1964: King Report Published

1964 saw publication of the landmark "King Report." Known formally as *Automation and the Library of Congress, a survey sponsored by the Council on Library Resources, Inc.*, the report endorsed the benefits and feasibility of automation in the Library of Congress—and perhaps of a national system of interlinked research libraries. The seven-member survey team, chaired by Gilbert W. King, comprised experts in the application of computers, mathematics, operations research, and human engineering to data processing systems. The study was supported by a $100,000 CLR grant made in FY 1961.

"The report visualizes a future day when automation of the Library of Congress can provide benefits in which all libraries electing to use its services may participate, and of which library users even at great distances will be the ultimate beneficiaries," noted CLR's *8th Annual Report*.

Nearly simultaneous with the report's issue was a breakthrough that promised further advances: the ability of the computer to overcome limitations on fonts and symbols that had characterized the punched-card technique for processing bibliographic information. This is described further on pp. 10-11 of CLR's *7th Annual Report*, a copy of which follows.

Because of this grant's duration, excerpts from three annual reports are provided here. At right is background from CLR's *5th Annual Report, ending June 30, 1961*, the year the $100,000 grant was made. The next page presents an excerpt from the *7th Annual Report, ending June 30, 1963*. The remaining pages excerpt from the *8th Annual Report, ending June 30, 1964*.

Planning

Seven grants and contracts fell under this head. Of these, several were to make possible meetings, dealing with the functions of state libraries, or of the program of the Council of National Library Associations, or the problems of providing library service in metropolitan areas. Two major projects had to do with the possibilities of mechanization (automation) in libraries.

Mechanization in Libraries. The Library of the Chicago Undergraduate Division of the University of Illinois expects in the near future to be required to give, in a new building on a new campus, an enormously increased service to a much larger university population. To prepare itself for this increased responsibility the Library decided to investigate the possibilities of achieving greater efficiency through mechanization, and, as a preliminary step, has flow-charted its entire operation in machine (i.e. computer) terms. The Council has made a grant to enable the Library to engage an engineering firm, specializing in computer and other data processing systems, to examine the operations thus analyzed with a view to identifying those to which mechanization may profitably be applied. It is hoped that this study may establish certain principles applicable to university libraries generally.

The situation of the Library of Congress is similar to that of the Library of the Chicago Undergraduate Division, but more acute. Although this library has over the years sought and employed mechanisms in many of its operations, these have been piecemeal applications. The computer-type data processing machines offer promise of advantages from a more systematic, overall approach. Several attempts to secure such an approach from surveys by engineering firms have resulted only in recommendations for more piecemeal tinkering. The Library finally decided to secure a survey by a group of acknowledged experts in the applications of computers, mathematics, operations research and human engineering to data processing systems. It is hoped that from this may come a plan for bringing the advantages of mechanization systematically to the operations of research libraries.

The following excerpt, from CLR's *7th Annual Report*, addresses the impact of the Medlars project, led by the National Library of Medicine, on the computer processing of bibliographic information. A few years earlier, NLM had mechanized the production of printer's copy for the *Index Medicus* using tape-operated typewriters, machine-sorted punch cards, and a "sequential" camera that expedited publication.

These advances were no sooner effected, however, than the Library, this time with funding from official sources, began to investigate, in its Medlars project, the possibilities of still further improvement by bringing a computer into the operation. Specifically, it was hoped that the speed and flexibility of a computer might make possible machine searches and special listings based on the bibliographic record which the more limited capabilities of punched-card sorting systems do not permit. This enterprise, the costs of which have been many times those of the earlier project, is now coming to a successful conclusion and constitutes the outstanding achievement to date in mechanizing a bibliographic operation, with important implications for many aspects of library work.

For a quarter of a century it has been possible to process bibliographic information with the use of punched cards which can be sorted, selected and printed out by electrical accounting machines. There have been individually successful applications of the punched-card technique, notably in the production of book catalogs for the branches of public library systems. But the range of application has been severely limited by the small font of type available to these machines, restricted to numerals, a few symbols and — in the case of the alphabet — to capital letters only. Even when the speed and manipulative ability of the card-sorting machines was later greatly surpassed by the computers, these typographical limitations persisted.

The Medlars development breaks through this barrier. By providing the computer with a capability of printing its results in a font of 226 characters at a rate of 500 characters a minute, it is able at last to bring the special competences of the computer not only to the editorial processes associated with the compilation and publication of a major bibliographic service, but also to complicated searches of the expanding literature of an important subject, and to special listings resulting from such searches.

The significance of this development consists in this — that

the computer can now speak in the cultivated language of bibliography, and not merely, as hitherto, in a bibliographic pidgin-English. The immediate consequence is to open up the possibilities of dissemination, in machine-readable form, of bibliographic information which individual libraries will be able to apply to local uses for the printing of accession-lists, catalogs and catalog cards, for the preparation of their many other records which are based on bibliographic information such as order lists and circulation records, and eventually perhaps for mechanized bibliographic searching which will supplement or even replace present practices based on printed books and card catalogs.

The immediate consequence is indeed to open up these and still further possibilities. But it cannot be expected that the possibilities will be immediately realized. The situation is much as it was at a point in time intermediate between the initial unsuccessful attempt, previously mentioned, to provide a central cataloging service in 1850 and the final success in 1901. The elements of an automated bibliographic technique have now been developed, but much remains to be done to develop the common denominators of need and potential use, the standards of machine language and of bibliographic information in machine-readable form, the computer programs which will make local use possible, not to mention the necessary bases of financing, all of which will be necessary before these elements can sustain a system.

Progress in these matters may be expected to be rapidly pursued. The stakes are high. They are none other than the pooling of bibliographic resources for library work — and ultimately of the collections which this bibliographic information represents — over wide areas, even nation-wide, in a machine-readable form in which they can be shared and used by methods as seemingly simple as the dialing of a telephone.

Summary of Operation in 1963. Thirty-eight grants, contracts and other allocations were made by the Council during 1963. These totalled $985,203. Twenty of the allocations were for new projects; eighteen were extensions or renewals of previously-supported projects.

The following pages briefly describe the projects assisted during the past year as well as the results of projects completed.

VERNER W. CLAPP
President

The following excerpt is from the CLR *8th Annual Report for the year ending June 30, 1964.*

COUNCIL ON LIBRARY RESOURCES, INC.

The Council on Library Resources, Inc., is an independent non-profit body incorporated in the District of Columbia with the principal objective of aiding in the solution of library problems. The Council, whose Members also constitute its Board of Directors, maintains its offices in Washington, D. C.

The Council was established in 1956 at the instance of the Ford Foundation with a grant of five million dollars, to be expended over a five-year period, "for the purpose of aiding in the solution of the problems of libraries generally and of research libraries in particular, conducting research in, developing and demonstrating new techniques and methods, and disseminating through any means the results thereof, and for making grants to other institutions and persons for such purposes; and for providing leadership in and wherever appropriate, coordination of efforts (1) to develop the resources and services of libraries and (2) to improve relations between American and foreign libraries and archives."

Late in 1960 the Ford Foundation approved a new grant of eight million dollars to enable the Council to continue for an additional seven-to-ten year period its programs of research and demonstration toward the solution of library problems, and at the same time further to concentrate its work in the field of technical storage and retrieval of information through the creation of a laboratory or center involving the activities of specialized scientific personnel.

The Council conducts its work chiefly through grants or contracts to appropriate organizations or individuals. It welcomes proposals for work in furtherance of its objectives.

INTRODUCTORY

The past year was replete with developments, in which the Council had a share, of promise or accomplishment for library work.

Automation and the Library of Congress. On January 22, 1964 Dr. Gilbert W. King and his colleagues brought in the report bearing this title. It had been the object of their painstaking inquiry since March 1961, the original grant for the purpose going back, indeed, to October 1960. This document, of which a further account is given later,[1] at last opened the way for work toward the development of a national system in which the (general) research libraries of the country might be linked through the use of automatic devices. The Association of Research Libraries was quick to urge the Librarian of Congress to press forward along the lines suggested.

The immediate significance of the document was enhanced by its being nearly simultaneous with the important development mentioned in last year's report,[2] namely, the acquisition by the computer of the capability of commanding lower as well as upper case type, diacritics as well as Arabic numerals, and non-Latin as well as Roman characters through the use of chain printers, photocomposing machines and automatic typewriters. Although when the King report appeared there was no instance (with perhaps one exception) in which this new capability was actually in use on behalf of library work, there were several active programs for applying it to the production of catalog cards, catalogs in book form, and bibliographic compilations, and by midsummer 1964 the *Index Medicus* was about to be printed from computer-controlled photocomposition, performed at the rate of 300 characters a second.[3]

Given this capability, it was now possible to foresee the early availability of bibliographic information in machine-readable form, capable of meeting all predictable bibliographic and typographic needs. The Council, which had been im-

[1] P. 41, *infra.*

[2] VII: 9-11. (Citations in this form are to the Council's annual reports; in the present instance to its *Seventh Annual Report,* pages 9-11.)

[3] Not 500 characters a minute, as stated at VII: 10.

patiently awaiting this opportunity, immediately took advantage of it, as reported later,[4] in an attempt to develop standards for the machine-readable record.

The reasoning behind this action is as follows. The cost of preparation of the machine-readable record is a principal expense of automation of bibliographic operations and constitutes a principal obstacle to developments in this area. Consequently, if the preparation can be performed centrally so as to distribute the cost among a number of subscribers, much important experimentation and development may be expected to ensue which would otherwise not occur. But for the centrally-prepared record to be generally useful, compatibility must first obtain between the producing and using systems, and standardization is necessary to effect this.

Indeed, the situation today is in main issues identical with that of 1901 when the Library of Congress began its distribution of catalog cards. Then, as now, benefits of inestimable value were promised by a system of centralized cataloging; but these benefits were conditional upon the adoption of standards — the cataloging code, the typographic design of the catalog card, the very dimensions of the card. Because the principal elements were standardized in 1901 there is today a high degree of compatibility, both bibliographical and physical, between the catalogs of the largest and the smallest libraries in the country. But refinement of the standards has continued through the years, and it is interesting to observe now that the new inquiry into the standards of the machine-readable record raises questions that have been put to one side throughout the history of the centrally-produced printed catalog card.

[4] P. 43, *infra*.

From CLR *8th Annual Report, for the year ending June 30, 1964*:

The Library of Congress — Possibilities of Automation. The problems of the Library of Congress are those of size and number. Its more than 43 million items fill two enormous buildings and need a third; it sells 46 million catalog cards a year and returns over $3 million a year to the United States Treasury; and it costs $23 million a year in appropriated funds alone to operate. Other libraries have become heavily dependent upon its bibliographic services which are made available through publication in various forms.

This library of course makes use of mechanical devices to the full extent that they are applicable, and accordingly they are omnipresent. Thus, it has been presumptive that for an operation which is essentially one of data processing, the data processing automata should be applicable. But a puzzle has been where to begin: the operations are so interrelated that tinkering with one could well be disastrous for others. Nor has it been clear just what improvements could be brought by automation to the operations of a great research library and of other libraries sharing its services. Surveys by three major companies specializing in computer applications failed to produce answers to these questions. It consequently was decided to procure a survey by a specially-recruited team of outstanding experts. The Council made a grant in aid.[61]

The team was headed by Dr. Gilbert W. King, until 1963 Director of Research of the International Business Machines Corporation, thereafter Vice President of the Itek Corporation.[62] It collectively possessed a background of work in the fields of information retrieval, computer theory and design, mathematical linguistics, automatic translation, indexing and abstracting techniques. Also assisting was an advisory committee of leading American librarians.[63] Henry J. Dubester, Chief of the Library's General Reference and Bibliography Division, served as project coordinator.

[61] V: 29.

[62] Other members: Harold P. Edmundson, Thompson Ramo Wooldridge, Inc.; Merrill M. Flood, University of Michigan; Manfred Kochen, International Business Machines Corporation; Richard L. Libby, Itek Corporation; Don R. Swanson, University of Chicago Graduate Library School; and Alexander Wylly, Planning Research Corporation.

[63] Herman H. Fussler, University of Chicago; Edward M. Heiliger, Florida Atlantic University; Frank B. Rogers, University of Colorado Medical Center and Frederick H. Wagman, University of Michigan.

LOOKING FORWARD. Feasible first steps toward a system of automating the Library of Congress, and perhaps of a national system of interlinked research libraries, were described by Dr. Gilbert W. King at a press conference held in the Library's Woodrow Wilson Room this past January. Facing the reporters and editors are: Mr. Henry J. Dubester, detailed by the Library to serve as coordinator of the investigation; Dr. King, Vice President and Director of Research of the Itek Corporation, who headed the survey team; Librarian of Congress L. Quincy Mumford; and Deputy Librarian of Congress Rutherford D. Rogers.

This past February the committee's work was finished and its report was made public.[64]

The report visualizes a future day when automation of the Library of Congress can provide benefits in which all libraries electing to use its services may participate, and of which library users even at great distances will be the ultimate beneficiaries.

Specifically it contemplates that the various catalogs of the Library of Congress will be so mechanized that they can be consulted electronically (on viewing screens) with convenience to the user and subject to his complete manipulation; and that the collections to which the catalogs refer will themselves be so mechanized through photographic or electronic microreproduction as to place them within the individual user's electronic control.

The report was backed up by a number of (unpublished) costing studies of the Library's operations.

It is not to be expected that this report should be able to describe in specific terms the future aspect of a system of fantastic size and complexity for which there exists as yet scarcely one piece of appropriate equipment. The usefulness of the report derives rather from its success in presenting the situation in broad terms, in indicating the manner and magnitude of the modifications which automation may be expected to effect, in estimating the costs involved and the balances of saving or of additional expense, and in suggesting a method of approach. Its significance, in consequence, is in getting the question off dead center.

Designing the Machine-Readable Bibliographic Record. When the survey of the possibilities of automation at the Library of Congress had progressed to the point where it was possible to discern some of the techniques which would be needed to make such a system possible, the Council commissioned Mr. Lawrence F. Buckland of Inforonics Inc., to make a brief investigation and report, in collaboration with the staff of the Library of Congress, on the simplest effective method for converting bibliographic data from graphic to such machine-readable form as to meet all foreseeable typographic and bibliographic needs.

[64] Gilbert W. King and others: *Automation and the Library of Congress. A survey sponsored by the Council on Library Resources, Inc.* Washington: Library of Congress, 1963 [1964]. 88 p.