper limit on the guideline space generated for the service function. To do so, however, would be to restrict severely the effectiveness of the guideline in generating the space necessary to house and serve the multi-media collections in the modern academic library.

Guideline Use of Proxy Variables. The modern academic library houses and services a great variety of information resources. Besides substantial collections of books and periodicals, the academic library contains varying amounts of other materials in a variety of formats, including manuscripts and other archival materials, audio and video tapes and discs, graphics, microformats, and, increasingly, electronic databases and computer software. These diverse materials require protective containers and a controlled environment. Moreover, the libraries must provide the specialized equipment needed to permit retrieval and use of the various media and electronic databases.

The Council's guideline, despite not accounting for the non-print media and services, does appear to provide sufficient space for current levels of this library function. With the exception of manuscripts, none of the non-book holdings are incorporated into the volume projections, and the guideline for stack space ignores the question of shelving of non-book materials. Nevertheless, these materials, their specialized containers, and their retrieval mechanisms are all present in the academic library. It is possible that the stack guideline, 12 volumes per ASF, is sufficient to generate space to house the multi-media materials as well as the bound collections. It is also possible that whatever excess space may be generated by the 25 percent multiplier for the service function is encumbered by the media storage and retrieval equipment.

Space for New Information Services and Technologies

During the past several decades, the information resources of the academic library have moved from predominantly print collections to holdings of various media. In the near future, as library resources increasingly will include access to a variety of electronic databases, library space will be needed to accommodate the terminals, printers, and other peripheral equipment necessary to retrieve the electronically stored information. Moreover, the presence of the electronic media in the library in all likelihood will accelerate the growth of collections and use of other non-print media, whether audio, video, or microformat.

The inclusion and growth of these non-print information resources in the academic library has important implications for both library space requirements and the guideline that generates and justifies this space. Although the current guideline may result in a gross provision and justification of the space needed to support current levels of services, the use of the print volume as the proxy variable for generation of stack space (and, by derivation, service space) will become increasingly ineffective as the non-print holdings increase within the total collections.

The need for additional full-service library stack space may be eased by housing little-used materials in other locations. Whether these materials are physically shelved at some location outside the library or electronically stored on disk or tape, the transfer of the little-used materials from their current shelf-space would free that space for new acquisitions. It would

also exclude these materials from the volume count that drives the guideline for full-service stack space.

When materials are in electronic formats, various equipment is necessary to store and retrieve them. Whether these materials and their electronic environment are placed in the library, the computer center, or other location will be a decision made by each institution in accordance with its evolving plans for the "electronic campus." Whatever the ultimate placement of these information resources, the Council's space guidelines should recognize and provide for their presence. The library space guideline should reflect the trade-off between the stack space needed to house printed information and the other kinds of space needed to house information in electronic formats.

OFF-SITE HOUSING OF INFORMATION RESOURCES

The great majority of Virginia's academic library collections are housed in full-service facilities. Ideally, these facilities are fully lighted and environmentally controlled for faculty and student use. The books are shelved in call number order with enough vacant shelf space to allow for new additions to the collections without extensive shifting. These collections are open to students and faculty for browsing and are immediately available for access and circulation. Although this is the most expensive means of storing collections, it is also the most effective means for convenient and effective access by those who need the materials.

As collections grow larger, especially those at the research institutions, there is an ever increasing number of volumes which are rarely used, but must be retained for access by scholars. These materials can be stored in alternative locations where the cost per volume stored is less and the environmental conditions for preservation are present.

The Shelving Facility

The use of compact book shelving facilities is not new to libraries, with the first building specifically designed for high-density shelving having been built at Iowa State University in 1946. These buildings allow for book shelving at rates 80 percent higher per square foot than do full-service facilities, while at the same time maintaining environmental conditions that will extend the useful life of the books. By using special types

of shelving that eliminate aisle space, by filling each shelf completely, and by shelving books by size, tremendous savings in floor space can be realized. The level of lighting and janitorial service can be much lower than in full-service facilities, thus saving on operating costs. At the same time, heating, cooling, and humidity controls can be set for the preservation of books and not for human comfort. The facilities can be leased or built on non-prime land thus also reducing the cost per square foot for shelf space.

There are three types of high-density facilities that could serve Virginia's public academic libraries. First, a facility could be placed on or near a campus to serve the needs of the institution. Second, a facility, on or near a campus, could serve the needs of the host as well as other institutions in the immediate region. Third, a single facility at some central location within the Commonwealth could serve the needs of all academic libraries.

Service Requirements

In order for a high-density facility to support effectively the mission of the academic library, it must meet certain service requirements. These requirements are in large part determined by the type of facility, whether local, regional, or central. Each of these requirements, important in itself, relates to the others.

Materials to be housed. In establishing a storage facility, the first task is to identify the materials to be stored. The most common determinant is use of materials, with seldom-used items being the primary candidates for storage. The logic behind that criterion

is evident in terms of user demand, delivery cost, and staffing. Another criterion is the location of the facility. Materials in intermittent demand may be candidates to be housed in an on-campus facility but not for placement in a regional or central facility. Moreover, if telefacsimile transmission is used to deliver stored material to the user, then the size of the material may determine the best location for the facility.

Bibliographic access. Each library placing materials in a high-density shelving facility must maintain bibliographic control over the materials so that they may be identified and retrieved upon demand by faculty and students. The scope and complexity of bibliographic control over stored materials depends largely upon the location of the facility and the number of libraries using it. For a single institution facility, located close to the campus, the bibliographic control can be minimal, with the library circulation records indicating the shelving location. For regional or central facilities, a more complex system of control is necessary. The provision of an automated bibliographic retrieval system that shows ownership and location of multi-institutional materials would require the creation of new bibliographic records and maintenance of a large database.

Physical access to materials. Once a desired item is identified as being housed in a high-density shelving facility, it must be delivered. Again, the method and time of delivery to the user is dependent upon the location of the facility. Quick, manual retrieval of materials is possible from local shelving facilities. The length of time for delivery is greater from regional or

central facilities, and may be accomplished by either physical return of the material (using the Postal Service or courier) or by some form of electronic delivery. Recent advances in telefacsimile transmission offer the potential for quick delivery of short text items. Transmission time and staff requirements suggest that periodicals would form the major type of material to be delivered by this medium.

Copyright is a factor to be considered in considering on-demand copying by telefacsimile transmission. The National Commission on New Technological Uses of Copyrighted Works (CONTU) has developed copying guidelines agreed upon by authors, librarians, and publishers to prevent copying in "such aggregate quantities as to substitute for a subscription to or purchase of such work." One of these is the "rule of five," which allows a library to borrow each calendar year no more than five copies from the last five years of a periodical title. No restrictions have been placed on copying from periodicals that are more than five years old. Copying from a monograph falls under the fair use provision, where up to a chapter may be copied without obtaining permission from the copyright holder. For that reason, copying from older periodicals may be the only type of on-demand service that could be supported by a shelving facility. No participating library would be expected to cancel subscriptions because titles are shelved there, and those titles would remain under the ownership of the respective library so copyright would not appear to restrict the use of such facilities.

Staffing. The level of staffing required for a shelving facility will be somewhat dependent upon its size, but primarily dependent upon its location. A local facility may not require any assigned staff, as the local academic library staff can retrieve the stored materials as necessary. A regional facility, housing the stored materials of several academic libraries, may require some staff to maintain bibliographic control and to prepare requested materials for delivery to the local institutions. A central facility may require an even larger staff, as the bibliographic control system will be more complex and the volume of requests for delivery of material would increase with the size of the collection.

Costs

There are additional costs associated with maintaining a high-density shelving facility. An additional level of bibliographic control must be maintained to keep track of what is in the collection. If the facility is shared by two or more institutions, the level of bibliographic control becomes more complex. The cost of retrieval of materials escalates proportionally with the distance between the facility and the user. Finally, there is the cost to the researcher in delays in obtaining access to the material, and the lost possibilities of discovery by not being able to browse the shelves.

Whether economies of scale work with regard to such a facility remains to be proven. A facility serving multiple institutions must depend on more complex bibliographic records and access. Retrieval and delivery costs increase as the distance

increases; however, once the distance is great enough to warrant courier delivery, these costs flatten out. Retrieval time also increases in the same way. Costs of administration and labor are harder to predict, but a facility serving multiple institutions cost more to administer.

The actual cost of running a book shelving facility breaks down into two major components. The first is the physical plant; the second, administration and retrieval. The first costs are generally fixed and dependent on the cost of real estate and construction, and are incremental depending on the number of volumes stored. The second are variable and dependent on the distance from the facility to the user and the type of users the facility serves.

A final cost factor to be considered is the amount of duplication of material to be stored in a facility serving multiple institutions. If only a single copy of a work is to be retained in a shared facility, a space savings can be realized by the discard of duplicates. However, this raises the issue of ownership in a multiple institution facility. How much these savings will be depends on the level of collection overlap among the various institutions.

Among Virginia's academic institutions, there would probably be a relatively low level of overlap of items to be stored by the research libraries because of their differing strengths and programs. At the same time, there would be a high number of items to be stored. At the four year and community colleges there is

likely to be a high level of overlap among their collections, and a lower number of items to be stored.

Options

Taking all these factors into consideration, shelving facilities serving single institutions offer the lowest cost in administration and retrieval, the fastest delivery, and some possibility of browsing. However, they offer no savings through the elimination of duplicates.

Regional facilities offer somewhat higher costs of administration, bibliographic control and labor. They offer slower and more costly retrieval time, and greater difficulty of browsing. Some savings could be realized through the elimination of duplicates.

A centralized facility for the state would offer the highest costs of administration, the most costly and slowest retrieval system because of the need for a delivery service, the most complex and costly bibliographical control system, and a remote possibility of browsing. However, this system offers highest cost savings through the elimination of duplicates.

ELECTRONIC STORAGE OF INFORMATION RESOURCES

The technology is now available for compact computer-based storage and retrieval of materials that were previously maintained only in printed form. This technology is developing so rapidly that it is difficult to predict the power and use of the new storage formats beyond the immediate future. However, it is possible to describe the capabilities of the information systems that could be purchased and used today (or at least by the time any actions can be taken on the basis of this report).

Compact Disk Technology

Present compact storage techniques encompass microfilm and microfiche, high density magnetic disk and tape, and optical media.

Microfilm and microfiche are stable formats, found in most libraries. The shortcomings of these microforms are well known to anyone who has used them. Besides the quality of the image and ease-of-use problems, a significant problem is that these forms are not computer searchable --but then neither are books in their usual form.

Computers using high quality magnetic and optical media not only improve the abilities for image compression and reproduction, they allow for a revolutionary approach to the way students, researchers and the general reading public can access information. A state-of-the-art optical scanner can digitize an image of a document and store an image of each page, including text, graphics and pictures. It can also use optical character recognition (OCR)

to interpret the patterns on the page as letters and numbers, and store these in a regular computer file. Modern information storage and retrieval systems can index such files to provide quick access to any document or page based on any words or phrases in the text.

A compact disk (CD-ROM), less than five inches in diameter, can hold 500 million characters, enabling a single disk to hold the full text of approximately 250,000 pages. The use of "juke-boxes" and multiple-drive control boxes can increase this quantity many times. Compact disk drives can be attached to or mounted in personal computers, including portables. Therefore, using a small inexpensive workstation, an individual could have rapid access to the full text of an enormous body of literature. Theoretically, the entire contents of the Library of Congress could be stored on 16,000 disks, which could be stored on bookshelves around the perimeter of a 13' x 18' room.

The technology of optical disks can be discussed in two categories: read only (CD-ROM) and write once, read many (WORM). It must be emphasized that optical disk technology and applications are developing so rapidly that any description of the current state-of-the-art will quickly become outmoded. Nevertheless, it is possible to identify the current level of development and speculate about future applications.

Read only (CD-ROM) disks are stamped out from a master disk, are low in cost and are used for mass distribution. The drives for these disks, often referred to as players, are also inexpensive (less than $400.00 at the present time). Disks in

this category are CD-ROM and "videodisc." The distinctions between videodiscs and optical disk have caused some confusion. Videodiscs were initially developed to store analog data for NTSC television. They were used to store images, either still frames or motion pictures. Although the video signal is analog, the signal can be modulated to store digital data representing text on the videodisc. This is done to use videodiscs for data base storage.

The technology for CD-ROM is very similar to videodisc. CD-ROM were developed to store audio data in digital form. Their use has included storing digital data for interfacing directly to computers. Disk format standards have held back some of the applications since this technology is ideal for mass distribution and high volume production. Format standards are being finalized to facilitate audio, digital text, and digital image data on the same disk.

Write once, read many (WORM) permits data to be written only once on any given area of the disk. It can be read many times. It functions much like a magnetic disk system where data are written to the disk sequentially, and is not stamped as in the CD-ROM disks. Access to the data on the WORM disk is random, and copies can be made by transferring data. As the name implies, these disks cannot be erased. These disks are often referred to as optical disks, since laser optics are used both for the writing of data and for the reading of the data. A number of recording technologies currently are used to record data onto the disks. This system results in a permanent deformation on the surface of

a disk which cannot be altered. Changes to this basic technology are under development and will result in reversing the process to yield erasable optical disks. But the "erasables" are not yet a reality.

Compact Disk-Interactive (CD-I) is a new medium that represents the merger of CD-Audio and CD-ROM technology. CD-I disks will be compatible with both the audio and data CD's being produced today. They will enable the production of inexpensive disks containing combination of data, images and sound, and the utilization of a single disk drive for listening, viewing, and reading.

Fortunately, CD technology is benefiting from an early and apparently effective standardization effort. The major producers have agreed on draft standards for the various CD media. It appears that the Beta-VHS videotape problem will be avoided.

Compact Disk Software and Applications

The effective use of compact information storage requires both text and image processing software. Very sophisticated software of both types are now available at low cost for personal computers.

There are many instances where it is important to store the image of a document. The document may contain pictures, drawings, or hand-written notes, or it may be of intrinsic value to readers to see the original form. Off-the-shelf software now allows the retrieval, display and manipulation of images stored on optical disks.

As the cost of high quality printers continues to drop, these can become incorporated into a library's reading workstations. After a user locates the information he wants, he can print the text or image and carry it away.

Many combinations of the methods mentioned above are possible. For example, the text of several hundred books could be stored on an optical disk as part of a collection on any subject. An information retrieval system could be used to identify relevant items and sections in the collection. The user can do some reading on the screen and print some text on a nearby printer. If a real image of a document is desired, the image could be stored on a disk locally and printed on demand or the actual book could be scanned at its storage location and a facsimile electronically transmitted to the user's location. Ultimately, the book itself might be transferred.

The read only (CD-ROM) disks lend themselves to storage of files that can be used in applications involving mass distribution. Although the initial creation of a master disk now is very expensive, copies may be produced from the master disk at low cost. Applications that call for distributed data bases are suited for CD-ROM or "videodiscs." A disk and player is usually associated with each user workstation. A full retrieval system would include a PC, disc player, printer, and an assortment of discs, along with retrieval software.

Applications for the write once, read many optical disk (WORM) are different than those of the read only disks. Since write once disks are not designed to be stamped out for mass

production, these disks and systems using write once media will find applications where users want to create their own files and maintain a centralized storage system. These drives cost about 8 to 10 times more than the read only drives, and are available using disks in a size range from 5.25 inches to 12 inches. Disks and files from disks can be copied and distributed. Currently there are no standards on these systems and disks cannot be interchanged from one manufacturer's drive to another.

The advantage of optical disk storage using either read only or write once is the storage density available. Projected cost of storing data on optical disk will be anywhere from 1/10 to 1/100 of the cost of using magnetic storage.

There is no question that optical disk storage technology is becoming an economical, efficient, and commercially available storage media for both data and documents. Many technologies are involved in an automated library. These include scanners, image processing, networking and telecommunications, high resolution terminals, juke-boxes, optical disks, and of course retrieval software.

The optical disk industry is beginning to penetrate the market of database creation and document image capture, storage, and retrieval, with claims that low-to-medium volume turnkey filing systems offer the opportunity to handle the full text of documents plus images as efficiently and cost effectively as they now handle bibliographic data on computer systems.

A comparison of costs for microfilm and CD-ROM published in the July 1986 issue of CD Data Report suggests that significant

savings may accrue through use of CD-ROM. The comparison found that providing 5,000,000 images to 100 sites would cost $1.1 million if on CD-ROM, less than half the $2.3 million cost for microfilm. It should be noted, however, that these figures do not take into consideration the cost of equipment for microfilming documents or mastering them for CD-ROM, nor the personnel requirements for each system.

At the present time, the relative ease and low cost of replication of the CD-ROM disk leads to the conclusion that mastering for archival purposes would only be justified if there were a significant market for copies of the disk. If the Commonwealth were to undertake the development of CD-ROM storage of archival material, the market should be sufficiently large for the state to recover its investment.

CD-ROM and Copyright

Mass storage of published materials still in copyright is complicated by the problem of reprint permissions. The publisher of a journal does not "own" all the required rights for information contained within an issue. Author agreements often cover only print rights, not reproduction by electronic formats. Rights to such items as letters to an editor are not always formally acquired. The Library of Congress is coordinating activities with publishers to resolve document publication on optical discs of various types for library use. In the meantime, publishers have been granting permission on an individual basis, and the principle of fair use, which is defined as not interfering with market value, can be applied.

Possible Initial Applications of Compact Disk Technology

The rapidly developing compact disk technology appears to have great potential for meeting the dual goals of conserving library space and making more information widely available to the citizens of the Commonwealth. The reliability, efficiency, and user acceptance of this technology remain to be proven, however, and a series of pilot projects should be initiated to test a variety of applications in Virginia's academic libraries. The Council's task force has suggested the following projects that might usefully be undertaken in the near future:

* The Michie Company is considering the possibility of producing and marketing the Code of Virginia on compact disk. If the Code becomes available in this format, the state could subsidize its purchase, together with the equipment necessary to access the information, by a number of academic and law libraries throughout the state. Although the purchase of the Code of Virginia in CD form would not, in and of itself, save significant space in libraries, it would be an excellent demonstration of the potentials of the CD format and would enable the libraries to develop training and instruction programs that also can be used with future acquisition of information on compact disk. Included in this pilot study could be the development of comfortable workstations that would encourage users to read the materials on screens rather than to ask for paper copy.

* Virginia state documents such as the Acts of Assembly might be published in electronic rather than paper format. Since most academic libraries are depositories of state documents, accumulative savings of space could be realized and the Commonwealth could capture a leadership role in electronic publishing. This is an opportunity to begin using the technology without having to first resolve the copyright problems discussed above.
* A significant collection of Virginiana could be published in an integrated format which combines optical and digital elements. Such a publication might have market value far beyond our immediate applications and would encourage exploration of ways to use the new format. Among the possible collections with a broad scope of interest are the Templeman books on Virginia architecture that contain historic photographs. The potential market value of a special archives collections held by academic libraries should be explored.
* Multi-volume sets or monographs or back issues of periodicals can copied onto compact disk. The complete back-issues of Virginia newspapers or the papers of a President of the United States who was a native Virginian are other possibilities that would benefit from preservation on compact disk and might have a broader market value.
* The state could provide grants for cooperative projects between academic departments doing research that produces

information and libraries interested in working with these departments to store and access the information. This activity would lead to the kind of partnerships that are essential to effective use of the products of academic research.

* Replacing the current statewide union catalog, currently issued on microfiche, with optical disk offers the potential for substantial cost savings and greatly increased efficiency. The developers of this catalog should be encouraged to look beyond the constraints of current catalogs to the development of a more powerful bibliographic tool.

* Revising current State policies for records management to permit the retention of the Commonwealth's records in optical or compact disk format would result in substantial space savings for academic institutions as well as all other State agencies.

These or similar pilot projects should be carried out in a variety of types of libraries throughout the state so that maximum exposure to the new technologies can be accomplished. The Center for Innovative Technology should be a participant in the funding and direction of the projects, and the Center could also investigate markets for the products outside the academic libraries in Virginia.

CONCLUSIONS AND RECOMMENDATIONS

The primary role of the academic library is to support the teaching and research mission of the institution of higher education. To do so, the library must house an organized collection of information resources that reflects the ever-expanding scope and breadth of knowledge in a variety of disciplines. These resources include not only substantial collections of printed materials but also, increasingly, significant amounts of information in audio, visual, and electronic formats. These materials must be readily accessible to, and easily retrievable by, the academic community for immediate use when needed.

To fulfill their responsibilities, Virginia's academic libraries must be housed in adequate facilities. These facilities must not only house and provide access to the physical collections, but also support access to, and use of, the new information resources in electronic formats. As the new technology, and the market which drives information production, develop, two unrelated things will happen, both of which will change the libraries' needs for full-service facilities. First, libraries will find the use of high density shelving for seldom-used printed materials to be increasingly feasible and cost-effective. Second, information publishers will provide an increasingly larger volume of materials in electronic media and

libraries will transfer more of their collection growth to these media.

In considering the need for academic library facilities to house and make accessible the full range of information resources for Virginia's public institutions of higher education, the Council of Higher Education concludes that:

* Physical collections of print and other media will continue to grow, and sufficient stack space must be provided for these collections to prevent intrusion into necessary reader and service space.
* Electronic technologies offer potential for access to new information resources, but most current collections of printed materials will not be available in electronic format for the foreseeable future.
* To ease the demand for additional stack space to house new acquisitions, rarely-used materials should be housed in local or regional high-density shelving facilities.

The Council thinks that a dynamic, multi-phase approach is needed to ensure that the public academic library facilities are adequate to house and to provide access to all the information resources needed to support the teaching and research mission. In response to House Joint Resolution No. 32, the Council offers a six-point plan to promote the effective and efficient use of library facilities, ensure full systemwide access to information resources through the use of advanced technological support systems, and control the need for future library construction in Virginia's public institutions of higher education:

1. **Systemwide Planning for Future Library Facility Needs.** The Council of Higher Education will include in the 1987 Virginia Plan for Higher Education a paper that will address the potential effects of evolving information technologies on current and future academic library facilities in Virginia's public system of higher education.

2. **Revision of the Council's Space Guideline.** The Council will revise its space guideline so that it better differentiates between stack space for print materials, space to house non-print materials in a variety of media, and space to support staff and service functions. The need for adequate reader space will be protected and supported in the revised guideline. The guideline will not only encourage the continuous judicious evaluation of library collections and the withdrawal of obsolete materials, but also will reflect the increased use of electronic technologies in the academic library. Moreover, the guideline will recognize the efficiencies to be gained in the use of existing full-service library stack space through the alternate housing of seldom-used materials in high-density shelving or electronic formats.

3. **Evaluation of Future Requests for Library Construction.** The Council, will continue to review all future capital outlay requests for library construction at the public institutions. Before recommending the construction of any library project that is fully justified by the Council's revised space guideline, however, the Council also will evaluate the existing library facility to ensure that it is being used efficiently and can

no longer support existing and anticipated levels of collections and services.

4. **Construction of High-Density Storage Facilities.** The Council recommends the construction of, or conversion of portions of existing full-service library space, to local, single-institution high-density shelving facilities (or regional facilities where appropriate). These facilities would relieve pressure on current full-service library space by providing cost-effective high-density shelving for low-use printed materials and would require no additional personnel to operate. The Council believes that a central shelving facility is inadvisable because its construction, administration, telecommunications, and other support systems necessary would be too costly to develop and maintain. Moreover, the retrieval time for materials would be far slower than from a local or a regional facility.

5. **Projects to Demonstrate and Test New Information Technologies.** The Council will encourage the public institutions to develop individual or cooperative projects to test the application of electronic media in delivering information to users. The Council, through its Cooperative Library Services program, will fund selected projects that accelerate the use of the new technologies in the libraries and promote acceptance of the information resources by the academic community. The Council likewise will support institutional requests for General Fund appropriations for projects that will significantly reduce the need for additional library facility space.

6. **Continuing Assessment of the Costs and Benefits of New Information Technologies.** The Council will monitor the growth and availability of new information technologies and resources and will propose appropriate adjustments to the operating budget guidelines to reflect increasing use of these technologies in the public academic libraries. The Council recognizes that additional funding for electronic equipment and information resources may be necessary in order to affect substantial savings in the future. Moreover, the Council and the institutions must ensure that the costs of the new electronic information technologies do not threaten the principle of free and equal access to information resources.

1986 SESSION

LD4068416

HOUSE JOINT RESOLUTION NO. 32

Offered January 15, 1986

Requesting the State Council of Higher Education to investigate the academic library facility needs in Virginia's public system of higher education.

Patron--Ball

Referred to Committee on Rules

WHEREAS, the collections of academic libraries reflect the teaching and research missions of the institutions of higher education and preserve the cumulative record of human wisdom and knowledge; and

WHEREAS, the continuously growing collections of print, manuscript, and multi-media materials create a constant need for additional library space; and

WHEREAS, many of the public institutions' library buildings now need additional space to house existing collections, to provide quality reader space, and to support new information technologies and modern library services; and

WHEREAS, the housing of little-used but still useful library materials in alternate locations, using compact physical storage or electronic storage, would release current library stack space to house additional heavily-used materials; and

WHEREAS, recent advances in information technologies and the development of electronic networks will affect both the organization and accessibility of collections as well as the design of the facilities required to support academic library services; now, therefore, be it

RESOLVED by the House of Delegates, the Senate concurring, That the State Council of Higher Education for Virginia, with the assistance of the public institutions of higher education, identify the library services needed to support the teaching and research mission of each level of institutions; investigate the feasibility, cost, staffing requirements, and implementation process for adopting new forms of information technology that will increase access to collections, improve library services, and support the storage and preservation of valuable specialized materials; and develop a plan that promotes the effective and efficient use of library facilities through the use of advanced technological support systems to ensure full systemwide access to the library collections of Virginia's public institutions while controlling the need for future library construction.

The State Council of Higher Education shall complete its work in time to submit recommendations to the 1987 Session of the General Assembly.

Official Use By Clerks	
Agreed to By The House of Delegates	**Agreed to By The Senate**
without amendment ☐	without amendment ☐
with amendment ☐	with amendment ☐
substitute ☐	substitute ☐
substitute w/amdt ☐	substitute w/amdt ☐
Date: _____	Date: _____
Clerk of the House of Delegates	Clerk of the Senate