DOCUMENT RESUME

ED 021 595 LI 000 862

By- Shank, Russell

REGIONAL ACCESS TO SCIENTIFIC AND TECHNICAL INFORMATION, A PROGRAM FOR ACTION IN THE NEW YORK METROPOLITAN AREA. REPORT OF THE METRO SCIENCE LIBRARY PROJECT, 1966-67. METRO MISCELLANEOUS PUBLICATIONS SERIES, NUMBER 1.

New York Metropolitan Reference and Research Library Agency, N.Y.

Pub Date 68

Note- 207p.

EDRS Price MF-$1.00 HC-$8.36

Descriptors- *ENGINEERING, *INFORMATION NEEDS, INFORMATION SERVICES, INFORMATION SYSTEMS, INTERLIBRARY LOANS, LIBRARY COLLECTIONS, *LIBRARY COOPERATION, LIBRARY FACILITIES, *SCIENCES, *TECHNOLOGY

Identifiers- New York City

Library facilities and services for 60,000 users in the fields of astronomy, chemistry, earth sciences, physics, engineering, mathematics, and, to some extent, architecture, in the New York City Metropolitan area are the subject of this report. Recommendations for cooperative library efforts to improve resources, services, and organization and administration are presented. Data were collected from scientists and engineers in the area, science librarians in the area, college and university students majoring in or taking courses in science subjects, copying departments of large libraries, manufacturers and trade associations, libraries and information services in other areas, and individuals in library and information service industries. A Bibliography of Selected Readings on Regional Library Cooperation and Interlibrary Cooperation appears on pages 106 to 111. Maps of the areas involved, copies of the questionnaires and forms used, sources and tables of data, and library collection specialties are appended. (CC)

REGIONAL ACCESS TO SCIENTIFIC AND TECHNICAL INFORMATION

A PROGRAM FOR ACTION IN THE NEW YORK METROPOLITAN AREA

Report of the
METRO Science Library Project
1966-1967

RUSSELL SHANK, Supervisor, Science Library Project

METRO
NEW YORK METROPOLITAN REFERENCE AND RESEARCH LIBRARY AGENCY, INC.

REGIONAL ACCESS TO SCIENTIFIC AND TECHNICAL INFORMATION

A PROGRAM FOR ACTION IN THE NEW YORK METROPOLITAN AREA

Report of the
METRO Science Library Project
1966-1967

RUSSELL SHANK
Supervisor, Science Library Project

METRO
NEW YORK METROPOLITAN REFERENCE AND RESEARCH LIBRARY AGENCY, INC.

1968

METRO Miscellaneous Publications Series
NUMBER 1

CONTENTS

ACRONYMS

CARES	Central Advisory and Reference Service
CENSSUS	Central Serials Supply Unit
CENTRAN	Central Translation Facility
DASC	Delayed Access Storage Center
MACSINET	Metropolitan Access to Scientific Information Network
MACSINEX	Metropolitan Access to Scientific Information Experiments
METRO	New York Metropolitan Reference and Research Library Agency
SPINBIBS	Specialized Information and Bibliographic Service
SURE	Serials Utility Register

PREFACE

This study of physical science and engineering library and information facilities and services in the New York Metropolitan area was initiated by the New York Metropolitan Reference and Research Library Agency in Fall 1966. It was financed by the New York State Science and Technology Foundation.

METRO is one of several regional organizations chartered by the Regents of the University of the State of New York in what is termed the "3-R's" (Reference and Research Resources) program. METRO's purpose is "to improve reference and research library services in the New York Metropolitan area by promoting and facilitating utilization of existing resources and by developing additional resources." METRO's activities are directed by a Board of Trustees, composed of librarians and other interested area residents. Its geographical scope of activity officially encompasses the five boroughs of Manhattan and Westchester County.

Throughout the course of the study, the heads of many libraries, and managers of the science and engineering facilities in them, were asked many times to analyze various of their resources and thoughts and to provide input for consideration by the Project staff. With few exceptions, these people participated fully in what was a difficult and time-consuming process. Nothing would have been possible without their support and contributions.

Many agencies, including all of the major American physical science and engineering societies, the U.S. Office of Education, various business and industry officials in New York, and people from libraries, the government, and industry in Detroit, Pittsburgh, Houston, Dallas, Washington, Boston, and Chicago cooperated with the Project staff. Interest in the work of METRO was high in all of these places.

The METRO staff is indebted to the efforts of its consultants, some of whom traveled long distances several times to advise us. The Project's permanent consultants were Eugene Jackson (IBM, Armonk, N.Y.), Susan Artandi (Rutgers University, New Brunswick, New Jersey), and Joseph Shipman (Linda Hall Library, Kansas City, Missouri). Others who joined us from time to time to offer invaluable assistance were Robert Levesque (Information Services Laboratory, Syracuse University, Syracuse, N.Y.), Melvin Voigt (University of California, San Diego), Maurice Tauber (Columbia University, New York) and Stanley Milberg (MARCOM, Inc., New York). A group of exceptionally qualified science librarians aided in the evaluation of library facilities. They were S. Kirk Cabeen (Engineering Societies Library, New York), Ellis Mount (Columbia University, New York), Robert Krupp (New York Public Library, New York), and Irlene Stephens, Richmond College, Staten Island, N.Y.).

The work of the Project was unfailingly supported by a small staff of interested and enthusiastic students at Columbia University: Lewis Archibald, Alan Anderson, Brian Aveny, Margery Blake, Dan Clemmer and Catherine Sestay. They must be credited for their ingenuity, integrity, and ability to work under pressure in less than ideal facilities.

Finally we must tender our highest regards to the members of the METRO Headquarters' staff who bore the brunt of the work involved in printing and distributing forms, letters, and questionnaires, and in providing information and guidance to respondents in the frequent absence of the Project Supervisor. Lawrence P. Murphy, formerly Assistant to the METRO Executive Director, was doubly helpful because of his training and experience in science and science information.

Russell Shank
Smithsonian Institution Libraries
Washington, D.C.
March 1968

Project Objectives

The METRO Science Library Project was undertaken to study the needs of those people who use both large and small science libraries in the New York City area. An attempt was made to assess the effectiveness of various cooperative devices and information service facilities, including:

- Guides to local science collections
- Union lists of local holdings
- Rapid communication and transportation facilities among local libraries
- The adequacy of copying services
- The availability of translators and abstractors
- The possibility of formal agreements for divided responsibility in the acquisition and storage of science materials

Of particular significance is that this was a design project, not merely a fact-finding survey. As stated in the grant application: "This project will also try to find mechanisms whereby the libraries of this area will be certain to acquire needed materials, and it will try to fit those mechanisms into a plan of effective pooling and sharing." The Project Supervisor took this as a mandate to lay out recommendations for action that would specify in operational terms an integrated service system of science and engineering library and information facilities in the METRO region.

Significance

The grant application for financial support for the METRO Science Library Project states:

> The need for such a study in New York City is extremely urgent. The pressure on all local libraries by students, researchers and practitioners is greater than it has ever been and it is increasing rapidly. Furthermore, several long range projects in the field of science reference and research libraries are presently under consideration. These projects include the proposed World Science Center

in New York City; the proposed expansion of the City-operated Hall of Science; the New York Public Library plans for the establishment of a new Mid-Manhattan library, which will include an open shelf science collection; and the interlocking plans by library organizations and government agencies for the establishment of a national network of science information centers.

Demands on science and engineering library facilities and services throughout the nation are indeed so heavy, and the likelihood of any individual library or library system being able to meet these demands with its own resources is so improbable, that planning and cooperation among libraries within limited geographical regions to create the widest intellectual and physical access to publications and information for their clientele has become essential for survival. Evidence of planned regional services involving more than one agency was examined at first hand in Houston, Pittsburgh, Chicago, Detroit, Dallas, and Washington, D.C.

Written reports of other regional efforts -- for entire states such as Colorado and Massachusetts, for academic systems such as the University of California and State University of New York (SUNY), and for smaller regions like the Research Triangle in North Carolina -- were studied. The technology utilization programs of National Aeronautics and Space Administration (NASA), Atomic Energy Commission (AEC), and the U.S. Department of Commerce, as well as the national information analysis operations of the centers sponsored by the Department of Defense and AEC are of particular importance because they bring such obvious financial strength to the operation of regional information services.

We may someday look back on this as an era of the institutionalization of regional cooperation and system development among libraries and information services.

The METRO area contains the wealth of libraries and the concentration of scientific and technical talent to make an information system based on these elements potentially one of the most powerful agents for information transfer and service in the nation. The basic objective of the recommendations in this report is to orient libraries and information services in the New York City region towards a system structure that will enhance full exploitation of literature-based information resources in science and technology for the citizens of this particular region, for the State of New York, and finally for the nation.

Sources of Data and Information

METRO region scientists and engineers, including faculty members of institutions of higher learning

Data obtained by questionnaire on library and literature use characteristics and from opinions on present and proposed library and information services.

METRO region librarians in charge of academic, public, and some association and museum libraries organized to serve students majoring in science studies, faculty members, and researchers in engineering and the physical sciences

Data obtained by questionnaire on levels of collection development in science, on involvement in and the potential for, cooperative acquisition programs, and space needs. Data supplemented through site visits.

METRO region science librarians in general

Information on operational problems, regional needs, ideas for investigation, etc., obtained in small group meetings with science librarians from public, industrial, government, association and academic libraries.

METRO region science and engineering libraries in industry

Data obtained from published directories on location, size, and collection specialization. Data obtained from transaction report forms on interactions with other libraries for information and publication transfer.

METRO region college and university students taking courses or majoring in science subjects

Data obtained by questionnaires from undergraduate and graduate students on library use characteristics and opinions about collections, services, and facilities.

METRO region manufacturers and trade associations

Data obtained by questionnaire on interaction between associations and libraries and on information services offered to the public.

Large library photocopying departments

Data obtained on characteristics of literature copied from item-by-item analysis of photocopy orders in five METRO affiliate libraries.

Libraries and information services in other regions

Data obtained from site surveys and documentary analysis on the organization and administration of regional information services, on services offered, kind of public served, problems encountered, etc.

Individuals in the library and information service industries

Data and information obtained through consultation with regular and occasional consultants and consulting firms, and with librarians, industrial information officers, and scientists.

Miscellaneous sources

Content analysis of the literature on regional library services, library cooperation, information systems, communication networks, etc. Data extracted from published statistical sources.

Through these mechanisms, over 6,000 people were contacted. Nearly 1,700 of them provided the data and information that were analyzed in preparing the program for action outlined by the recommendations in this report.

Limitations of the Study

The study was concerned only with the physical sciences (astronomy, chemistry, earth sciences, and physics), engineering, mathematics, and, to some extent, architecture as well as with the professional scientific community, beginning with college level students, and its literature.

The full role of special libraries in industry as contributors to regional services was not studied.

Problems faced by faculty members of small colleges, particularly from schools in the suburbs, were not adequately studied.

Some potentially important libraries, several of which were METRO affiliates, did not respond to questionnaires and other requests for information and data. Therefore, they are not as prominent among the libraries mentioned in various recommendations as might have been the case. Except for site visits to several other regions and a brief examination of the use of local libraries by industrial corporations within a 50-mile radius of New York City, data were gathered only from people and agencies in New York City and Westchester County.

Premises

Not every publication of potential use in scientific and engineering research need be held by libraries within a region. Publications located elsewhere will be suitable for local service if adequate delivery mechanisms (physical access) can be organized.

Local autonomy and first priority to serve primary clientele are important administrative concepts for individual libraries. They can be preserved at the same time that semirestricted facilities and services are opened to reasonable use by qualified users.

Physical and intellectual access points to information and to publications need not be at the same place in an integrated library system.

To the maximum possible extent an improved system of information and publication access should utilize already existing library components or at least portions of them.

To build on strength in terms of the quantity and quality of information stored is the best course of action in facilitating access to information and publications. This is the most economically feasible technique, and for certain elements of system development, it is the only technique possible to assure that subsidy funds for system development will be applied to the benefit of the greatest number of users. It is also the quickest technique to use in reaching full power in a system involving existing libraries.

Useful modification of library facilities to enhance the utility of an information system and advances towards the system of the future can be made without full scientific understanding of every aspect of the communication of scientific information and users' needs and habits in interactions with information systems. The information facility of the future involving libraries will come about as a product of evolution, not revolution.

Regional library and information center systems will evolve as the viable nodal units in national information networks. The regional library community has an obligation to take the lead in creating a position of organization of its services and facilities for information work that will enhance the integration of regions into national systems and networks.

A PROPOSAL TO STRENGTHEN AND EXTEND LIBRARIES FOR SERVICE TO SCIENCE: A SUMMARY OF RECOMMENDATIONS 2

The Project recommendations call for positive action calculated to increase the utility of libraries in service to the scientific community at large and to establish commitments toward a new era of joint responsibility for facilitating the exploitation of the region's resources systematically and economically. The recommendations are imperative, but general. Many decisions remain to be made on specific operational details in order to achieve the goal each recommendation seeks. Innumerable alternative steps within each recommended course of action remain to be determined and considered in making decisions on details. Nevertheless, the contribution to service each recommendation seeks to make remains a verity that must be accommodated.

These recommendations strive for an optimum course of regional action in response to findings derived from input from a plurality of types of library and information users from various and often disparate settings. Data were gathered in such a way that system planning, not individual library operations, was the focus. Individual libraries will not find their particular problems specifically delineated with direction for their local solution. Internal surveys and critiques of individual library problems are the province of local library administrators, and call for closer concentration on specifics by consultants over a longer period of time than could have been managed for them all during the course of this study. Nevertheless, participation by individual libraries in the regional plans for development of library resources, facilities and services herein recommended will have a local impact to the benefit of service to that portion of the public that approaches the region's resources through the individual libraries.

Resources

1. At least $400,000 must be added to the annual expenditures for the purchase of library materials by the 38 public, academic, association, and museum libraries in the open sector that offer service to the professional physical science and engineering community in the METRO region. Nearly $60,000 more is needed annually by these libraries for the preservation of library materials.

These amounts are essential for the provision of basic library services of the highest quality in the performance of each library's primary mission, and are in addition to the resources and services subsequently recommended in this report.

2. At least 77 additional positions, at a total estimated cost of $424,000 a year, should be added to the 38 open sector libraries surveyed for normal service to the physical science and engineering community.

These positions also are essential for the performance of these libraries to fulfill their primary missions.

3. A program of regional collection development in science and engineering, based on cooperative acquisition of materials and a continuous review of collection specialties and strengths among the region's science and engineering libraries, is required to fulfill several purposes: (a) to join together library communities with similar demands in order to justify the acquisition of various materials for which the demand from any one of them is insufficient to support alone; (b) to place duplicate materials judiciously throughout the region to meet needs from local enclaves of users who cannot or do not have the time to travel too far to get material they need urgently; (c) to bring into the region material that is not otherwise being collected, but for which local demand dictates a speed of access greater than can otherwise be organized; (d) to assist particularly the large libraries in their attempts to serve missions other than those for which they have been organized, but which for various reasons they are otherwise in a position to serve; (e) to allow libraries with similar missions and clientele to pool their resources in order to obtain a broader representation of literature among them than would otherwise be possible.

In this manner the varied demands of dispersed users and the awkward distribution of materials among the region's libraries can be brought closer to congruity. The region's rich resources can thus also be further strengthened so the powerful science community can more quickly tap literature resources than is even now the case. Duplication of material as required by demand can be assured, relieving pressures on stressed resources.

4. Supplementary academic library collections to serve college and university students in engineering and the physical sciences should be established at several key locations throughout the METRO region in libraries that already exist.

Students are more evenly distributed throughout the METRO region than perhaps any other sector of the community. As they have more flexible time schedules and more mobility

than others in the science community, not being tied to a rigid full-day work schedule, they are attracted thus to public library facilities to augment their school studies, but too few centers of academic library excellence exist in the public sector of the library systems.

5. The quantity and quality of circulating collections of professional books and journals in science and engineering, particularly in Manhattan and Westchester County, should be increased and widely publicized.

Probably no other metropolitan region in the nation has as large a proportion of its publicly available science and engineering library resources restricted to library use or available for controlled circulation only, as does New York City. This availability of circulating material should be widely and frequently announced because public libraries in the region are not generally recognized as likely sources for such material.

6. The publicly available stock of bibliographical services and separate bibliographies should be increased, either through the purchase of more titles for the public libraries or subsidized public access to comprehensive, but relatively closed collections that exist among the science collections of the large university libraries in the region.

Not only the traditional, but the new kinds of bibliographical services should be brought to bear on the problems of providing intellectual access to publications for the area's scientists and engineers. The problems and issues to be faced in implementing this recommendation should be priority items for funding in the program of research and development (MACSINEX) recommended later in this report. It should be anticipated that librarians and information officers will make more use of these bibliographic resources than will scientists and engineers.

7. Stack space in existing libraries can and should be more economically used by the removal of various kinds of little-used material for transfer to less expensive space. A new Delayed Access Storage Center (DASC) should be established to house this material and should develop the capability of delivering material to the local libraries within from one to three days of its request.

Real estate is a premium resource among New York libraries, particularly in the crowded boroughs. The storage of little-used and older material would be an ideal way of highlighting the remaining newer and more important literature as is recommended by the science community.

Services

8. A Central Advisory and Referral Service (CARES) should be established to assist librarians in fully exploiting the region's library and information resources quickly and efficiently. It should provide consultation, middleman, and directory services in this effort.

Most librarians in the region learn through experience how to tap other libraries and information services, but the process is a long one and produces local services of highly varying quality, depending upon the ingenuity and the administrative freedom given to librarians. Many of the region's resources are inefficiently and improperly utilized by librarians on behalf of those they serve. A service to assist librarians in developing search strategy would heighten the usefulness of these resources as they stand, even if they are not further augmented.

9. A Central Serials Supply Service (CENSSUS) should be established to provide photocopies and interlibrary loans of scientific and technical periodicals.

Articles in scientific and engineering journals are the principal units of communication in these fields. The call for loans and copies of articles and journals among the area's libraries, both internally and through interlibrary actions, is heavy. Most research libraries are stressed to capacity in meeting this demand, to the detriment of service to those many researchers who use the same material in the library. Every library manager queried indicated that the supply of scientific serials was too meager for all of the demands made of them. Clearly, a specially designed, quick acting facility for providing physical access to scientific and technical serials is urgently needed.

10. A Serials Utility Register (SURE) should be established and maintained on a current basis in lieu of a union list of serials. SURE would establish the location of as many copies of as wide a

range of serial titles as possible, and would direct librarians and the public to these titles upon demand.

Providing physical access to scientific serials is one of the most frequent key tasks of the science library community. A service covering all known titles, and directions to a few public sources of availability for each, involving even locations outside the New York region, would provide a more powerful, more economical, and viable facility.

11. The information service capability of the region should be strengthened by creating separately identified public agencies to provide: (a) scientific and technical data and facts, including elements of bibliographic citations in response to questions that can be answered quickly and on demand; and (b) specialized information and bibliographic services at cost, tailored to specifications set by the customer.

These services would complement and extend the special search services of the Engineering Societies Library. At present little such capability is available to the public in New York City. Demand for such services is low at present but where these services have been made available and promoted, demand has been generated. It is incongruous that the science community in New York turns to such services in Chicago when better resources are available to sustain these services locally.

12. A Central Translation Facility should be established to assist scientists in gaining access to available translations and to direct them on demand to the translation industry in the area.

The provision of literal translations is one of the key avenues of access to foreign scientific information. The translation industry in New York is intellectually powerful and institutionally unstructured. Libraries should develop the capability for bringing customers and the industry together.

Organization and Administration

13. A Science Library and Information Service Council should be established to advise and assist the METRO Board of Trustees, METRO committees, and individual libraries in planning and implementing programs to improve reference and research libraries serving the

professional science community in the METRO region and to review regularly the state of the science library and information service capability of the region.

The demands of the scientific and engineering community and the state of the art of information science are dynamic forces and must be constantly reevaluated to facilitate administrative decisions among libraries for cooperation in providing the best possible service to the various sectors of the public. The activities recommended in this report are merely indicators of direction: none will become viable without a prime mover with knowledgeable guidance to develop plans for and monitor their implementation.

14. An educational program for employees of science libraries should be inaugurated to increase and update their knowledge and understanding of modern science and engineering problems, projects, and research and development methods.

The science and engineering community demands librarians who are more knowledgeable in these various aspects of science. It will be difficult to recruit enough librarians with adequate science or engineering training for work at all professional levels in the area's libraries. The library community itself, with assistance from the region's extensive science and engineering education and research enterprises, can usefully invest time and effort to provide a general training program aimed at opening vistas into the world of science for people in these libraries.

15. Vigorous and high quality informational, promotional, and educational programs should be undertaken by a central agency. Its objectives include increasing knowledgeability among scientists, engineers, and librarians concerning the resources in the region's libraries and other information facilities, and the techniques of acquiring information, both physically and intellectually from them.

No small part of the underutilization and misuse of existing library and information resources of the region is due to the passiveness of libraries in general, and their lack of motivation and mechanisms for coordinated public information activities that would help scientists and engineers understand what is available for them and how to get at it. Active promotion of information and library services, in terms of the output that would be useful to them, has elsewhere produced a healthy community demand and support for libraries.

16. A formal, organized network, to be known as Metropolitan Access to Scientific Information Network (MACSINET) composed of selected physical science and engineering libraries and information services in the METRO area should be established to facilitate the communication of questions and answers involving scientific and technical data and information, bibliographic information, requests for location of publications and arrangements for their use, and the transmission of visual images (both hard and soft) of library materials.

An informal system of a relatively few libraries in the region already bears most of the burden of providing information and publications to the professional scientific and engineering community. Recognition of this system, and its formal institutionalization with dedicated communication facilities, would provide an administrative framework and the beginnings of a management data system on which to build a viable regional service. Joint action will be required by these libraries in order for them to capitalize on much of the new technology of information systems.

17. A research and development program, to be called Metropolitan Access to Scientific Information Experiments (MACSINEX), should be established to work on products and systems aimed at enhancing the establishment, operation, and continued up-grading of a fully integrated system of information resources and information transfer facilities in the New York metropolitan region.

The library community must act now, and on its own, if it is to have any control of its destiny and, indeed, any role at all in the coming generations of special purpose information and communication systems based on new technology. No one segment of the information science and communication industries within the framework of present corporate structure and organizational goals, can work on the problems of system design and equipment development or modification to suit the complex needs of a regional library and information service. Many public and private agencies can be mobilized, however, to work under contract to a planning agency on various aspects of these problems in a coordinated program of research and development.

18. In order to obtain full power from the programs and activities proposed in this report, a number of them should be integrated into one administrative unit for coordination and ease of exploitation.

Several of the services and facilities recommended in this report obviously have functions that are interrelated (CENSSUS and SURE; CARES, SPINBIBS, and the Central Translation Facility). The New York region requires and warrants a new, central public scientific and technical library and information center that would be, in essence, a combination of the best features of the present New York Public Library Science and Technology Division and these newly recommended active services. It is recommended that all of these elements be grouped together into a newly constituted and modernized Science and Technology Division of the New York Public Library.

LIBRARIES AND THE SCIENCE COMMUNITY 3

The objective of this study was to assist in the development of library services to the professional community of scientists, engineers, and mathematicians in the New York area. Nationwide pressures have been strong for modifications of library operations and services on behalf of science. These pressures come from the demands of scientists and engineers, from a host of panels and committees that have addressed themselves to various aspects of the communication of scientific information and library service, and from the realm of information and communication science where the technology seems to be offering more rapidly than ever, the promise of new capability. Libraries have an obligation to examine these pressures and to take action on a variety of fronts in order to bring these new technologies to bear on the creation of useful and innovative library services. It is particularly important that those libraries that can act cooperatively do so, for many of the influences on libraries call for the introduction of resources and techniques that are too expensive and sophisticated for independent action. The economical use of relatively dear resources for library service within a region will thus require the development of library systems of various kinds in order to share resources.

This study concentrated on an examination of the existing library enterprise in the New York area and the community of users that confronts it. The interactions of these two groups, each with characteristics that are in part independent, and in part a result of previous interactions was studied to see where they could be made more compatible. Soon after the study began, it became evident that existing library facilities could not alone meet all demands. The problem quickly expanded to include an estimation of the kinds of facilities that should be added to the region's resources in order to serve current needs and to build towards a future that is as yet only dimly seen.

What follows in this chapter are the significant findings of the various phases of the Project, presented so as to give an impression of the issues and problems that the recommendations attempt to resolve. This synthesis, then, is a description of the community, the resources, and their interaction today in terms that are suggestive of the science library and information facility of tomorrow.

The Region's Library Resources

Overall, the library resource in the METRO region and nearby environs must be rated outstanding, in the subjects under consideration in this report. Over two million volumes, covering astronomy, chemistry,

earth sciences, engineering, mathematics, and physics, are held by about 235 libraries whose primary aim is to serve some segment of the professional scientific community beginning with students in institutions of higher learning who are studying for entry into the various fields of science. Among these libraries are the collections of the 31 colleges and universities that offer degrees or emphases in science, 4 public library systems, and about 200 industrial, museum, government, and society libraries.

One of the key characteristics of the region's collections is the fact that strength in all disciplines is displayed by the public, college, museum and society libraries, or what might be called the open sector of the community. Although the academic libraries do not have a direct obligation to serve the public, by tradition most libraries of nonprofit institutions do contribute to a larger community service by allowing access to their collections for reasonable use by qualified users. At least they are the strongest elements of the voluntary national interlibrary lending activity.

As shown in Table I, these libraries have comprehensive research collections in every major discipline of the sciences covered in this study and some of the strongest collections of their kind anywhere in the nation (e.g., the New York Public Library and the Engineering Societies Library). In the entire open sector in the sciences there are nearly one million volumes and over 24,000 current serial titles. And these collections are growing at the rate of over 23,000 volumes a year! (See Table II.)

This is in sharp contrast to most other metropolitan areas of the country where many industrial libraries must be included in regional inventories in order to show good coverage of a wide range of subjects. This may then pose a problem to regional planners in those areas, because access to industrial collections is usually severely restricted, or is made available only begrudgingly, through interlibrary lending or inconvenient negotiation in each individual case requiring direct access to materials in the libraries.

This characteristic is of more than just passing interest. It means that, if we follow the principle that it is better to build on strength, we can concentrate our creative efforts to improve our library resources and services on the already open sector of the library enterprise. We thus not only steer clear of involvement with the constraints of industrial proprietary interests, but also rely heavily on the portion of the library community that controls and draws benefits directly from the state's 3-R's program.

TABLE I.

LEVELS OF COLLECTION DEVELOPMENT IN GENERAL SUBJECT AREAS
AMONG RESPONDENT METRO AREA LIBRARIES

Subject	Levels at Which Libraries Indicated Maintain Collections *			
	(A) Information	(B) Basic Study	(C) Working Research	(D) Comprehensive Research**
ASTRONOMY	1A, 1D, 2, 5, 6, 7, 8, 9, 11, 12, 17, 20	1B, 10A, 10B, 13, 15, 16	3	19
CHEMISTRY	1D, 2, 5, 6, 7, 8, 9, 10B, 11, 12, 13, 17, 20	1B, 10A, 14, 15, 16	4	1A, 3, 19, 21
EARTH SCIENCES	2, 5, 6, 7, 8, 9, 11, 13, 20	1A, 1B, 1D, 10A, 10B, 15	16	3, 14, 19
ENGINEERING	1A, 1D, 2, 5, 6, 8, 9, 11, 13, 17	7, 10A, 10B, 15, 20	1B	3, 16, 19
MATHEMATICS	2, 7, 8, 9, 11, 12, 20	5, 6, 10A, 16	1A, 1B, 1C, 1D, 4, 10B, 13, 15	3, 19
PHYSICS	2, 8, 9, 12, 20	1D, 5, 6, 7, 10A, 11, 15, 17	1A, 1B, 4, 10B, 13, 16	3, 19

* See key to library designators.

** Listed on the survey forms as Exhaustive Research. The designation was changed by the Project Director since so few library collections are really exhaustive.

Key to Library Designators

Academic Libraries

1A. CUNY, Brooklyn College
1B. CUNY, City College of New York
1C. CUNY, Graduate Studies Division
1D. CUNY, Queens College
2. College of New Rochelle
3. Columbia University
4. Fordham University
5. Iona College
6. Long Island University (Zeckendorf Campus)
7. Manhattan College
8. Marymount Manhattan College
9. Mercy College
10A. New York University, Science Library
10B. New York University, Engineering and Science Library
11. Pratt Institute
12. Sarah Lawrence College
13. Yeshiva University

Other Libraries

14. American Museum of Natural History
15. Brooklyn Public Library
16. Engineering Societies Library
17. Mt. Vernon Public Library
18. New Rochelle Public Library
19. New York Public Library
20. Yonkers Public Library
21. Chemist's Club

TABLE II.

HOLDINGS IN THE MAJOR PHYSICAL SCIENCES AND ENGINEERING IN LIBRARIES IN THE OPEN SECTOR

Subject	Collection Size		
	Volumes	Current Serial Titles	Volumes Added
Astronomy	15,450	459	688
Chemistry	83,343	1,948	5,386
Earth Sciences	133,799	4,582	5,244
Engineering	210,684	9,086	6,612
Mathematics	70,863	972	470
Physics	68,818	1,774	4,810
Total, 21 reporting libraries	632,957	19,321	23,212
Estimate for 17 libraries not reporting*	323,400	4,800	--
	956,357	24,121	23,212

* The following libraries did not report their holdings by subject to the Project staff: Cooper Union, Finch College, Good Counsel College, Hunter College, Kings College, Manhattanville College, Marymount College, New York Institute of Technology, Polytechnic Institute of Brooklyn, SUNY-Maritime College, Notre Dame College of Staten Island, Pace College, St. Francis College, St. John's University, St. Joseph's College for Women, Wagner College, and Queensborough Public Library.

Administrative decisions involving unusual library developments on behalf of the region and, particularly, those that involve the use of funds available to METRO and its voting members, is thus much simpler than might otherwise be true. Most of the effort in this study to gather data that would spotlight collections, facilities and services useful to a regional system was focused on the public, the academic, the society, and the museum libraries. The recommendations in this report propose that elements from these libraries be drawn together in various ways to form a publicly accessible resource for the region's science and engineering community.

The following institutions are in the open sector to which reference is frequently made in this report. These agencies maintain library collections for direct support of some portion of the science and engineering community.

Academic Institutions[1]

Brooklyn College
City College of New York
College of New Rochelle
College of Notre Dame
Columbia University
Cooper Union
CUNY, Graduate Division
Fordham University
Good Counsel College
Hunter College[2]
Iona College
Kings College
Long Island University
Manhattan College
Manhattanville College of the Sacred Heart
Marymount College
Marymount Manhattan College
Mercy College
New York Institute of Technology
New York University
Pace College
Polytechnic Institute of Brooklyn
Pratt Institute
Queens College
St. Francis College
St. John's University
St. Joseph's College for Women
Sarah Lawrence College
SUNY - Maritime College
Wagner College
Yeshiva University

Public Libraries

Brooklyn Public Library
New York Public Library
Queensborough Public Library
Yonkers Public Library[3]

Other Libraries

American Museum of Natural History
Chemist's Club
Engineering Societies Library

The corporate, or closed, sector of the New York Metropolitan area library community is also quite strong overall. Nearly 1.4 million volumes are located in 195 industrial libraries devoted to science and engineering within a radius of 50 miles of New York City. The average size of these libraries is only 6,100 volumes, but among them are many

large and intellectually rich libraries, such as those of the IBM Watson Laboratories (48,000 volumes) and the Esso Research and Engineering Company (40,000 volumes). Table III summarizes the data regarding the holdings in the closed sector. The fact is that it would be possible to create two separate and independent systems of libraries, one open and one special purpose from among these two sectors, with unusual strength of resources in each.

The existence of great strength in the closed, industrial sector is likewise an important characteristic of the region's resources. These libraries can form excellent backstops for the provision of materials that on occasion will not be found in the open sector. Hopefully, the open sector can become self-sufficient in serving the professional public at large. Presumably, the occasions when it will be found deficient will be few.

These libraries are not the region's only information resources of importance to the future of service to the sciences. New York City hosts the offices of nearly 1,000 manufacturers and trade associations, including the headquarters offices for about 300 of them, that might be potential sources of scientific and technical information. Some of them are concerned not with science, but with economic and public relations information, and some serve only members. But a few offer advanced information services to the qualified public.

New York City is also the headquarters for the publication of the internationally important Engineering Index, International Aerospace Abstracts, and Applied Science and Technology Index. Although these publications are no less available to the scientists of other regions of the country, the fact that several of them are based on collections of resources in the New York area means that we know immediately one place locally that we can turn for access to publications listed in them. Furthermore, unusual experiments in formating and distributing such services might well be tested in the local market, giving New York scientists an unusual opportunity to contribute to the future of these services. New York's science libraries also might well be the laboratories for testing public access to nontraditional outputs from such agencies.

Finally, the New York metropolitan area is the center for a large part of the scientific and technical book and journal publishing industry in this country. Again, it is not inconceivable that local libraries might have some potential for participation in unusual publication distribution and evaluation programs with these agencies.

TABLE III.

SUMMARY OF RESOURCES IN CORPORATE AND TRADE ASSOCIATION LIBRARIES IN SCIENCE, TECHNOLOGY, AND RELATED SUBJECTS IN THE NEW YORK METROPOLITAN AREA (WITHIN 50-MILE RADIUS)*

Subject	Number of Libraries	Total Number of Volumes	Average Size	Largest in METRO area
Chemical Industries	40	202,450	5,000	Geigy, Ardsley (9,000 volumes)
Communications	11	75,228	6,800	CBS (22,000 volumes)
Engineering	36	189,588	5,300	Ebasco Services (15,000 volumes)
Metals	10	37,000	3,700	AISI (9,000 volumes)
Petroleum	13	116,000	9,000	Standard Oil of N.J. (27,000 volumes)
Science and Technology	74	532,260	7,200	Con. Ed. (39,000 volumes)
Transportation	11	32,836	3,000	Port of N.Y. Authority (12,000 volumes)
Total	195	1,186,062	6,100	

* Source: Special Libraries of Greater New York: a Directory. New York, Special Libraries Association, New York Chapter, 1967. (Information taken from draft.)

The Community of Scientists

Although the resources of the science libraries and collections in the region are basically strong and extensive, they support a large and potent community of scientists. The region within a radius of 25 miles of New York City has been called the nation's richest area in terms of scientific and technical personnel, containing approximately 10 percent of the total of all personnel listed in the 1964 Register of Scientific and Technical Personnel maintained by the National Science Foundation. This is 25 percent greater than the national capital area, the second richest area.[4/]

Over 58,000 physical scientists, engineers, and technicians are employed in various research, manufacturing, educational, and other agencies in the five boroughs of New York and Westchester County, distributed as shown in Table IV. This is about 44 percent of the total so employed in New York State. Nearly 29,000 of these people work in the area's industrial research laboratories, a setting that encourages much library use. About 11,800 of this latter group are engineers, 5,600 are basic scientists, and 11,100 are technicians. The major scientific and engineering societies report that nearly 42,000 of their members reside or work in the New York area, including parts of Long Island, Connecticut, and New Jersey. The New York Metropolitan area alone encompasses over 37,000 manufacturing establishments.

Appendix Table D.I lists the number of engineers, scientists and technicians in New York City and Westchester County. All important subject fields are represented among the population in these areas. The engineering sector is dominated by civil, electrical, and mechanical engineers, with electrical and electronic engineering the most heavily represented field in Westchester County. Among the basic sciences, chemists far outnumber their peers in other fields. These same strengths were represented among the respondents to the questionnaire sent to scientists and engineers in the region.

Among the principal responsibilities of the respondent engineers, research and development tasks were the most prevalent, and in all phases of engineering. Thus an important input of data for analysis in this study came from a segment of the science community that is involved in those aspects of work that generate the strongest information needs and pressures on libraries. Production, management, and design responsibilities were also strongly represented.

The 31 institutions of higher learning that offer majors or emphases in science granted over 6,000 degrees at all levels in the 1965-66 school year. (See Table V.) Probably as many as 24,000 students are working on science degrees at any one time.

TABLE IV.

NUMBER OF ENGINEERS, SCIENTISTS, AND TEACHERS OF PHYSICAL SCIENCE AND TECHNOLOGY IN NEW YORK STATE, NEW YORK CITY, AND WESTCHESTER COUNTY*/

Occupation	New York State	New York City	Westchester
Engineers and Architects	86,393	35,060	3,024
Scientists	13,656	4,158	866
Mathematicians	1,802	360	119
College teachers	11,227	6,351	95
Technology teachers	2,803	1,703	14
High School teachers			
Science	8,354	2,430	551
Mathematics	8,747	2,677	519
Technical	250	112	10
Total	133,232	52,851	5,198

* Source: New York (state) Department of Labor. Division of Research and Statistics. Technical Manpower in New York State. Special Bulletin 239. Vol. 1, Supplement A. New York, New York State Department of Labor, 1964. pp. 125-7. (Table 47.)

TABLE V.

NUMBER OF GRADUATES IN THE PHYSICAL SCIENCES AT EACH ACADEMIC LEVEL FROM INSTITUTIONS OF HIGHER LEARNING IN THE METRO AREA JULY 1965 - JUNE 1966*/

	Number of Graduates				
	Bachelors degree	Post Bachelors degree	Masters degree	Doctorate	Total
Architecture	171		37	3	211
Astronomy	1		1	1	3
Biochemistry	22		2	10	34
Chemistry	644		379	103	1,126
Earth science			2		2
Engineering	1,547	74	807		2,428
Geology	84		11	18	113
Geophysics	--	--	--	--	--
Mathematics	869		287	48	1,204
Merchant marine	30				30
Meteorology	11			2	13
Military science	30				30
Oceanography	7		3		10
Physical sciences	31			2	33
Physics	267		96	46	409
Statistics	30		35	5	70
General science	16		16		32
Total	4,030	74	1,676	238	6,018

*/ Source: U.S. Office of Education, Data Processing Unit. August, 1967.

Thus, the core of the science community in the New York Metropolitan area must contain no less than 60,000 scientists, engineers, technicians, and students, at least half of whom are engaged in activities that are known to generate library use. No attempt has been made to estimate the number of lawyers, writers, management consultants, business owners, and other people who might not qualify as professional scientists, but who may nevertheless require and use science libraries for various aspects of their work. Even without them, there can be no doubt, that the area's science libraries are busy and have an important audience for which to plan improved facilities and resources.

The Basis for Action

The Constraints of Location. The assessment of strength of the region's collections must be qualified, of course, since they are a composite of many separately administered collections spread widely throughout a large geographical region. Local autonomy in determining rights of access to collections and the inconveniences of transportation are barriers to full and easy use of the area's libraries that distract science people who are not necessarily strongly oriented towards libraries anyway.

In one sense, the strengths of the library resources of the region are well situated, since they lie within a limited area of Manhattan. Four major collections are housed within a 15-minute walk of each other in mid-Manhattan. These are the New York Public Library, the Engineering Societies Library, the Chemist's Club Library, and the collection of the American Institute of Aeronautics and Astronautics. Furthermore, it is not difficult to travel north or south to other principal collections at Columbia University, the American Museum of Natural History, City College of New York, and New York University. A short ride into Brooklyn brings the Polytechnic Institute of Brooklyn into this system. A scientist who has an information problem sufficiently troublesome to require that he use library resources on the premises can, with planning and the assistance of the librarians involved, map out a search sequence that should be manageable. He may, however, spend the better part of half a day in the process if he must use several of the libraries including one on each of the axes of this system. Interestingly, the New York Public Library is at the crossroad of this configuration of libraries.

This convenient configuration notwithstanding, the people in the fringe areas of the region will not be able to have ready physical access to strong library resources as easily or conveniently as those who find themselves with some frequency in Manhattan. Travel time from the far reaches of the region to mid-Manhattan can be as much as two hours on public transportation. Driving is little better. Parking is always

a problem and as much time can be used in locating a parking place as can be saved by driving to the area. Because of the lack of concentration of scientists in the fringe areas it would not be justifiable to create strong, broad-ranging research collections in outlying districts for them.

It would be possible, and advisable, to designate certain libraries in these areas to build good collections of ready reference materials and current-awareness collections. These would serve as the focal points for contact by these scientists with a system of services that can be offered by strong science libraries in the region. At these points, the user could be confronted with directories, advice on use of the system to serve his particular problem, and communication facilities to contact specialists in the system. These designated units could develop expertise in locating materials and serve as agents in interlibrary lending for scientists.

This would match the present pattern of use of libraries by scientists and students in these outlying areas. They are already oriented towards places such as Adelphi University, Fordham University, the Yonkers Public Library, and the scores of branches of the large public library systems in New York City. Their patterns of use indicate further that there are probably subregional systems that could be formed by enclaves of libraries within the METRO area. The maps in the Appendix to this report give evidence of perhaps five or six convenient configurations of subsystems. One such arrangement already exists among a group of academic libraries situated in downtown Brooklyn. Although the kinds of cooperative activities they might engage in on behalf of public service is limited by their administrative restrictions and varying missions among them, nevertheless this potential for increasing physical access to libraries by scientists should be carefully investigated.

Another aspect of the geographical spread of collections that makes it difficult to serve regional interests is the existence of several collections in each subject that together would make an ideal resource, but that are maintained and controlled by different jurisdictions, sometimes miles apart. In the earth sciences, for example, the collections of the American Museum of Natural History and of Columbia University together are outstanding. Columbia's collection is split, however, between its Manhattan campus and the Lamont Geological Observatory across the Hudson River in Rockland County. Likewise, the collections in chemistry of the Chemist's Club and the Brooklyn Polytechnic Institute are ideally complimentary but geographically dispersed.

It is imperative that the libraries whose collections are thus so complimentary, work closely together to plan acquisitions and to work out mechanisms for easy physical and intellectual access to the literature

and information they hold. One of the outstanding findings from the questionnaire survey of scientists was their wish for access to broader collections. Except for marketing and production people, scientists in all kinds of job assignments, and in most of the subjects covered, indicated that their use of libraries would be increased greatly if the breadth of collections in their areas of interest were to be increased. Scientists' interests range widely in this era of interdisciplinary effort. It becomes increasingly more difficult for a specialized library in a single discipline, or part of a discipline, to be self-sufficient. Even the large libraries with subject branches, such as exist at Columbia, Fordham, and New York University, find that the lines of responsibility in their collection development policies are diffused because of pressures from researchers and students to recognize new orientations and methods in various fields that stem from the breakdown of intellectual boundaries in the sciences themselves.

Regional library service would very definitely be improved if scientists could be attracted to the libraries of strength in each of the disciplines and if these libraries could expand their collecting activities or simplify the path of joint use of complimentary libraries by scientists. Librarians should become thoroughly familiar with the holdings and services of related subject collections in other libraries. Agreements should be reached in advance on how, when, and for what these libraries can and will refer scientists back and forth among them. One of the most annoying aspects about the current techniques of referral of users from one library to another is the fact the referral is so often fruitless for the user. Frequently the second library either administratively or economically cannot offer the kinds of service needed, or its collections are not at all adequate to the demands of the users. To the extent that this could be determined in advance the user would be better served. Rapid communication and transfer (documents and images) between central storage points and local branches was another of the suggestions for improving services that was volunteered frequently by scientists on their questionnaire returns.

The Patterns of Burden. None of the science and engineering libraries in the region is entirely self-supporting. This is particularly true of small college libraries and the special libraries in industry and government. In the New York area, as is the case in every such community, even though individual users may report general satisfaction with their own organization libraries, they are attracted to any other library that seems to have either the mission or the resources that match their needs and is convenient for them to use. There is, of course, the usual interlibrary exchange of information, publications, and copies of materials among libraries as librarians do their best to negotiate voluntary agreements that will help them serve their primary users.

The patterns of this cooperation and public use of library facilities creates, in essence, informal systems of library service on

a regional basis. The delineation of at least the major elements of these interlibrary systems was a primary task of the METRO Science Library Project. The sweep of the Project was broad, and the depth of analysis of the system structures and loads was shallow. The general character of the patterns, however, is sufficient to indicate directions for the future.

Individual users, particularly undergraduate students, wander far throughout the region to use library resources. Quite apparently their use is dictated largely by convenience of location of library facilities to their homes and jobs. The more difficult the problem and the more serious the need, the more the user turns to the major scientific collections in the region. Little attention seems to be paid by these people to the rules for access to the libraries. They are restricted, of course, almost entirely to the open sector of the library community, although a number of the college and university faculty members have found ways to use industrial library facilities, either through their association as consultants to these firms, or in the company of colleagues who work in industry.

Industrial librarians call on each other for assistance and with frequency. The pattern of exchange is quite diffuse; it appears that this voluntary cooperation is arranged largely on the basis of personal friendships among the industrial librarians. The load is spread widely among industrial libraries, and may account for 40 percent of their interlibrary activity. Proprietary interests undoubtedly require some circumspection in approaches to competitors.

The use of public, society, and academic libraries by industrial librarians is by far the most conspicuous and heavily loaded interlibrary activity. Of the more than 400 requests for assistance in providing information and publications reported to the METRO Project by 66 industrial libraries in a one-week period, 75 percent of the requests were sent or called into these three kinds of libraries in the New York area. Four of the largest libraries that maintain Xerox order records reported doing from 45 to 90 percent of their business with industrial libraries. Furthermore, the load is mostly concentrated on journal collections. The remainder of the transactions were chiefly for the lending of monographs and reports.

Academic libraries play host frequently to each other's faculties and students. Undergraduates did not report as much use of science library facilities in schools other than their own, even during vacation periods, as might have been expected from comments about this phenomenon from academic librarians, although the survey of their use must be considered only sketchy. Smaller schools ordered more copies of materials from the larger libraries than had been expected and reported at the

outset by academic librarian advisers. Many of the faculty members who reported using several libraries indicated that they were students at one of the schools while teaching at another. This was also true of a number of the scientists from industry who used academic libraries.

From all of this, the really significant fact is that the larger libraries and, ultimately, relatively few of the large and well-developed research collections in the region bear most of the load, whether it is for interlibrary lending, photocopying, or on-the-spot use. Over and over again, in questionnaires, in interviews, in group meetings, and in site visits, the same libraries were mentioned as outside sources of information. In the rank order of their reported use by the nearly 1,000 respondents to the questionnaire sent to scientists and engineers, these are the important libraries other than their own reported by the professional community:

New York Public Library (Science-Technology Division)
Engineering Societies Library
Columbia University
Chemist's Club
New York University
Polytechnic Institute of Brooklyn
Brooklyn Public Library (Grand Army Plaza)
City College of New York
Defense Documentation Center (No longer in existence)
Queensborough Public Library (Central Library, Jamaica)
Brooklyn College
American Institute of Aeronautics and Astronautics
Fordham University

These libraries, all in the open sector, are hereafter referred to as the core libraries. Of these, the first four were also the four most frequently used libraries during the week's survey of the outside calls for assistance by industrial libraries in the region! These libraries are attractive to the public, of course, because of their size, the quality of their collections, and the uniqueness of some of their holdings. The public importance of these libraries must be recognized: they are essential to strong informati:a services for professional scientists.

As was indicated, the load on these libraries was not accurately measured, but indicators of this load were obtained. The top eight libraries among those used by industrial libraries received 50 percent of the action generated by the industrial community. The remainder of the load was distributed among 31 other libraries, some of them located in other regions.[57] An extrapolation of the rate of use of other libraries by industrial libraries in the New York Metropolitan area indicates a total load of at least 2,200 requests for information, loans, and photocopies a week, at least a quarter of which is concentrated on the top four libraries in the list above. In another part of the survey it was calculated that

these same four libraries were supplying 30,000 copies of articles a year to all customers. No attempt was made to estimate the number of individual users of these libraries.

The rate of success among industrial libraries in locating publications not found in their own libraries was found to be high, both by the METRO Project and by a study made simultaneously by Arthur D. Little, Incorporated.[6/] Not only that, but public and academic libraries responded well within the time limits considered acceptable to scientists and engineers. There is little room for complacency with this record, however. The staffs and resources of academic and public libraries are quite stressed by the amount and intensity of use made of them by industrial libraries. The fact that much of this activity is really work being done in proxy for industrial librarians by staffs of libraries that have a difficult time serving their own users on the premises is cause for concern among libraries in the open sector. The same holds true for the interlibrary activity among academic libraries, although there is a reasonable amount of mutual benefit in that activity through an exchange of courtesies.

The industrial librarians' successes obscure another disquieting element in the operation of this informal system. Frequently these librarians are able to locate materials only through long sequential searches by phone and mail among libraries until they can find what they want. It should be quite obvious to systems planners that more adequate inventories of services and resources, including the availability of information specialists, some rules for formating information requests, and dedicated communication facilities for the most heavily trafficked channels are required in order to achieve a leveling of the load among libraries and an economical use of the system.

One final aspect of this concentration of use on the larger libraries in the open sector is important. It reduces considerably the vista of the region's resources to be used for support of public demand. As can be seen in the following figures of the holdings of science materials in the region, the two million volume resource is reduced two-thirds when we focus on that segment of the material that is most likely to be available for a public regional library service in science. The publicly available holdings of other materials is similarly reduced.

	Volumes	Current serials
Total in region	2,141,266	73,625
Total in open sector	956,357	24,121
Total in core libraries	706,607	22,965

The Conflicts with Mission. Much of the criticism by both librarians and scientists of libraries and their services that was brought out during the Project resulted from attempts by the public to use libraries for missions they were not organized, staffed, or outfitted to serve. Large collections, particularly, are attractive because of their size; small libraries may be attractive if they hold unique resources. Disappointment that turns to criticism is the lot of the user in most of these instances. It is difficult to tell whether this is due to lack of understanding on the part of the users or the lack of ability on the part of librarians to explain to the users the implications for resources and staffs of their demands. Seldom do users display any awareness of how heavy the demands on libraries can be.

Demands that conflict with missions occur frequently according to the data. Academic libraries are asked via telephone by industrial librarians to search for information. But academic libraries are neither oriented toward nor staffed for the process of extracting information from literature for users. In the academic setting this is traditionally part of the user's task. Hence these libraries are unable to perform in a manner to which industrial users are accustomed when they make forays into these libraries for assistance. Large collections in research libraries are difficult to use for current-awareness browsing, and yet the demand for this privilege was frequently heard. College library collections with the mission of supporting the learning processes of youth cannot support the research interests of the sophisticated faculty members being recruited to teach them, but the intellectual inadequacies of college libraries was often mentioned. Industrial libraries with unique resources serving proprietary interests cannot readily open their facilities, usually in cramped quarters, to even small groups involved in advanced studies in universities, but a number of students and faculty members suggested this as an amenity the METRO Project should seek to obtain.

One specific conflict, mentioned by many people, is occasioned by the heavy demand for photocopies of journal articles for home use that is placed on the New York Public Library whose collections have been organized for the support of advanced research problems and are to be available for use in the Library. Too frequently those who use the Library find these journals tied up in the photographic process. The provision of photocopies is a supply mission, the logistics of which require an industrial engineering approach to materials handling; the research support mission requires expensive intellectual access mechanisms and tailored delivery services. The former mission keeps materials revolving in internal technical processes; the latter requires that the materials be readily available in locations where the directories and catalogs say they should be for access by the public.

The librarians, at least those who participated in the METRO Science Project, claimed they understood the principle of the conflict of missions as a dysfunctional aspect of regional library service involving interlibrary cooperation. Nevertheless, they have been forced by the lack of alternatives to turn to libraries where collections that could help them had been created, regardless of the lack of administrative, intellectual, and physical accouterments to these collections for making full and easy use of them. Occasionally the burdening libraries are able to offer financial assistance, at least to the private libraries, in the form of donations to fund drives. Some of the libraries have established fees for the use of their facilities on a continuing basis. Seldom, however, do the gifts and fees relate to the costs of providing services of various kinds.

The recognition of missions and the provision of resources appropriate to demands of users for varying mission support is the critical issue faced by this Project. The recommendations made in this report are, in reality, designed to create facilities in the New York Metropolitan area to serve all of the missions required by scientists and engineers, with an optimum combination of existing and new resources and system structure.

Cooperative Collection Development

An examination of the need for and the potential of cooperative acquisition programs was a primary mission of the Project. Data of use in this examination were obtained directly from the librarians in charge of science and engineering collections in the core libraries and indirectly from an analysis of several of the questions submitted to scientists and students.

Interest in the topic of cooperative acquisitions and its counterpart, joint use of library resources by several sectors of the community, was high. Cooperative collection development holds the promise of significantly great advancements in library services. Yet these programs have seldom achieved the power in practice that is attributed to them in theory. METRO area scientists and science librarians have their views about the reasons for this failing, which are worth summarizing here because they contain directions for potential success in such ventures.

Failure to achieve viability or full power has been attributed to:

Lack of recognition and definition of the geographical boundaries of the region of location of cooperating libraries in terms of acceptable time of access by users, or to provide mechanisms for user access within acceptable time limits.

Inadequate planning and failure to identify the materials needed with reasonable precision, and the priorities for their acquisition.

Failure to realize that planned duplication to meet heavy demands is as essential a part of cooperative acquisitions as the reduction of duplication of little-used material. Growth of the literature and an increase in its cost in the fields of collection specialization, as well as in the general areas of each library's primary mission, faster than the increase of funds available to apply to the cooperative programs.

Inflexibility in the allocation of responsibilities and in the location of collections once determined, leading to dysfunction in the access systems as demands for materials change [in kind and intensity] among several groups of different kinds of users, and because of changes in time in the needs within each class of user.

Failure of librarians adequately to promote with vigor, enthusiasm, forthrightness, strength, and ingenuity the kinds of service required to make cooperative use of library materials palatable to researchers.

The persistence of the concepts of local autonomy and scholarly prestige based on the size and quality of locally owned and immediately accessible collections, rather than on the totality of resources that can be drawn into the research process.

The unwillingness of scholars to accept the constraints on conditions of use of portions of the literature resources they need, even though their cooperation would open access to vast increases in quantity of material

> for them. The difficulty in describing potential needs of users in terms of the characteristics of publications to be acquired except in the most gross and general terms, and with little evidence of quantitative elements of need.

In spite of these difficulties, more material is available and is being used by scholars in the United States because of various cooperative acquisition plans than would have been possible without them: these plans are essential to adequate support of research, whether practiced on a national or a regional scale.

Libraries in metropolitan areas cannot afford to continue to grow independently with large amounts of duplicate material, much of it little-used, in direct and individual response to the growth of the intellectual resources of the world. Those who support at least the public segments of the library systems, including those in tax-supported academic institutions, have a right to question the need for the duplication of large research facilities at various points throughout a relatively compact region. The libraries' public questions the need for so many libraries when too few of them have collections broad enough to suit the user. (The need for broader scope in collections was clearly cited by graduate students and scientists in this study.) If for no other reason, cooperative acquisition programs are required lest the cost of the real estate needed to house collections exceed the value of the effectiveness introduced into the scholarly community by allowing uncontrolled redundancy in the collections. The challenge is to organize regional cooperative programs to overcome the problems facing attainment of their full potential.

Without a doubt, the best library service is attained by having a large quantity of required material close at hand and organized for relatively immediate delivery. Although everyone who uses a library might appreciate this kind of service, at least 80 percent of the scientists and engineers who responded to the Project's questionnaire reported that their need for publications could be satisfied in the majority of cases with deliveries made in from one to a few days after determination of need.[77] It does appear, therefore, that the operation of a regionally dispersed system of library collections could be made to satisfy the demands for physical access to required materials.

For a variety of reasons, cooperative collection development programs should be easier to design, administer and operate in science and engineering than in the social sciences and the humanities.8/ The results of new research in each of the scientific and technical disciplines are reported in a relatively small core of journals, although dispersion of information among a wide range of journals is not unusual for new sciences. This core is more readily identifiable in each topic than might be the case for the media used to report new research in the social sciences and the humanities. Scientific and technical information ages rapidly; hence it is possible to limit the size of collections serving current research and development. Furthermore, as science advances, older theories and models and engineering techniques fall into disuse, hence large collections of retrospective literature need not be accumulated to facilitate the operation of current scientific endeavors. Older material retains some utility, but demands on it are less, and access to it can be delayed. A few large research collections with retrospective material can serve a whole region. The emphasis in the use of scientific and engineering literature is concentrated on several kinds of publications, the characteristics of which are rather traditional and persistent, making it easier to plan at least part of the collection development program in these subjects around formats of literature.

Science and engineering by tradition, practice, and nature concentrate the search for new knowledge in the laboratory and the field, and not on the examination of the evidence of culture residue in library materials. Library research for scientists usually is neither prolonged nor extensive; it can, however, frequently be intensive and marked with a high degree of urgency.

A significant portion of scientists' and engineers' needs for literature are what have been termed everyday needs, with each incident of need requiring access to only a few publications. Relatively few scientific and technical projects require or utilize extensive bibliographical searches. Current-awareness needs are met in a large part by the scientists' and engineers' own personal channels of communication, including oral contacts with colleagues and personal subscriptions to journals. According to the Project's findings, browsing in libraries is useful and could be extended in its importance if libraries could be made more attractive and convenient to use.

These same characteristics suggest that it should not be too difficult for any library to be reasonably self-sufficient in one or a few subjects in science and engineering. But the growth, and the rate of growth of scientific and engineering information, and the

library material in which it is reported, is large enough, the pool of the little-used, retrospective material is large, important, and expensive enough, and the prices of all of this material is rising rapidly enough to make cooperation in building strong, comprehensive regional research resources imperative. It is just impossible for many agencies to finance the operation of a library resource that contains everything needed for all of its science and engineering clientele, regardless of the limits of their interests. Furthermore, it has been shown that perhaps as much as a fourth of the demands scientists and engineers place on libraries are not related to their job assignments or agency interests, hence may well fall outside the scope of the collections organized to support them in their work.

Whatever is done in the area of cooperative collection development, public knowledge about the collections must be increased. One of the striking findings of the Project was the widespread lack of knowledge of scientists and engineers about the collections of special types of materials in the region's libraries in the subjects important to them. The figures in Table VI show that it was not unusual for over half of the respondents in all lines of work to be unaware of the adequacy of the collections of indexing and abstracting services, patents, and government documents in New York area libraries. Since there are 22 officially designated depositories for U.S. Government Documents in the METRO area, and the most complete patent collection in any library outside of Washington, D.C., the need for a public information campaign is evident. Without the active promotion of the region's resources, demands on and criticisms of library collections will continue to be contrary to reality.

The Scientist and the Library

Perhaps as many as 90 percent of the scientists and engineers in the New York Metropolitan area have access to libraries associated with their jobs. This, at any rate, was the situation disclosed by the population chosen for the questionnaire survey in this study. The percentage is higher for those in research and development and lower for those in production jobs. Nearly a third of the marketing specialists reported that they were not supported by company libraries, not an unusual condition given the nature of their tasks. This last item is important for public libraries, for these same people indicated a strong need for frequent access to data and facts, for current information on specific topics, and general background information on industry-related topics. Current trade journals are their stock in trade.

As large as the population of scientists and engineers is, there is a far greater number of other workers, over one million, in

TABLE VI.

PERCENT OF RESPONDENTS IN VARIOUS KINDS OF WORK WHO DID NOT KNOW THE ADEQUACY OF THE REGION'S LIBRARY RESOURCES OF VARIOUS KINDS IN SUBJECTS OF IMPORTANCE TO THEM

	Teaching	Research	Development	Production	Marketing	Science Writing	Other
Trade Magazines	30.9	27.1	24.3	29.7	24.1	26.3	24.9
Research Journals	5.6	14.2	21.5	29.0	23.1	21.1	21.0
Textbooks	6.9	14.8	19.4	27.0	24.0	22.2	24.9
Advanced Monographs	11.3	24.4	48.3	51.6	70.8	47.1	56.6
Indexes and Abstracts	33.8	36.2	48.0	59.0	54.2	56.2	52.2
Patents	58.6	46.6	53.9	61.4	58.3	58.8	67.0
Scientific Reports	19.7	26.5	29.4	37.1	34.6	22.2	34.9
Other Government Documents	46.8	41.0	44.7	48.3	44.0	50.0	52.2

the 35,000 industrial firms in the New York Metropolitan area, who are not served by industrial libraries. Most of these people have few information needs that are not supplied to them by their supervisors, operators' manuals, company policy manuals, and other internal sources. Many people in industry work on business, financial, legal, and other problems that require little or no technical information. The manner in which this study was conducted did not expose these workers' needs for scientific and technical information. It is not that they are not important. This sector of the community would, however, be much more difficult and costly to approach in a broad scale, reliable study because of its dispersal and lack of interaction with external information services, then could have been accommodated by the METRO Science Library Project. The highest priority in the study was given instead to the most sophisticated professionals assigned principally to duties as scientists and engineers at all levels of administration. Although we have no verifying data, experience suggests that these people are employed by relatively few of the 35,000 firms.

Most scientists do not interact easily with libraries, although more than half of them rate their knowledge of the techniques of using libraries from good to excellent. Evidence from other studies indicates that libraries do not rank high as sources of information among scientists and engineers, and not as high as they might for sources of publications. When in need, these people do tend to use or call libraries themselves, rather than have their colleagues make the contacts for them. Very naturally, those who can avail themselves of the services of company or organization librarians most often leave the problems of interlibrary actions to these librarians. Discussions during the Project with industrial librarians suggests that corporation scientists worry little about where the information or publications come from, as long as whatever is needed is delivered within some reasonable period of time. Most scientists and engineers are unaware of the volume of interlibrary activity engaged in on their behalf. A significant number of them indicated that they were quite satisfied with the behavior of their organizations' library information and publication-gathering systems.

Even if the majority of the scientific community is served by company libraries, there is a sizable group of people who work in small firms who must rely on public libraries for the largest part of their publication and much of their information needs. Prominent among these people are those who work in small consulting firms, small manufacturing, testing, and business firms, and the independent science writers. There are probably at least 6,000 professional scientists and engineers in this category in the New York Metropolitan area.

Furthermore, even those scientists who have access to company libraries report frequent and heavy use of other libraries. Nearly 1,000 incidents of use of at least 41 other libraries in the area were reported by scientists, some reporting daily use. It was from these reports that the ranking of libraries mentioned in a previous section of this chapter was derived.

In their reactions to the questioning of their library use and opinions, scientists and engineers gave clear evidence of several good reasons why, in the face of their rather favorable impressions of their own organizations' library services, they themselves still go to other libraries. There are times when the restrictions on the breadth of these libraries, particularly in industry, is too limiting for them. The subject scope, the variety of kinds of materials, and the depth of the historical material in large research libraries is attractive to those who are trying to bring themselves up to date in a new field or some aspect of their own field they have not worked with in recent times. Complex and interdisciplinary subjects, often with sophisticated theoretical bases can best be researched in large libraries. Then too, as much as one-fourth of their work in libraries is in fields that are peripheral or completely unrelated to the major emphases of their own organizations' libraries. Unfortunately, these needs in unrelated areas are not predictable, neither in their timing nor subject area, hence cannot be planned for and accommodated by the typical industrial research library.

For some of the respondents, other libraries were convenient to their homes. This is not a significant planning factor for regional library service, however. That is, it would not pay off in a large increase of frequency of use to try to disperse regional research resources into more residential areas. Longer evening hours of service in the central public research libraries appears to be a more relevant factor.

With all of their relatively weak interaction with libraries, many scientists are quite vocal about what they prefer in them, or what it would take to make libraries generally more attractive to them. Although they like broad collections, and are pleased to be able to find materials of all kinds and ages, they would still like to have the newest and the highest quality material featured. The scientists undoubtedly have in mind two uses of the library, although they do not distinguish between them. On the one hand they sense the value of a large library for those few occasions when they must do exhaustive research, but at the same time they think of libraries as places where they might from time to time browse among the newer high quality research materials with no particular problem in mind. Even when they are confronting the library for extensive research, they prefer to have the

material screened so that only the best is at hand. Few of them recognize the difference between the problems and techniques of providing intellectual and physical access to information. The major abstracting services can help to screen out items that the scientists can bypass in their searches. The librarian turns first to the secondary sources when searching for information, precisely for this reason--this search increases the probability of success in physical retrieval relevant of material.

The scientists somehow tries to get directly at the primary sources of information.[9] This phenomenon is evident in the frequency with which respondents suggested that they preferred open-stack libraries. Many who did not suggest open stacks were nevertheless querilous about having to wade through circulation routines, and to wait for books to be delivered all too slowly from closed stacks, only to find that the material was of little value. In getting materials from libraries they prefer to do it themselves.

Part of their problem, of course, is that these scientists have difficulty specifying their information needs with precision, except when they are searching for a fact or piece of data. This may help account, too, for the frequency with which the scientists and engineers called for more librarians with science training as an inducement to them to use libraries. The problem of communicating needs is reduced if the information officer can conceptualize the user's work task or project in the same terms as the user, and can translate the need into sources of information that might be value to the user. The same difficulty in specifying with precision the problem or the information needed confronts the developers on the new information systems and services, particularly where the computer is used as an aid to analysis.

Finally, the scientists would themselves like to see more integration of library effort in the community. Their interest in the METRO Science Library Project was whetted at those points where the mobilization of various community resources and the creation of networks and systems was being probed. These people, like many of the librarians that serve them, have been too much disaccommodated by being referred from one library to another, often with the assurance that the next library would be the one that would help them. They sense that librarians themselves do not know the community's resources to the degree required to bring them to bear effectively on the wide range of problems brought to them.

The METRO Science Library Project was not designed to obtain critical comment in detail about the suitability or the shortcomings of individual libraries in the service of their primary clientele.

Nevertheless, the Science and Technology Division of the New York Public Library was so prominently featured in responses from the community that an assessment of its utility was inevitable.

The collections of the New York Public Library were noted for their strengths as research collections in all of the subjects covered by this Project. But competition for the use of the collections is heavy and the staff of the Science and Technology Division is too small to offer full-strength services. In addition, the location of government documents and current serials in other departments makes it extremely difficult for scientists to obtain full power from use of the Library, particularly in view of the great importance of these two media in science and engineering. Scientists are oriented toward information - not the format in which it is published. To ask them to categorize and sequence their searches for information according to the type of publication in which it might be found was frequently cited as sufficiently discomforting to cause the users to go elsewhere or to do without. This helps account for the popularity of the cohesive and compact collections of the Chemists' Club, and to some extent of the Engineering Societies Library, even though one is painfully overcrowded and the other somewhat out of the major traffic patterns. Should the Science and Technology Division move from the Main Library Building, as has been recommended, the further physical separation of its collections from the current serials and the government documents relating to science would be devastating to public service.

Other attributes of the New York Public Library are distracting. The stacks are closed, which forces users to be more specific about their needs than they usually can be at the outset of their searches and throws them at the mercy of a card catalog that does not contain the language they need for a search dialog and of a busy staff. Again the open stack arrangement of the Chemists' Club Library was cited as an attractive and important environmental feature.

The operational pattern of the New York Public Library is understandable, given the demands placed on the collections, the problems of maintaining the records of acquisitions, of cataloging and arranging of research materials, and the cavalier manner with which the public treats material objects in large and impersonal institutions. But the pattern of operation is not inevitable. Different quarters, more attractively designed, and featuring controlled access, at least to the new and the most frequently used materials, would induce more scientists to utilize literature resources for their informational needs than is now the case.

Other relief must be given to the New York Public Library to allow the public to draw full power from its extensive resources. Various missions served by the Library should be sorted out and staff and additional facilities installed to meet competing demands. As it is, the same staff must deal with patrons in person, over the phone and by mail. They must interpret card catalog entries; look for answers to quick information questions; search for the most obscure information and data; explain the library and the use of bibliographies, indexes, and other resources to users; supervise the retrieval of material from the stacks; and play watchdog in the reading room - all at the same time. The library has sufficient literature resources to back up a wide range of services, but more staff, different space, and a commitment to active exploitation of the information in the literature to the advantage of the community are the keynotes of the demands from the scientific and engineering community.

Libraries and Information Service

As might have been expected following the findings of other studies, libraries are considered by scientists and engineers as sources of publications, and occasionally places to obtain quick answers to factual questions, but not as active agents in analyzing and matching scientific and technical problems with information. A number of the engineers did refer to the search service of the Engineering Societies Library and suggested that the library community examine the possibility of extending this service to other subjects. Most frequently when the respondents to this study mentioned the potential for new information services in the region, they did not tie their suggestions very emphatically to the prospects for library administration and management of the services.

This does not mean that New York's science libraries should not take an active role in establishing and operating information services. A number of scientists recognize that libraries command a technology and large stores of information that should make at least some of them centers of innovative services. What is required is a commitment by libraries to the idea that they should take the initiative in exploiting their collections in special ways demanded by science users, and the provision of staffs of adequate size and subject expertise to do the job. The science community is willing to pay the costs of these services if they match the effectiveness of the information obtained. Many scientists volunteered that they would pay; not one suggested that the libraries had an obligation to offer special services free.

Suggestions of all kinds were offered by the scientists and engineers: computerized subject searches in libraries, ties with other

regional service operations, networks with specialized information centers around the country, fact searching services, selective dissemination announcement services for publications received by libraries, information searchers for hire, product specification data banks, and a host of others. The coordination and systematization of all these services was latent in the language of most of the suggestions. Several scientists were outspoken on the need for integration, not only of future services, but of present library effort.

Not every kind of information need can be fulfilled from literature-based resources. Many information problems can best be solved on a person-to-person basis with consultants serving as information transfer agents, utilizing a variety of sources of information. Some of these information stores might never have been published. In some fields, new information is being developed so rapidly, or is needed so soon after development, that research project directors go directly to those who can utilize the information to make oral reports. In other fields, it is not really information, but large quantities of data that are required, often accompanied by special analyses and correlations. Storage of such data in nonprint media, and recall and analysis of such data tailored to the demands of the users, suggests the kinds of work that data archives and computer data-processing centers can best perform. It is neither improbable nor out of order for a library to administer such information and data services. It would, however, be unusual.

There is a compelling reason why libraries in the open sector, and particularly public libraries, should become active agents in offering nontraditional information services to the public. The slow but certain growth of the size, power, and number of highly sophisticated and unusual commercial and government information services, frequently computerized or based on computer printout, is slowly changing the nature of the environment for the interface between the individual scientist and his sources of information. Many of these new services are quite expensive, and some of them require the batching of a number of users' questions before it becomes economical to activate the information searching processes. All of this suggests that access to the products of the new information technology is becoming highly institutionalized and available only to the large institution at that.

The point is that unless some mechanism is developed by a public enterprise to provide access to these tools for the unaffiliated scientist or engineer, he may find himself totally excluded from these powerful resources, and thus at an intellectual and competitive disadvantage to his peers, unless he is willing or able to affiliate with

a large and rich research agency. The independent consultant, the staffs of small research and testing laboratories, science writers, and the faculties of many colleges and universities are in this category, and there is no way for them to make this affiliation without losing their important roles that require their independence or small size. There are far more than enough of these people to make this a vital issue.

Although the majority of scientists and engineers who might need these services will already be working in large research agencies, someone ought to be concerned that this does not become the only way the individual can have access to these important tools. The public library could well be the agency that can best assume responsibility for the individual scientist in this regard since it is the one kind of agency that is universally charged already with the task of providing physical and intellectual access to information and publications for the individual citizen at large.

One of the principal issues that has yet to be faced in this matter is whether the economics of production of the data bases for these services can accommodate access by individuals through public agencies at a price that either the agencies or the individuals can afford. Any dilution of the capability of the producers of the services to recover their costs through sales of services or copies of the data bases likewise reduces the ability of the producer to continue operation. There seems to be little alternative but community subsidy of information services through support of a regional, publicly accessible information enterprise as the route of access to the new tools at a cost individual users can afford.

The Goals for Action

So this is what we face. The library collections of the area are excellent overall, and fortunately, the open sector of the library community contains the strength of the region's resources. But these resources are packaged into several hundred physical locations and are cordoned by jurisdictional constraints, both of which work to set up barriers to physical access that cut across intellectual boundaries of many science subjects. This seriously hinders full exploitation of the region's collections by many people.

The community of scientists is so large and dispersed that the size of the library enterprise to serve them must be large, and must contain alternative communication mechanisms in lieu of equalization of direct physical access to all its parts by all scientists.

In many ways scientists evidence needs beyond the capacities of their own organization libraries, and they have only a dim idea of the problems involved in drawing upon other libraries on their behalf. Patterns of interlibrary use have evolved into informal systems with their own rules of operation. These systems are not planned, but exist because of the traditions of voluntary cooperation among librarians and an ethic of man's right to knowledge - particularly in academic and public librarianship. At present, the degree of utility of these systems is a function of the ingenuity of librarians and the energy and skill of information - seeking scientists.

The burden of public service to science falls on relatively few libraries, principally the large or highly specialized research collections in the open sector of the library community, which consist of public, academic, and association libraries. These libraries are overburdened with this use, even those for whom the public is supposed to be their primary clientele. Throughout the region, the use of these libraries is reduced in effectiveness as they are called upon to serve kinds of people and missions for which their collections and staffs are not organized and maintained. Misinterpretation of the motives for restrictions on public accessibility and services offered by these libraries has resulted, which causes serious criticism for the entire library community.

Gaps and shortcomings in public service exist for science library users, although there is little overt pressure on the local library community directly from the science community to rectify this condition. This is largely a function of a lack of skill on the part of scientists in specifying their information needs in terms meaningful to the design and operation of information systems, and the fact that libraries are not very obvious to them as agencies that can do much to help them. The initiative for establishing services will have to be taken by librarians, who after all are the holders of the expertise and technology in service systems utilizing literature-based information resources, and who know what these resources can do for scientists and engineers.

The challenge is threefold; first, to build each library to the strongest possible position to serve the unexceptional needs of its primary clientele; second, to create a public system from the readily available and unique elements of existing libraries and facilities yet to be established, in order that all scientists and engineers in the region can have physical access to materials they need within time constraints they deem acceptable; and third, to provide the facility for the highest order of intellectual access to information by the public of which present and future information technology is capable.

Notes

1/ The academic institutions in this list are those that offer degrees or emphases in science. Other academic institutions may collect science materials, but they were not covered by the Project.

2/ Includes the Bronx campus that is now the separate Herbert Lehman College campus of the City University of New York.

3/ Although there are several other important public libraries in Westchester County that collect science materials, Yonkers is listed since it has been given special responsibility for the sciences for the entire Westchester Library System.

4/ Lapp (1966).

5/ Among these other libraries the Linda Hall Library, the John Crerar Library, and the Library of Congress were prominently featured.

6/ The 3 R's Program: Meeting Industry's Informational Needs (1967).

7/ Chemists and physicists have the most urgent demands and place the most stringent requirements on library systems to deliver publications within minutes or hours of demand. Nevertheless, even in these disciplines 78.1 and 77.3 percent of the respondents, respectively, reported they could wait from one to several days for publications. In both the pure and applied sciences about 25 percent of the respondents reported they could wait at least one day for the delivery of publications. Fewer than 20 percent in both disciplines reported needing publications in less than one day.

8/ Excellent summaries of the characteristics of use, users, and literature are contained in Bradford (1953), Hanson (1960), Hanson (1964), Herner (1954), Stevens (1953), Vickery (1961), and Voigt (1959).

9/ Shaw (1940).

A PROGRAM FOR ACTION: RESOURCES

4

1. At least $400,000 must be added to the annual expenditures for the purchase of library materials by the 38 public, academic, association, and museum libraries in the open sector that offer service to the professional physical science and engineering community in the METRO region. Nearly $60,000 more is needed annually by these libraries for the preservation of library materials.

2. At least 77 additional positions, at a total estimated cost of $424,000 a year, should be added to the 38 open-sector libraries surveyed for normal service to the physical science and engineering community.

A large step can be taken towards the attainment of the objectives of the 3-R's program through the strengthening of individual reference and research libraries' collections to support the services each of them offers to its primary users. Although all libraries with broad and liberal interests should be encouraged to improve their holdings in science and technology, the 38 libraries in the open sector identified in Chapter 3 that support education, research, and other information functions in these subjects have a particular obligation to do so. If these libraries are to be linked together for cooperative regional service, it is even more essential that each of them be as strong as possible in its own right. The requirement that libraries conform to standards or have plans to do so in order to qualify for membership in the 3-R's regional agencies recognizes this principle.

The director of each of the libraries supporting physical science, engineering, and mathematics programs in the open sector was asked to specify how much of his library spent annually for library resources for these programs. Further, each was asked to specify how much he judged should be spent annually for ideal collections and services. The term ideal was defined as implying the level of operation that in the judgment of each respondent would have met all of the unexceptional needs of the library's primary public and the reasonable needs of others from outside the organization or region who might seek to use resources or services in which the library maintained exceptional strength.

The figures contained in these first two recommendations were obtained from the cumulation of the differences between the actual and the ideal figures reported by the librarians of the open-sector libraries, adjusted to include estimates for the libraries that did not respond. Libraries were grouped by type (public, academic, other) and size (large,

medium, small) prior to this adjustment. Extreme figures (one very high and one very low) reported by several libraries were not included in the calculation. These libraries were added to the group of nonrespondents.

The additional funds are essential for the provision of basic library services to each library's public and are in addition to the elements of resources and services subsequently recommended in this report. The shortage of staff is a most severely limiting factor in the planning for even moderate increases in public accessibility to the resources of the open libraries. The amount recommended here is a minimum figure and would finance only four new positions in each of the four largest libraries, three in each of the medium-sized libraries, and less than one in each of the 20 small libraries.

3. A program of regional collection development in science and engineering, based on cooperative acquisition of materials and a continuous review of collection specialities and strengths among the region's science and engineering libraries, is required to fulfill several purposes: (a) to join together library communities with similar demands in order to justify the acquisition of various materials for which the demand from any one of them is insufficient to support alone; (b) to place duplicate materials judiciously throughout the region to meet needs from local enclaves of users who cannot or do not have the time to travel too far to get material they need urgently; (c) to bring into the region material that is not otherwise being collected, but for which local demand dictates a speed of access greater than can otherwise be organized; (d) to assist particularly the large libraries in their attempts to serve missions other than those for which they have been organized, but that for various reasons they are otherwise in a position to serve; (e) to allow libraries with similar missions and clientele to pool their resources in order to obtain a broader representation of literature among them than would otherwise be possible.

Information obtained from the managers of the science and engineering collections in the core libraries, who were asked to specify the criteria to be used to guide plans for cooperative acquisitions, cannot be translated by itself directly into programs for action. These librarians identified no less than 20 categories of literature that might well be cooperatively collected in all of the subject fields included in this survey, and according to six operational criteria, but in no particular pattern of combination of these elements. There is, however, sufficient meaning in this information when coupled with observations of existing local collection specialties, other cooperative programs in this country and abroad, and in the patterns of existing local interlibrary use in the region, to direct the establishment and initial operation of a strong and

serviceable regional collection that will satisfy the demands of users without serious dislocation of the traditions of local autonomy and economy of library operations.

No startling, unprecedented, or simple approaches to the operation of cooperative acquisition programs were uncovered or suggested by the data gathered for this study. None of the open libraries reported being involved in formal collection development programs with other libraries in the region. Several libraries noted that they refrained from collecting patents because of the strength of the New York Public Library's collections, and a few of them mentioned their reliance on the large collection of scientific and technical reports at Columbia University, and of standards at the United States of America Standards Institute. Nevertheless, the needs of the community and the existence of islands of strength in libraries large and small in the region suggest that several standard techniques of cooperative acquisition of science and engineering library materials are needed and might well be combined in an innovative program for the region. This program would encompass five patterns of cooperation that would concentrate simultaneously on broad subject orientations, on small and powerful subdisciplinary collections, on large collections of little-used or hard-to-acquire material, and on enclaves of kinds of users that focus attention on limited geographical segments of the region.

The patterns of cooperative collection development that should be undertaken in order to meet the many mission needs of the total science community are, then:

(a) A few libraries should concentrate on special materials by type, making certain that as complete collections of these materials as possible are available. Existing extensive collections of three important types of materials that can thus be made available to all scientists and engineers in the region were frequently identified as follows: scientific and technical reports at Columbia University; patents at the New York Public library; and standards at the United States of America Standards Institute. These three collections should be sustained and publicized as regional resources. Table VII lists these and other possible categories of materials that can form the basis for negotiated agreements for collection responsibility. Some of these materials can be linked to the programs organized by subjects as later recommended.

(b) The responsibility for maintaining strong research collections in each of the major subdivisions of the physical sciences, engineering, and mathematics, to be accessible to the qualified public, should be assigned to those libraries that are already committed to the maintenance of research collections, according to their existing

TABLE VII.

RECOMMENDED AMOUNT OF DUPLICATION IN THE REGION AND DESIGNATED AGENCY FOR COLLECTION DEVELOPMENT OF SEVERAL KINDS OF SCIENTIFIC AND TECHNICAL LIBRARY MATERIALS

Type of Library Material	Amount of Duplication Recommended for Regional Service: Heavy	Moderate	Light	None	Library Recommended as Designated Agent for Collection Maintenance
Current research journals	x				Various according to existing specialties.
Old research journals (core)	x				Various according to existing specialties.
Old research journals (little used)				x	CENSSUS
Current trade journals		x			Various; CENSSUS
Old trade journals				x	CENSSUS
Scientific/technical reports			x		Columbia University; several depositories for selected series.
Patents				x	New York Public Library
Standards				x	United States of American Standards Institute
Specifications (Fed/Mil)				x	New York Public Library
House Organs				x	CENSSUS
Geological survey documents			x		Columbia University; AMNH
Observatory publications				x	Columbia University
Old editions of textbooks				x	DASC
Old editions of handbooks				x	DASC
Bibliographies/indexes			x		Various/SPINBIB
Government documents	x				Various according to subject specialties of libraries. Complete collections to be maintained at the New York Public Library and the Westchester Library System.

strengths. A commitment to support advanced research, and not the size of the library, should determine the suitability of a library to participate in this phase of cooperative collection development. Each field may be assigned to more than one library if several important collections are already being supported for several major groups of researchers. Table VIII lists the major subdivisions of the sciences considered in this survey according to the Dewey Decimal classification and identifies the existing collections of strength among the core libraries in each of these areas. These libraries should take the initiative in developing a regional program for the operation of publicly accessible research collections in all phases of science. Other libraries that may develop strong research collections should be recruited to this effort as they are identified. Table IX identifies some of the libraries whose collections in various science fields are likely to be in this category in the near future.

(c) Regional library service should capitalize on the strong and highly specialized collections in segments of disciplines maintained by many libraries because of some particular local need or interest (e.g., fire prevention at the Brooklyn Public Library; industrial engineering at Columbia University). These collections should be identified and inventoried, and those that are deemed important to the community at large should be incorporated in the cooperative system and strongly maintained in addition to the more general collections previously recommended. This is the aspect of cooperation to which industrial libraries might best be able to contribute, even though they might not be able to guarantee the viability of their commitments. Since these industrial collections would be in addition to the broader and more comprehensive ones previously recommended, they could be withdrawn from the public system without serious effect. Published regional inventories will provide a starting point for locating these collections, but as will be pointed out subsequently, these inventories are inadequate to the task of guiding collection development decisions. A standardized technique of evaluation of these collections will have to be devised before their potential for public service can be assessed.

(d) Academic libraries in close proximity to each other within the region should explore ways to cooperate in building collections that serve some of the more urgent and special mutual needs of their faculties and students that might not be met adequately by the more general structure recommended above. The formal Academic Libraries of Brooklyn plan can serve as a model. Similar subregional grouping of libraries can be identified throughout the area. The chief criteria for their affiliation should be the similarity of their missions and levels of scholarship served, and the ease of travel among them. Such groupings offer the greatest hope for the creation of resources sufficient to sustain the research interests of faculties of small colleges, and the breadth of course offerings they wish to offer.

TABLE VIII.

SUBJECT AREAS OF POTENTIAL SPECIAL COLLECTION STRENGTH NOTED AMONG RESPONDENT METRO AREA ACADEMIC AND PUBLIC LIBRARIES.*/ (DEWEY DECIMAL SYSTEM MAJOR SUBJECT CLASSES)

Subject	Library of Strength
ASTRONOMY	
Celestial Dynamics	19
Observatories and Instruments	19
Descriptive Astronomy	15,19
Earth	
Geodesy	16
Celestial Navigation	
Time Measurement	19
Astronomical Maps and Charts	19
CHEMISTRY	
Physical Chemistry	1A,4,15,19
Apparatus	
Analytical Chemistry	4
Qualitative Analysis	
Quantitative Analysis	4
Inorganic Chemistry	1A,4,19
Organic Chemistry	1A,1B,4,15,19
Crystallography	3,14
Mineralogy	3,14
EARTH SCIENCES	
Physical, Structural Geology	1A,1B,15,16,19
Petrology	16,19
Economic and Applied Geology	16
Geology of World Regions	1A,16,19
Paleontology	3,19
Meteorology	3,19

Subject	Library of Strength
ENGINEERING	
Aeronautical	3,16,19
Chemical	3,16,19
Civil	3,16,19
Industrial	3,16
Mechanical	3,16,19
Metallurgical	3,16,19
Military	15
Mining	3,16,19
Nuclear	3
Petroleum	19
Electrical	3,16,19
Naval	19
MATHEMATICS	
Arithmetic	1B,1D,10A,19
Algebra	1A,1B,1C,19
Geometry	1B,1C,19
Trigonometry	1A,1B
Calculus	1A.1B,19
Special Functions	1B,19
Mathematical Statistics	3,19
PHYSICS	
Mechanics of Solids	19
Mechanics of Liquids	16
Mechanics of Gases	1B,4,16,19
Sound	19
Optics	4,19
Heat	19
Electricity and Magnetism	4,16,19
Molecular, Nuclear, Atomic	1B,4,19

*/ These are the same library designators used in Table I: 1A, Brooklyn College; 1B, City College of New York; 1C, CUNY, Graduate Studies Division; 1D, Queens College; 3, Columbia University; 4, Fordham University; 10A, New York University, Science Library; 14, American Museum of Natural History; 15, Brooklyn Public Library; 16, Engineering Societies Library; 19, New York Public Library.

TABLE IX.

GENERAL SUBJECT COLLECTIONS IN SCIENCE DISPLAYING EXCEPTIONAL GROWTH AMONG RESPONDENT METRO AREA LIBRARIES

Subject	Library	Current Rating*/	Serial Titles Currently Received
ASTRONOMY	Engineering Societies Library	B	95
CHEMISTRY	Brooklyn College	C	162
	City College of New York	B	114
	Queens College	A	112
	Manhattan College	A	60
	New York University, Science Lib.	B	285
	New York University, Engrng. and Science Library	A	100
	Yeshiva University	A	96
	Brooklyn Public Library	B	105
	Engineering Societies Library	B	197
EARTH SCIENCES	Queens College	B	69
	Brooklyn Public Library	B	69
	Engineering Societies Library	C	843
ENGINEERING	Manhattan College	B	526
	New York University, Engineering and Science Lib.	B	373
	Brooklyn Public Library	B	175
MATHEMATICS	CUNY, Graduate Studies Division	C	193
	Yeshiva University	C	190
PHYSICS	New York University, Science Library	B	230
	Brooklyn Public Library	B	55
	Engineering Societies Library	B	359

*/ Levels of collecting, as defined on the Collection Evaluation Form, Appendix B, are: A-Basic Information Collection; B-Working Collection; C-Comprehensive Research Collection; D-Exhaustive Collection. Subsequent to the receipt of the evaluation and site surveys, the definitions were modified as follows: A-Information; B-Basic Study; C-Working Research; D-Comprehensive Research.

(e) Certain types of materials for which the demand is either extremely high or extremely low, and that are not already accommodated under any other phase of this plan, should be acquired on behalf of the region by central facilities, particularly the New York Public Library, CENSSUS, and DASC.[1/]

The assignment of responsibility to any library for any aspect of collection development on behalf of the region shcuild not deter any other library from developing strength in the same aspect if local demand so requires. The delegation of responsibility for maintaining a regional collection on specific topics, or of certain kinds of materials, might be shifted from one agency to another under these circumstances if all indications are that this should be done. Neither should cooperative acquisition programs be used by any library to shift to another library a significant amount of use over extended periods of time by a major segment of its primary clientele, unless, of course, there is agreement among several cooperating libraries that recognizes and accommodates this shift. In principle, each library should meet the majority of its continuing needs with its own resources. The library community will have to consider the development of sources of subsidies to assist libraries in accepting responsibilities for maintaining regional, public resources, that require them to operate at levels of collecting higher than would normally be expected of them in the support of their primary clientele.

Cooperative acquisition programs must be accompanied by open access to the special resources so acquired for reasonable use by any qualified user. Subsidy funds for both technical and reader services should be sought for the cooperating libraries to the extent that this can be justified by each library through indicators of the workload imposed by regional use of resources in the areas of their specialties.

The librarians in charge of science and engineering library collections who contributed to this phase of the study considered the following services highly important to the successful operation of reader services based on cooperatively developed collections: union catalogs, centralized referral services, delivery services among cooperating libraries (once-a-day deliveries were most frequently mentioned), Teletype or other quick communication facilities to use for checking on the availability of specific items, and uniform access by users to material cooperatively acquired. These are listed in the order of the average ratings given to them by 26 of the libraries in the open sector.

Scientific and technical reports, government documents, and patents were singled out often enough by respondents as materials that might be considered, by type, for cooperative collection development programs, that comments on these kinds of publications are appropriate.

Scientific and technical reports. The report format has been used for years by scientists and engineers to disseminate various kinds of information: brief notes and comments on research method, potential solutions to problems, research progress notes, final reports of research results, translations of foreign articles, working text of handbooks, tables of data, and many similar items. Many of these reports are meant to be ephemeral; some contain advances in research that are not found anywhere else.

Reports have been used for controlled and quick circulation to those who have a need to know, as determined by the research sponsor, the author, or some distribution agency related to these parties. While the distribution of this material is thus haphazard and unsystematic, useful collections can be acquired with diligence and constant attention to the progress of research. Few libraries, however, would find it worthwhile to maintain large report collections of broad subject scope for too long. Because of the low probability that any one report will be called for, it takes a large community of scientists to create sufficient demand for enough of the hundreds of thousands of reports that could be saved to make it work worthwhile investing space and staff to the logistics of acquiring, inventorying, and servicing even one such collection.

Nevertheless, these reports, even the ephemeral ones, have a peculiar viability, being referred to sometimes several decades after their first issue. The older reports are more difficult to acquire. In addition, the several government agencies that have been set up to serve as clearinghouses for the sale or distribution of reports have been too slow in their response for copies, although this situation has improved considerably in recent years. The prices of reports distributed by the Clearinghouse for Federal Scientific and Technical Information have gone down, but as it is almost impossible to ascertain from titles or indicative abstracts whether a report will have information of value, even these low prices might be prohibitive.

Improvements in the availability of reports in the New York area were cited as one of the measures that would greatly increase the use of libraries by scientists and engineers. Clearly, a local depository of as many reports from as many agencies as possible, where the reports could be made quickly available to the public for reading, copying, and circulation, is an essential facility. Individual libraries may still want to collect reports for their own collections that are determined to be appropriate to their selection policies, but the availability of a large central collection would allow them to concentrate on the current awareness function.

Columbia University has long been a depository for report series from the largest government agencies and from engineering experiment stations throughout the country. Columbia has the collection of

reports issued by the former Office of Technical Services of the U.S. Department of Commerce (PB Reports) that were once housed in the New York Public Library. A collection of the reports of the World War II Office of Scientific Research and Development was given to the University when OSRD was closed. Other series, now impossible to obtain, have been saved by Columbia. In the early 1960's the University was designated by the Federal Government as a regional depository for all reports from the Defense Documentation Center (ASTIA Documents) and from the Clearinghouse for Federal Scientific and Technical Information. Columbia drew together its own dispersed collections of reports to add to the depository. Although the deposit agreement no longer exists, the size of the collection put together by Columbia, and Columbia's willingness to continue to service the collection, makes it the logical designee as the center for continued effort in maintaining a report collection for the region.

Government documents. The publications of the United States and the governments of other industrial nations have long been primary sources of information and data for science and engineering. In fields such as mining, geology, and physical standards, these documents may be the only sources of information. While many agencies disseminate information in the report format just discussed, more is published in other formats that require different acquisition processes.

The Federal Government and American libraries have long cooperated in making official documents available to the public through the official depository laws. Under the terms of the present law (Depository Library Act of 1962: PL87-579), 22 such depositories, partial and full, have been designated in the New York Metropolitan area. For the record, these are listed here:[2/]

C.W. Post College	Cooper Union
U.S. Merchant Marine Academy	NYPL, Astor Branch
Queensborough Public Library	NYPL, Lenox Branch
St. John's University	CCNY
Queen's College	New York University
Brooklyn College	New York Law Institute
Polytechnic Institute of Brooklyn	Columbia University
Pratt Institute	Fordham University
Brooklyn Public Library	SUNY Maritime College
SUNY Downstate Medical Center	Yonkers Public Library
Wagner College	Mt. Vernon Public Library

Although most of these depositories are not public libraries, the documents are a public resource. Yet, except in Westchester County, little has been done to call the public's attention to this material

and to attempt to assess the quality of the collections in terms of the region's needs. The Westchester Library System has taken a very simple and expedient step: it has prepared an inventory listing, arranged according to the Document Library's classification numbers, of the publication series received by the Yonkers and the Mt. Vernon Public Libraries, the two designated depositories in the system.

This inventory listing should be made as quickly as possible, for the other depositories in the area. The results ought to be useful to the public, to individual libraries, to those planning regional collection programs, and to the Federal Government. Although each library should retain its depository agreement in light of its own selection policy, some of them might find sufficient justification in the evidence of duplication to streamline their collections.

Some of the more avid library users among the scientists and engineers noted disadvantages in the housing documents as separate collection, as is done in the New York Public Library. They point out, and with some considerable justification, that this introduces an artificial separation of elements of closely related information in almost every phase of science, and is just one more of those elements of inconvenience to the user that suggests to the scientist that libraries are not the place to go for information. Every possible step should be taken by all libraries to integrate at least the non-administrative government documents with the regular collections of science materials in their stacks if they do not already do so.

Patents. Patents are not considered major sources of information by most scientists and many engineers. Nearly 60 percent of the respondents to the Project's questionnaire did not know enough about the collections of patents in the region to be able to evaluate their adequacy. As a matter of fact, the New York Public Library maintains complete files of patents from the United States (from 1871 to date), Great Britain (from 1617 to date), and extensive holdings from France and Germany, and publications varying in completeness from 35 other nations.

Many large corporations, particularly those involved in developing new products, collect patents for the use of their own engineers, technicians, and attorneys. Some utilize the files in the Patent Office in the Washington, D.C. area.

Searching patents, either for evidence of a specific piece of information or for information in general, requires training and a special skill based on a knowledge of what patents really are, the language and style used in this unique medium of literature, and the state

of the art in whatever field is under study. To obtain full value from the kinds of information contained in patents, they must be used in conjunction with the open, regular literature of technology and the court records of litigation of patent claims. Furthermore, the information searches among large and general files of patents can best be made through a full knowledge of the classification system utilized by the Patent Office and a collection of patents that is then based on this classification. From the standpoint of the examiner, the ideal situation obtains when duplicate copies of patents are filed under many subject classifications--a collectanea, so to speak. Few agencies can afford to maintain such files. Nor is it recommended that any such file be established in New York City, at least on the basis of evidence gathered during this Project. (The people to whom patents are particularly important should be sought out and consulted about the further development of local public patent files.)

There seems to be no question that the numerical file of patents at the New York Public Library should be continued. The respondents who used these collections were either noncommittal or critical about the files. The critics prefer a more convenient location than the 43rd Street Annex, more study space associated with the collection, and speedier acquisitions. At present patents are made available as soon as they are bound, a process that might take from two weeks to two years. The seriousness of the delays occasioned by this policy should be carefully examined with the cooperation of the principal users of the collections.

The separation of the patent collections physically over such a long distance from the facilities of the Science and Technology Division of the Library is troublesome in that it makes difficult the consultation of the few indexing and abstracting services, such as Chemical Abstracts, that cover patents. Once again, however, the cost of adding these bibliographic services to the New York Public Library's Patents Collection would far outweigh the value of the effectiveness to scientists and engineers in general, hence is not recommended again on the basis of data received during this Project.

4. Supplementary academic library collections to serve college and university students in engineering and the physical sciences should be established at several key locations throughout the METRO region in libraries that already exist.

The sophistication of the collections used by college and university students increases, and the geographical range of the libraries decreases, as the students move through their academic training. Undergraduate students who were contacted during this study reported heavy use of the branches of the public libraries,

and with some frequency; graduate students seldom mentioned these facilities. Once they begin graduate study, students begin to orient themselves to the literature needs and use patterns of trained scientists, whether through emulation or because of the realities of scientific research.

The graduate students who reported using libraries other than those in their own schools, concentrated their use on other academic and research libraries, principally the central facilities of the public libraries, Columbia University, the Engineering Societies Library and the Chemists' Club Library. Graduate students also report the use of several medical libraries, the American Museum of Natural History, and the American Institute of Aeronautics and Astronautics. Only one of any of these was even occasionally mentioned by undergraduates. Therefore, graduate students probably will be accommodated by whatever strengthening can be gained for library resources for professional scientists. Some other arrangement will have to be made for the undergraduate students.

Library resources required for undergraduate students in the physical sciences and engineering are not excessive. Lecture and problem-solving techniques dominate the educational process in these fields. Advanced undergraduate students require exposure to a reasonable range of monographs, journals, and reference books as they seek alternative presentations to those in their textbooks, and search for examples of the development of modern theory and the demonstration of research method that is part of every research article in science. A good selection of basic materials and general journals in science, including the news journals, is therefore required for undergraduates.

Undergraduate students in the physical sciences and engineering who responded to the questionnaire displayed only slight involvement with libraries for support of their science studies. Their indifference, regardless of its reason, was evidenced by an almost total lack of free comment on the questionnaires, something that cannot be said of the graduate students and the scientists. The undergraduates reported use of 72 branches of the City's major public library systems. Nearly 40 percent indicated that they used libraries other than those of their schools to support their science studies. Only a handful reported the use of the advanced professional collections such as the Engineering Societies Library. One must wonder about their real need since many of the branches of the public library systems do not have much, if any, of the professional literature of science. Over 25 percent of the respondents indicated that their use of other libraries was attributable to the readier availability of more useful material in them than could be found in their college libraries.

Probably the most significant aspect of the undergraduates' responses was their obvious need for college-level facilities other than those of their schools. Nearly 70 percent of the respondents used off-campus libraries, either in the public library systems or on other campuses. The convenience of these other libraries to their homes was given as the reason for this use in over 80 percent of the cases. Overall the range of travel times from their homes to their school libraries was twice as long as from their homes to other libraries. They reported travel time of up to 60 minutes to get to libraries nearer to their homes than the campuses of the colleges they attended.

In general these students reflected the same needs that were evidenced during an earlier study for the Council of Higher Educational Institutions in New York City. The report of that study[3/] recommended the creation of "a system of supplementary academic libraries that would be built and operated in the metropolitan area primarily for the use of higher education students." The evidence from the METRO Science Project and the administrative judgment of the heads of several of the large research and public libraries in the area, reinforce the recommendation of that earlier study in general, but, insofar as physical science and engineering students are concerned, gives little support to the suggestion made in the earlier report, that entirely new and administratively separate library facilities be established.

Instead, it is suggested that the following libraries should be given consideration as the designated agents for supplementary, publicly accessible college library services in the physical sciences, engineering, and mathematics:

Manhattan:	New York Public Library (Mid-Manhattan Library)
Queens:	Queensborough Public Library
Bronx:	Herbert Lehman College
Staten Island:	Richmond College
Brooklyn:	Brooklyn Public Library
Westchester County:	Yonkers Public Library

These libraries are recommended on the basis of their location and the ability of their book selection policies to support college-level studies in the sciences. Undergraduate students are already oriented

to the geography of academic and public library facilities. The Queens Borough and the Brooklyn Public Libraries can support college-level studies in science, and their collections, particularly of monographs, are as yet underutilized for that purpose. The New York Public Library's decision to shift college student use away from the Research Libraries and into the new Mid-Manhattan Library gives proper recognition not only to the college student's need, but also to the stress now placed on the Research Libraries in trying to serve both research and educational missions. The list of journals to be acquired for the Mid-Manhattan Library contains an excellent array of physical science and engineering journals. Because of the convenience of this new facility it should be highly publicized as the off-campus library headquarters for serious college students in the sciences and engineering.

The students of the City University of New York evidence an awareness that they are involved with an academic system with widely dispersed facilities. Many of them have located the CUNY campus libraries closest to their homes and are using them - which should be encouraged as all of the units should have basic, well-developed and broad-ranging undergraduate collections. This practice should be particularly encouraged on those campuses that can serve students who live nearby and do not have quick access to the strong central units of the public libraries in the area, particularly in the Bronx and on Staten Island.

The location of this special-purpose facility within or near, and administratively under the jurisdiction of, existing facilities has another benefit. Our data indicate that college-student use of independent facilities is likely to be concentrated in relatively few hours of the day, certain days of the week, and several periods during the year. One of the areas of least satisfaction to the undergraduate students in the METRO survey was the availability of library services on the weekends when their own campus libraries were closed or had limited hours of service. Unless independent facilities were conveniently located and adequately manned and stocked to serve some additional community needs, they might well be greatly underutilized for long periods of time. It would seem a wiser expenditure of funds to invest heavily in existing facilities that already serve other purposes in order to allow them to add or augment this dimension of public service.

The collections in these libraries should be planned in cooperation with the faculties of the 31 institutions of higher learning that offer degrees with majors or emphases in the physical sciences, engineering, and mathematics. The collections of these libraries, perhaps with the exception of the Mid-Manhattan Library now being formed,

would have to be augmented in order for them to respond fully to this task. The cost of augmentation would be in addition to funds already recommended for the enhancement of collections in the area's academic libraries. The libraries should be compensated, also, for their public service in direct proportion to the use of the collections.

In summary, the METRO Science Project findings urge the creation of an "independent," that is, publicly accessible, academic library facility within the strongest libraries and growing systems in the region, rather than the diffusion of limited financial resources through the creation of yet another system of facilities. The administrative resources, the intellectual talent, the sources of operating funds, and existing geographical conspicuousness of the libraries named would serve to put a public academic library facility into service sooner than would otherwise be possible.

It is also conceivable that Herbert Lehman College and Richmond College could be further developed into the ready reference and current awareness collections for professional scientists and engineers in these outlying locales, and as the access points for these people to the wider network of research collections and services recommended elsewhere in this report.

5. The quantity and quality of circulating collections of professional books and journals in science and engineering, particularly in Manhattan and Westchester County, should be increased and widely publicized.

Probably no other metropolitan region in the nation has as large a proportion of its publicly available science and engineering library resources restricted to library use or for controlled circulation only as does New York City. In the open sector libraries, only the Brooklyn Public, the Queensborough Public, the Yonkers Public, and the Branch Collections of the New York Public Libraries offer circulation services to the public at large, assuming they meet certain residence or place-of-work requirements. These services are not sufficient in size, nor appropriately enough placed, to serve the needs of the entire community.

Most of the industrial scientists may circulate materials from their corporation libraries, but of course, the subject scope and depth of collections of most of these libraries are restricted by the limited range of interests of the corporations. Academic libraries do engage in interlibrary lending activities, but this channel provides access usually only for certain graduate students and for

faculty members, and to limited kinds and amounts of materials. Frequently the newer and the most pertinent research materials are not available for interlibrary lending, and undergraduate students are left to fend for themselves. The materials in the Engineering Societies Library circulate only to members of the founding societies and to those corporations that purchase special membership privileges from the Library.

The collections of the Science and Technology Division of the New York Public Library and the Chemists' Club are absolutely non-circulating. In addition, most of the circulating libraries do not lend journals, at least to individuals. Almost all of the libraries do provide photocopying services in lieu of lending, but the cost of copying is prohibitive. A number of academic libraries will not lend materials to other libraries if they are close enough to send the users directly to the collections. It is not unknown for a local industrial user, in these instances, to have a far distant division of his company request an interlibrary loan in order to have the material transshipped back to him!

The Brooklyn and the Queensborough Public Libraries have excellent collections of basic and advanced monographs available for circulation to the qualified public. Both of these libraries could support wider use than is being made of their materials. The circulating collections in the other parts of the METRO area public library enterprise are reasonably well stocked with books about science, but are weak and unevenly developed across the range of subjects of concern to the Project in books and journals for the professional scientist and engineer. This situation will be partially remedied for Manhattan, the Bronx, and Staten Island with the creation of the Mid-Manhattan Library. The collections of that library will not be enough alone to augment the area's circulating collections.

The METRO Science Library Project barely touched this phase of library use. The need for circulating materials was listed without further specification by a number of scientists. In addition, these people suggested that such materials be made available widely throughout the library systems, which would be most difficult to do. As an immediate next step, the local public libraries ought to study the kinds of materials that now circulate and that are called for but that are not available in circulating collections, in order to ascertain the characteristics of these materials that can guide the establishment of collection development policies among them. A wide range of titles ought to be made available at central points in these systems especially to be sent out to the branches upon request. A few of the

larger branches in all of the public library systems must develop broad-scope collections on the premises, even though the number of titles within each subject area might be limited.

Whatever is done, special catalogs of this material should be widely dispersed throughout the region, and other public information devices should be used to attract scientists and engineers to these sectors of the library community. This publicizing is essential as the public libraries are not known as sources of such material.

6. The publicly available stock of bibliographical services and separate bibliographies should be increased, either through the purchase of more titles for the public libraries or subsidized public access to comprehensive, but relatively closed collections that exist among the science collections of the large university libraries in the region.

Access to the bibliography of science is as important to good regional service as is local access to materials. As a matter of fact, the bibliographical capability of any library enterprise created for the public should receive top priority, even ahead of the development of collections of primary materials. The ability to produce bibliographies by subject to any depth of specificity, of current and retrospective materials, in general or tailored to suit individual customer's needs, or according to any reasonable criteria, is the first service in which libraries should excel. This is the first step that leads to so many subsequent activities such as cooperative acquisitions, interlibrary borrowing, special collection development, and information analysis. If nothing else, librarians should be able to tell what has been published.

The number of standard bibliographical services in various subjects in public libraries in the METRO area is adequate, but far from outstanding. No one library can adequately serve as a center for bibliographical services in a wide range of subjects. The collections of secondary literature at the Engineering Societies Library are well developed as they must be in order to support the searching service of the Library. The bibliographical collections of the large academic libraries may be rated from good to excellent. Those that support doctoral research were found to be obviously superior to others. The bibliographical and other information services in a number of the industrial libraries range from poor to outstanding. The collections of this secondary literature in a surprising number of those libraries visited were inadequate, particularly in their ability to support retrospective searches. One of the most frequent criticisms from academic librarians was the low quality of the bibliographical

citations given to them by industrial librarians who did not have access to the large, particularly national bibliographies in which to verify references before beginning the public hunt for materials. This puts an added burden on the librarians who do have the bibliographical tools that they can ill-afford to bear. A subsequent recommendation calls for the establishment of public bibliographical and information services, which will require outstanding bibliographical resources. The same resources should be available for use by the public in their own searches and to help them verify specific references. Adequate staff should be available to assist the public in using these tools, either in person or by phone.

Very particularly, a few of the libraries of the region, particularly the larger ones should begin to develop machine search capabilities. The number of bibliographical services on computer tapes is not large, but is steadily increasing. The Atomic Energy Commission, the National Library of Medicine, the National Aeronautics and Space Administration, Chemical Abstracts Service, and PANDEX are just a few of the agencies that now distribute or sell tapes providing intellectual access to information in the literature. The Library of Congress will begin to sell tapes in the summer of 1968 in the MARC II format. These all should become part of the foundation of public service in the METRO region.

Several configurations for a public information facility are possible. A central agency could arrange to buy searching services for individual and corporations or other agencies in the region, contracting with publishers or producers of tapes for the searches. Libraries in the region might buy or lease the tapes and provide searching services for the public, either sharing the load among them, or centralizing their effort in a regional service agency. The problems and issues to be faced in implementing this part of the recommendation should be priority items for funding in the program of research and development (MACSINEX) recommended later in this report.

It should be anticipated that librarians and information officers will make more use of these bibliographical resources than will scientists and engineers. The use of these services should be promoted among the people in small businesses who are largely unserved by corporation libraries and librarians. This is an area of development that libraries in the region might undertake under the terms of the State Technical Services Act.

7. Stack space in existing libraries can and should be more economically used by the removal of various kinds of little-used material for transfer to less expensive space. A new Delayed Access Storage Center (DASC) should be established to house this material and should develop the capability of delivering material to the local libraries within one to three days of request.

Few of the libraries in the open sector reported serious space problems associated with their science and engineering collections that could not be internally resolved in the foreseeable future. Six of the libraries that responded to the Project's call for information estimated a requirement for space for cooperative storage of 129,000 volumes within 10 years. Site surveys of the nonresponding libraries suggest that storage space for 150,000 volumes would be required, given current collection development programs and ways of operating these science libraries.

A number of factors suggest that a larger center would not be inconsistent with regional needs. Some of the academic librarians noted that competition for space among various campus programs could cause a rapid deterioration in their favorable positions. Expanded programs of cooperative collection development and of public services as recommended in this report, if successful, are likely to increase the demand for space in a number of the libraries in the open sector beyond the anticipations of the librarians involved in this Project. DASC may then be a welcome and an essential facility. Unfortunately the burden of financing DASC might well fall to only a few of the libraries in the area, and unless a highly favorable cost-effectiveness ratio can be shown for the Center, it will be difficult to justify.

The lower utility of a considerable portion of the older literature in science and engineering, and the willingness of scientists and engineers to accept delays of from one to three days for some material, makes the operation of a delayed-access collection not incompatible with reasonable service. It would be a disservice, however, to store all old literature. Through experience most science and engineering libraries can designate the classics and portions of the published archives of science that should be retained in local collections.

All librarians contacted expressed some interest in cooperative storage operations, even though they felt no sense of urgency about the need for space. They were particularly interested in the operation of an acquisition program by a storage center on behalf of the region. The kinds of materials that might thus be acquired, however, would undoubtedly be the little-used materials in current American science and engineering work (e.g., old trade journals, foreign theses, and foreign documents). These kinds of materials are collected by the Center for Research Libraries (CRL) in Chicago, and for which users can wait the longest for delivery. It is recommended that local science libraries make every effort to associate with CRL and its programs on behalf of METRO area scientists and engineers. The availability of a local catalog of materials in the CRL collections and

quick communications with CRL would be essential to good service. If it is not possible to involve CRL as a strong and active arm of the New York region's library service, then DASC should begin a limited acquisition program of its own for lesser used materials. This would raise the estimate of capacity for DASC to 500,000 volumes for a decade's operation. The libraries that could use such a facility now recommend unanimously that title of stored materials be transferred to DASC.

The following services are recommended for DASC: delivery of material to libraries once a day; simplified, computer-based inventory with frequent and wide distribution of a printed book catalog; and copying services. Very limited reading space for the public is recommended.

Notes

1/ Central Serials Supply Service and Delayed Access Storage Center, as later recommended.

2/ Source: U.S. Congress. Printing Joint Committee. Government Depository Libraries; Present Law Governing Designated Depository Libraries. Washington: Government Printing Office, 1967.

3/ Cooperative Library Service for Higher Education (1960).

8. A Central Advisory and Referral Service (CARES) should be established to assist librarians in fully exploiting the region's library and information resources quickly and efficiently. It should provide consultation, middleman, and directory services in this effort.

It is difficult for every science librarian in the area to be fully informed about all of the resources of the region that can contribute to better library and information service in science and engineering, and about all aspects of how to tap all of the resources known to them. These resources are diverse, dispersed, often unique, sometimes not well-publicized outside of very limited circles, and bound by varying rules for public use that are frequently difficult to describe and categorize. Few librarians find themselves in organizational contexts that bring them normally into contact with all segments of the information service industry. Evidences of gaps in librarians' knowledge and understanding of the full range of resources available to them were noted with frequency in the study. Many librarians volunteered comments on their frustrations in charting an efficient path through the array of regional resources in seeking publications and information.

The goal of CARES should be to decrease this frustration and to increase the skill of librarians in mobilizing all the resources available and appropriate to specific needs as they arise. Specifically, CARES should maintain a small central staff to help librarians develop strategy involving regional resources for information and publications in science and engineering. CARES should base this service on its own inventory of libraries, information centers and services, and similar agencies, particularly, but not exclusively, in the METRO region, and of their purposes, services, data bases and specialities, regulations regarding use, and other information relating to public access to the resources. Although CARES should concentrate on providing its services on demand, it should also work to increase general knowledgability among librarians through the publication of public relations and training documents aimed at a better understanding of the region's information resources and the techniques of gaining intellectual and physical access to them.

If information to help librarians plan their hunts for publications and information is not in its files, CARES should take the initiative to conduct a preliminary hunt as a middleman for its customers, aimed at increasing the probability that subsequent contacts

between librarians and the recommended information sources will produce relevant results. CARES should deal only with librarians and information officers. The public in general would receive the benefits of the services of CARES through libraries. It is through these efforts of CARES that the public might gain more access to industrial libraries.

CARES will have to create its own inventories of libraries and services. Existing regional inventories can be used only as a rough guide to the charting of the geography of reference and research resources in the New York City area. The shortcomings of the available inventories are due principally to their failure to develop standards for application in evaluating the levels of intellectual effort that can be sustained by the collections listed, and to the great variation in subject terminology used to categorize the collections' strengths and specialties. In some of the inventories the specialities were defined by the librarians in charge of collections, each using his own terminology. Furthermore, each librarian's sense of the uniqueness or value of the areas of emphasis in his collections was biased by his experience with the full range of literature in the subjects covered. No attempt was made to modify the resultant lists of specialties for the variations in the evaluators' standards of judgment.1/

It is recommended that CARES be assisted in this inventory effort by a permanent task force of well-qualified, volunteer librarians to mobilize individual libraries into a coordinated and continuous inventory operation aimed at identifying the library resources of the region according to standard levels of collecting effort and standard subject analysis. This effort can start with the inventories that have already been done, which through constant refinement can be brought to a point of utility. The task force should prepare the data gathering instruments, evaluate the returns, and in general, act as an advisory committee to CARES. CARES should serve as the secretariat for the inventory work of the task force.

A regional union catalog has been suggested as an alternative to the grosser technique of creating descriptive inventories of collections. Nothing in this study should be taken as an endorsement of this proposal. No regional union catalog in existence today is soundly based financially nor intellectually for the full exploitation of resources. The variations in cataloging styles among libraries in the New York area is sufficient to require extensive and expensive editing of entries before they could be interfiled. The variations in subject analysis styles is even greater: an entire new layer of analysis would have to be constructed for efficient central access. A small staff in an agency such as CARES, with well-organized guides and inventories,

can provide reasonable guidance and more useful information gained through phone calls to libraries of probable strength at less cost than would be entailed in the creation and operation of a regional union catalog under present circumstances.

In the long run, probably the cheapest way to provide regional access to library resources will be to create this access as a byproduct of a regional, computerized technical service operation. Admittedly it will be difficult to establish and operate a single regional processing center for a library community as large and diverse as is that in New York City, but it is not improbable that several intra-regional system processing centers will develop, the output of which, along with more traditional inventory techniques, can be combined into a regional service to facilitate interlibrary cooperation and use.

CARES should give particular attention to manufacturers' associations as sources of information. Many of these agencies maintain extensive files of data and information, and some have staffs of experts on hand to offer assistance to the public. Some of the associations operate libraries, and a few can be quite helpful in bringing the resources of the libraries of the association members to bear on local problems. Over 300 of these associations were contacted by the Project. A list of 69 of them is contained in Appendix C with an indication of their accessibility by the public.

9. A Central Serials Supply Service (CENSSUS) should be established to provide photocopies and interlibrary loans of scientific and technical periodicals.

Most of the interlibrary activity among science and engineering collections in the METRO area involves the search for and provision of serial publications and copies of articles from serials -- not surprisingly, because the short paper is the chief unit of communication in science and engineering and the journal is the chief channel of published dissemination of the paper. Serials make up from two-thirds to three-fourths of the normal science or engineering library's collections. The pressure on industrial and other special librarians to obtain copies of journals or articles therein is heavy and placed with urgency. The problems that arise in searching for journals and obtaining loans or copies from them were the most frequent topic of discussion among librarians participating in the Project.

Because of the visibility and the comprehensiveness of the collections of the large research libraries in the area, they bear the brunt of the burden of providing photocopies. Most libraries in the nation long ago stopped lending scientific and technical periodicals

because of the heavy local demand on them. The Project staff analyzed several thousand requests for photocopies in the top four libraries on the list of the most frequently used libraries by the public (New York Public Library, Engineering Societies Library, Chemists' Club, and Columbia University). These libraries, as a matter of fact, were also the most frequently cited libraries as sources of photocopies by industrial librarians in another phase of the Project. Altogether they are supplying copies of articles at a calculated rate of no less than 30,000 articles a year, or 200 text pages an hour. In any reasonable operation this load is sufficient to keep six or eight Xerox machines going full time. This is a conservative estimate. The records of the libraries were not always capable of full interpretation, and not all of the copying activities of the New York Public Library were studied.

Three aspects of this process are disturbing. First, the wear on the materials being copied is devastating. In several of these libraries, the most frequently copied journals (and these are usually the most important research journals) are in urgent need of preservation. Second, as has already been discussed, all too frequently, material that is required in these research libraries by patrons for use on the premises is not on the shelves, but is somewhere in the copying process. The library users are subjected to undue delays and at times, never see the materials they seek. Third, the user libraries still must engage in tiresome and expensive searches for materials, even though they tend to concentrate on only these four libraries. Just as with personal users, these libraries find that some of the material is not on the shelves when needed. Furthermore, even among these four libraries, there are gaps in holdings that force the users to extend their searches.

This recommendation for the creation of a separate copying facility recognizes that this vital supply mission is not being adequately met anywhere in the region, except at the expense of the equally vital research support mission. The system load is more than sufficient to warrant the operation of a separate facility just for the supply mission.

The principal concern of CENSSUS should be to relieve research and circulating libraries of the responsibility of providing the public with copies of articles in journals, and particularly in the most frequently cited journals. CENSSUS should maintain an inventory of as many copies of the most frequently used journals as demand requires. Analysis of the data obtained in this phase of the Project provides us with the following useful information:

Recent titles were the most frequently copied materials.

The median age of the items copied in all libraries was about five or six years.

Older materials were requested with sufficient frequency to suggest that publicly available historical collections are vital.

Most of the older materials were journals of high quality and prestige--the archives of science--principally the journals reporting new research results.

English language materials dominate the lists.

The call for Russian language materials was not excessive.

Industrial libraries are the heaviest users of the libraries surveyed, although the flow of copies among academic libraries is likewise significant.

CENSSUS should maintain a stock of as many copies of the most frequently used journals as demand requires, and should also concentrate on building a comprehensive collection of trade journals in all fields of engineering and technology, including back issues. Further study should be made to ascertain the desirability of the establishment by CENSSUS of an active acquisition program for little-used material not otherwise held by libraries in the METRO region, although this might more justifiably be left to DASC (Recommendation 7). For a variety of reasons copies of articles will not always suffice, hence a sufficient number of copies of journals should be acquired to allow circulation of the original material when required. Circulation should be restricted to libraries.

The service should have as its own only objective the quick supply of articles in serials on demand on the premises and within 24 hours by mail, and interlibrary loan of journals. CENSSUS should offer no personal services (e.g., personal circulation or reading room study facilities) other than walk-in, quick photocopying from its stock. Only the least expensive full-size and micro-edition copying processes should be used, consistent with the archival and image quality most frequently demanded by the public. Low price is essential to success of the service. Other work should be contracted out to commercial firms. At all times CENSSUS should take an industrial engineering approach to materials handling. Journal issues in stock should not be bound, thereby reducing the amount of information (number of articles) off the shelves at any one time. Only the simplest

inventory record should be kept. CENSSUS should provide only limited bibliographical verification services. Detailed searching by subject and for verification of incomplete or faulty references should be negotiated by the users with their own public, academic, or company libraries. Material for CENSSUS should be obtained by purchase, and through the solicitation of gifts of discards, particularly from working collections in industrial libraries.

Recognition must be given here to the copyright issue. CENSSUS should obtain as many blanket permissions to copy as possible from journal publishers. Copies from other journals should be made only for research use. No journal should be copied in its entirety for any one user, nor should CENSSUS make multiple copies of any article for one user. Should future revisions of the copyright law shut off the copying service, CENSSUS should switch entirely to providing circulation services for original materials.

10. A Serials Utility Register (SURE) should be established and maintained on a current basis in lieu of a union list of serials. SURE would establish the location of as many copies of as wide a range of titles as possible, and would direct librarians and the public to these titles on demand.

The task of locating specific issues of scientific and technical journals is one of the chief and often the heaviest of duties engaged in by science and engineering librarians, particularly in industrial and research libraries. As the number of scientific and technical journals has increased and the lines of publication have become less clear through the mixing of disciplines, the task has become more burdensome. This accounts for the frequency with which librarians in various regions, and especially where there are chapters of the Special Libraries Association, suggest and attempt to create regional union lists of serials.

Scores of references to union lists were found by the Project staff. Among the earliest of these was a list of serials in New York and Brooklyn libraries, edited at Columbia College and published by the New York Library Club in 1887.[2] The first bibliographical contribution from the Engineering Societies Library was a catalog of technical periodicals in libraries in the City of New York and vicinity.[3]

But these union lists have some common production problems and failings that militate against setting to work on another one in New York City. Almost all of the union lists to date have been produced only through long and tedious hours of volunteer labor from a

core group of librarians, and the even greater total amount of time given by librarians on the job who had to provide lists of their holdings for inclusion in the union catalogs. Unfortunately, the product has been far from satisfactory in most cases. The usual catalog lists only the titles held within a region: other titles must still be sought out by the individual libraries. More locations for most titles are obtained in this fashion than are required for good regional service: there is no way for the list to serve to distribute the load of providing regional services among the libraries listed. To avoid any burden of public service, some libraries deliberately never list their holdings in such lists.

But even more troubling is the fact that after the investment of all the time and effort, very few of the lists are ever kept up to date. It is not long before the rapid growth of new titles puts the librarians strongly back in the business of hunting by phone and mail for sets of journals not listed. Then the task of updating a union list usually means repeating the whole listing and checking processes. Only in rare circumstances have a group of librarians been able to institute continuous updating procedures. A permanent staff at some central location, and the establishment of routines among libraries to notify the central staff of new subscriptions and cancellations is required. Even then the updating process is likely to be slow. Only a handful of these lists attempts to locate titles across regional lines in order to increase the range of materials listed.

In the Serials Utility Register (SURE), it is proposed that a viable operation be established whose aim is to establish a record of the public availability of a sufficient number of available copies, both in and out of the region, of every serial title deemed appropriate to regional service, and to keep the register current. SURE, therefore, must have a permanent, though not necessarily large, staff. Its chief function will be to direct librarians to sources of specific serials on demand. Its services will be based on its own register of locations of an extensive list of scientific and technical serials, with the number of locations for each title to be determined by statistical analysis of potential demand, based on the photocopy and interlibrary lending load among science and engineering libraries in the region, and on citation analysis of the published literature. Parts or all of the register could be published from time to time, although it is anticipated that SURE will develop the capability of quick electronic communication among libraries for the exchange of information about serials and their availability. SURE should work towards the creation of an automated record. Demand analysis might indicate that it would be possible to establish on-line phone communication between libraries and the computerized register at least at certain times each day.

SURE should establish a mechanism to maintain a continuous survey of the need for specific titles of serials in libraries in the region, and negotiate with appropriate libraries, including CENSSUS (Recommendation 9), for the acquisition of needed titles. SURE should establish an interregional exchange of information of serials inventory information, particularly for rarely held titles. Among other things, SURE should accept the responsibility of locating titles on demand that might not yet have been listed in the register.

SURE should experiment with the use of the output from the National Serials Data Project when available, as a tool to facilitate the establishment of standard entries, and to extend the number of locations for various heavily used titles. It is conceivable that by utilizing the output from the national libraries SURE could become the center for recording bibliographical data about serials to be used as an authority file for regional cataloging of serials. Experiments of various kinds, such as regional processing of automatic serials checking records in various libraries, should be undertaken as part of the MACSINEX Program outlined in Recommendation 17. Under these conditions, the region will obtain far greater utility from its efforts than would be possible by concentrating only on one product, the union list of serials.

11. The information service capability of the region should be strengthened by creating separately identified public agencies to provide: (a) scientific and technical data and facts, including elements of bibliographic citations, in response to questions that can be answered quickly and on demand; and (b) specialized information and bibliographic services at cost, tailored to specifications set by the customer.

For a region that is so rich in library resources and intellectual climate in science and technology, the METRO area is notably weak in public reference and information service capability, particularly at the advanced level of performance. Librarians assigned to reference duties can be found in all of the libraries with science collections, but the amount of time they can devote to each user is severely limited by the additional workload imposed upon them by other and simultaneous task assignments. The problem of finding librarians with the time and the resources to perform reference services was simply and succinctly referred to by librarians and scientists alike. Nearly 50 percent of the scientists and engineers reported that their use of libraries would be increased at least somewhat if the speed and quality of reference answering services were improved, and if more staff time could be made available for assistance to the public. Except in large libraries, few librarians are assigned at any

one time to work exclusively on reference and information problems, and the large libraries' reference services are overburdened.

There are some exceptions in this element of weakness. The search and translation services of the Engineering Societies Library are available to the public. A number of manufacturers associations in New York City offer good information services, albeit in rather limited topics or involving rather narrow goals and limited resources. The Copper Development Association recently announced a computerized information service for scientific, technical and application data on copper and its alloys. Data sheets, reports, and answers to specific questions will be prepared for engineers who use copper, brass, and bronze. The service is offered at no cost to the user. Libraries can do better, as their activities in a number of industrial research laboratories evidences. The New York area rates a better public service. Librarians will have to take the initiative, however, in creating an expanded information service capacity, and new services will have to be widely promoted in order to turn the public towards these new sources of assistance.

The first of the two services recommended herein, the quick reference service, should be established at the New York Public Library because of its coverage in depth of all of the subjects included in this study, its central location, and its existing conspicuousness among library-based information facilities in the minds of the scientific and engineering community. An expanded ready reference service should be available from a separately identifiable unit within the structure of the Library, and it should be well staffed and supplied with more than the usual number of telephone extensions. Access to the service should be available both by phone and in person. (Several respondents referred to walk-in current information services offered by a number of large metropolitan newspapers as an example.) The staff of this unit should be especially recruited for its talent to think logically about reference resources in response to requests for information. When on duty, staff members should have no other assignments to dilute their concentration on locating information quickly. No attempt should be made to answer questions that require analysis of information, advice on sources of general background information, or anything else that suggests more than concrete facts and pieces of data. Physical and chemical data, names and addresses of people and organizations; definitions of terms, phrases, and acronyms; identification of processes, products, and concepts; and information to complete bibliographical references will probably dominate the service. Its principal users will be people engaged in

production, development, marketing, and science writing, and librarians serving academic and industrial research.

Speed in supplying answers should be paramount with this service. A significant portion of the scientists and engineers in all disciplines reported that in the majority of cases when they need information, they need it within minutes or hours. The emphasis on speed was reported to be important to slightly more engineers than basic scientists, as evidenced by the figures in Table X. About 40 percent of the scientists and engineers reported needing specific facts and figures very frequently.

TABLE X.

PERCENTAGE OF SCIENTISTS AND ENGINEERS REPORTING NEED FOR DELIVERY OF INFORMATION IN THE MAJORITY OF CASES WITHIN TIME LIMITS SPECIFIED

	Minutes	Hours	Day	Few Days	Longer
All Engineers	9.7	30.9	29.2	28.9	1.3
All Basic Scientists	9.5	26.5	31.2	30.7	2.1

If it becomes apparent that a question will take longer than a day to answer, it should be referred to the normal reference staff of the Library, and the customer should be informed of the action. The staff of the service should exercise judgment as each question is put to it to avoid accepting questions that are likely to need more than quick answers.

The specialized information and bibliographic service (SPINBIBS) should also be established and headquartered at the New York Public Library. It should complement and not duplicate the searching service already available from the Engineering Societies Library, but should offer an expanded range of services. According to the resource analysis made during this study, the collections of the following libraries should be utilized by SPINBIBS in addition to those at the New York Public Library:

Chemistry: Chemists' Club
Fordham University
Polytechnic Institute of Brooklyn

Physics: New York Hall of Science (pending establishment of its proposed search capability)

Mathematics: CUNY, Graduate Studies Division
New York University, Institute of Mathematical Sciences

Geology: American Museum of Natural History
Columbia University

The fee structure for the services of SPINBIBS should be set to allow the transfer of at least a small amount of funds to those libraries on whose premises searches are made by SPINBIBS staff.

SPINBIBS should entertain requests for any type of information service. Particularly, it should develop the capability of offering the following services:

Bibliographies, in traditional and machine-readable formats.

Copies of cited literature in hard or micro-editions.

Regular abstracting services on specialized topics.

Reviews of current developments in science.

Continuing current-awareness bibliographies tailored to customer specifications.

Processing of requests to be contracted out to other, existing information services and centers. (e.g., NASA Technology Utilization Centers, AEC Technology Utilization program centers, Chemical Abstracts Service, PANDEX.)

SPINBIBS should work closely with the 35,000-firm manufacturing enterprise in the area to assist in the transfer of technology from research and development programs to manufacturing processes, either to develop new products or to solve problems in the manufacture of existing products. This kind of service goes beyond that normally offered by libraries, and would require a staff of industrial specialists who are not singularly literature oriented. They would, however, benefit from association with a literature-based service since they would have immediate and direct access to this repository of information. This particular aspect of the service, however, might well undertake projects for business firms, such as market testing and

analysis and data processing, that have little to do with literature resources. It is quite difficult to assist technologically based business firms with information problems in many cases without having a wide variety of information gathering and analysis capability, offered to business on a person-to-person basis.

SPINBIBS should be helpful to the many small scientific and engineering firms. A particularly strong market may be found among the small but sophisticated consulting firms that work on complex problems, but cannot afford to maintain anything more than a basic working library for immediate, everyday needs. Over 3,000 consulting firms operate in the New York area, with wide-ranging interests. As a matter of fact, the benefits of service to consultants would be amplified through their contacts with customers for whom they are solving problems. Consultants might therefore be tested as key agents in library-based technology utilization programs in the New York area.

Demand for the purchase of special information and bibliographical services is not overwhelming, by any means. But where these services have been made available and promoted, they have been used. The Industrial Information Service (IIS) in Dallas, for example, established less than two years ago, serves 123 firms with various types of library services, and in recent months provided 78 bibliographical searches to 39 firms. The range of services offered by IIS has been constantly expanding and is frequently announced and described in the Service's "Newsletter." The John Crerar Library in Chicago has for years provided tailored services at cost to many agencies, including a continuing current-awareness literature search and copying service to a large corporation in the New York area, for which the firm pays $1,000 a month. The dynamic Information Gathering Service in Cambridge, managed by Harvard Student Agencies, Incorporated, among other things has a thriving bibliography and abstracting service based on the Harvard University Library, for which it charges from $6 to $10 an hour. In all, its services to business and industry in a recent year grossed over $1.3 million.

From the experience of several of these agencies, it would appear that the typical literature search would be one that cost no more than $400 and took no more than 40 hours to complete. The IIS processes retrospectives searches to the NASA Technology Application Center at the University of New Mexico for its member firms for $125, and does the same for continuing, selective dissemination services for about $250 a year. The average fee paid to the Engineering Societies Library for a literature search in a recent year was $124.

12. A Central Translation Facility should be established to assist scientists in gaining access to available translations and to direct them on demand to the translation industry in the area.

The provision of translations of foreign scientific articles is merely one technique, and not the most important one, of the process of making foreign scientific information available to American scientists and engineers. The costs of most translations are too high and the probability of any one item being called for is too low for most libraries to invest heavily in the development of collections of translations. Nevertheless, the library community of the region has a responsibility to guide scientists to translations of articles they request, if such exist, or to translators for the preparation of English language versions of required articles.

Nearly two-thirds of all of the scientists surveyed reported that they seldom or never needed translations and over 40 percent of the respondents claimed that it was not at all, or was only occasionally difficult, to obtain translations. The dispersion of this low-level need was quite uniform among all of the subject disciplines and kinds of workers surveyed. Strong complaints were registered about the costs of translation services, but there is no inexpensive alternative to the use of human translators whose going rates are far from exorbitant for professional people.

Over 300 translators and translating firms are at work in the New York area. Overall this translating enterprise is capable of handling every modern language in which scientific and technical information is likely to appear. Many of the people are not available for full-time employment in libraries or translating agencies. The overall demand for translations in many languages is quite low, the number of subjects and languages to be covered is great, and the potential load in any one language is too unpredictable for any central staff to be provided that would result in a lowering of the costs of translating services. The establishment of referral and middleman contracting services is the most economical technique for a handling whatever problems exist with the availability of translations in the New York area.

A Central Translation Facility (CENTRAN) should concentrate on a few simple matters to facilitate access to translations and translators. CENTRAN should examine all avenues of cooperation with the few national translation centers that have been established around the world to perform acquisition and distribution services among other things. CENTRAN should promote the use of these services by New York area residents. CENTRAN should particularly work closely with the center in the John Crerar Library in Chicago, operated under the

auspices of the Special Libraries Association. A mechanism should be worked out to route unique translations discarded from New York area libraries to the John Crerar Library. Discards that duplicate the John Crerar Library holdings should be retained in the New York area, preferably in the Delayed Access Storage Center. Additional material that would duplicate items in the Crerar Library should be acquired by CENTRAN or DASC only if the frequency of demand or the need for speed of access to it is high.

The Engineering Societies Library and the Chemists' Club Library both offer translation services. A portion of the Engineering Societies Library work is done in-house; otherwise it is contracted out to local translators by both libraries. These libraries should continue to concentrate on this service in the fields of engineering and chemistry. CENTRAN should concentrate on astronomy, mathematics, geology, and physics to complement these services. CENTRAN should maintain a roster of readily available and high quality translators, and should accept the responsibility for contracting for the services of these people on behalf of the public.

Two special translation services not now provided in the New York area should be undertaken by CENTRAN. First, a roster should be maintained of translators whose work is of sufficient quality that it will stand the tests of those administrative agencies that must certify the credentials of foreign scholars and tradesmen, as evidenced by their diplomas and other certificates of qualification. This service must be performed in conjunction with the employment offices of various firms in the New York area.

Second, translators should be located who can be readily available to provide inexpensive, quick scans, and short indicative abstracts of information in foreign articles on demand. The quality of published foreign scientific information varies greatly just as it does in this country. Also, as is so often the case in all languages, it is impossible to ascertain from titles whether useful information will be found in articles. Many scientists and a number of librarians specified the need for assistance in determining, at least in gross terms, the contents of foreign scientific articles in order to determine whether or not to invest in the expensive job of literal translations.

Notes

1/ These disparities are quickly obvious. Appendix E is a combined list of subject specialties among New York Metropolitan area science libraries taken from several inventories. Neither of the

inventories are developed to uniform levels of specificity in their entirety. In the subject of electricity, eight supposedly general headings are used to describe what are only three general phases of the subject. In another directory both the Yonkers Public Library and the American Institute of Aeronautics and Astronautics are listed together under aeronautics, thus bringing together two vastly different kinds of resources without the slightest delineation of the difference. In one of the directories the areas of specialization in the Engineering Societies Library are listed in detail, while the large and strong collections of both Columbia University and New York University are merely listed under the heading engineering.

2/ Union List of Periodicals Currently Received by the New York and Brooklyn Libraries (1887).

3/ Catalogue of Technical Periodicals . . . (1915).

13. A Science Library and Information Service Council should be established to advise and assist the METRO Board of Trustees, METRO committees, and individual libraries in planning and implementing programs to improve reference and research libraries serving the professional science community in the METRO region and to review regularly the state of the science library and information service capability of the region.

The recommendations of the METRO Science Library Project do not lay out a series of steps with complete specifications that, once taken, solve all problems for improved reference and research resources. Local libraries will thus not be able merely to make some adjustments and go about their business independently as before. Continued developments in information science will provide continued impetus for review of activities among libraries. Contributions to better library service under the 3-R's program will result from a series of evolutionary steps, requiring cooperative guidance by local librarians.

Continued improvements and the sustenance of the highest quality of library and information service to the community, therefore, will require constant guidance and surveillance. The METRO Trustees cannot be expected to organize surveillance teams among themselves. Instead, it is recommended that the task of keeping a closer watch on the development of improved reference and research resources in science and technology be entrusted to a Council composed of people who work closely with science and engineering library and information resources.

The Science Library and Information Service Council should contain representatives of libraries, societies, the science community at large, and the METRO Board of Trustees (ex officio). The Council should be considered an agent of METRO and should have as its primary functions: (a) the preparation of a regular (no less than annual) state of the community report with regard to scientific and technical libraries and information service; (b) a critique of advances in information science and technology; and (c) recommendations to the METRO Board of Trustees for programs for action, for the Board, and for libraries at large, based on these reviews and critiques.

Among its other major, continuing functions, the Council should provide a forum for the discussion of problems and potential developments

in librarianship and information science in general. It should establish liaison with various governmental, society, and regional panels and committees concerned with the establishment of regional and national information systems in science and technology to assist those groups in their understanding of local operational problems on a regional base, and to promote the advancement of larger systems of scientific and technical information services in the METRO area consistent with national developments. The Council thus should be ready at all times to provide advice to the METRO Board of Trustees and to others engaged in programs of science information service.

At the outset, the Council should be chiefly concerned with a critique of the METRO Science Library Project, the establishment of priorities for implementing the recommendations on this report, the outline and development of plans for this implementation, and the monitoring of activities under these plans. Some of the recommendations require further study. The Council should be responsible for preparing proposals for these studies to be submitted by the METRO Board to appropriate agencies for funding. Council members would not themselves conduct studies. Their contributions would consist primarily of preparing, editing, and providing a critical review of working papers on matters of concern to the Council, drafting proposals and planning documents, monitoring research contracts, and preparing recommendations for action for the METRO Board of Trustees. The Council would thus become the chief force through which the programs to improve reference and research resources in the New York area would become viable.

14. An educational program for employees of science libraries should be inaugurated to increase and update their knowledge and understanding of modern science and engineering problems, projects, and research and development methods.

Librarians in science and engineering libraries were given considerable credit by the science community for their abilities to locate literature and to handle quick information and reference questions. The industrial librarians particularly were often noted as being quite effective at these tasks. Their knowledge of reference tools, indexing and abstracting services, and other library resources was never specifically faulted, for example, in comments on the questionnaires.

There is considerable disenchantment, however, with librarians as sources of help in advanced information problems because of the lack of science subject training among them. Nearly one-fourth of the science community indicated that its use of libraries would be greatly

increased if there were improvements in librarians' knowledge of subject fields. Although the feeling was widespread, it was strongest among electrical and industrial engineers. The basic scientists complained less about this aspect of library life: either they don't use librarians as information officers or they are better served than engineers, for reasons not made known.

It will not be possible to staff the science libraries in the region entirely with science-trained people, nor is this necessary. A knowledge of the reference tools and the literature in general in various fields is a basic need in science libraries, and this is something in which the librarian should excel. Many librarians say that the true professional among them should be able to transfer his skills in opening access to the literature to any subject setting. This may be the case in general, but when dealing with advanced scholars in difficult fields, there is little substitute for the confidence and ability to reach decisions on sources of information quickly that is best based on an information officer's own knowledge of science.

A librarian with an open and inquiring mind, and the time to study some of the material he is working with can gain this confidence through experience. It would be of great assistance, however, if from time to time, the librarian could be exposed to lectures, tours, and seminars covering science topics, guided and taught by scientists skilled in communicating ideas to serious nonspecialists. Lectures, mixed with inspections of research facilities, and the chance to talk to scientists are a superb combination of media for creating understanding. An additional benefit is derived from the exposure of scientists to librarians in this environment, in the feedback to the laboratories that may thus be provided, of information about libraries and information sources.

Classes, lectures, seminars, and films are appropriate to this training effort; tours alone are not. The effort should be planned and the individual's participation should be sustained. The aid of the science community should and can be enlisted in this effort. A number of members of a local U.S. Naval Reserve Research Company pointed to their program as one that might be as useful to librarians as it is to them. The group meets twice a month for two hours to hear lectures by local scientists, engineers, and businessmen on a wide variety of topics relating to research and development. Once a year each of the members has an opportunity to attend one of two kinds of research seminars for more concentrated discussions, integrated with tours of research laboratories.

A wide range of topics is covered in one of these seminars. The meeting is usually held at a large laboratory that conducts many different experiments and tests. In the other of these seminars, a specific topic is covered in depth.

Such a program will be difficult to mount, but it can be done. Topics and speakers will have to be carefully chosen so that the presentations can be made intelligible and interesting for serious nonspecialists. The whole effort will have to be planned, at least in general, well in advance of starting: it cannot be left to develop as time passes. Library management will have to be convinced of the value of the training, for it may have to be done on "company time." The idea of voluntary participation of librarians should not be dismissed: such activities should be considered by them as much a part of their continuing education as is their attendance at library and information science society meetings, training courses, and institutes.

Any specialized information services to be established in the New York area will have to be staffed with scientific and technical experts. These people will do more than hunt for bibliographic entries under subject headings that have been supplied by others. They will read and analyze literature to determine if the information in it matches the problem they are documenting. Although it is not impossible for a librarian without training to have acquired sufficient knowledge for this analytical task, the probability of finding and attracting such people to information centers is low. There aren't that many of them.

This will be one of the most difficult recommendations to implement. Neither librarians nor library administrators will envision much payoff soon enough from an investment in such training efforts. Special teaching skills and high student motivation are required for successful transfer of information with understanding to nonspecialists in science. The pleas from the science community for better understanding among librarians of the grammar of science and the tasks of scientists and engineers is unmistakable and urgent. Similar findings have been noted in other studies: scientists and engineers do not have much confidence in librarians in general as first-line partners in the search for information if the process involves much dialogue about the subject involved. It is time that a community such as New York took steps to modify this relationship.

15. Vigorous and high quality informational, promotional, and educational programs should be undertaken by a central agency. Its objectives include increasing knowledgability among scientists, engineers, and librarians concerning the resources in the region's libraries and other information facilities, and the techniques of acquiring information, both physically and intellectually from them.

Library and information center services must be promoted: they are not naturally attractive to most scientists and engineers. A vigorous public information campaign is required that will widely diffuse knowledge about existing resources, the degree of their availability, and the conditions governing their use. Service outputs must be succinctly described. Publications describing resources must prominently feature simple and direct instructions on how to make contact with various segments of the public information and library system in the region.

Public information programs are urgently needed immediately. The lack of awareness of the range and value of useful resources and the misunderstandings about the ways to tap those resources that do exist, was evident at many points during the Project. Few among both the scientific and the library community, for example, knew of the strength or even the existence of the collection of scientific and technical reports at Columbia University. It is difficult to believe that engineers in the area do not know of the patent collection of the New York Public Library and yet a number of the responses from the professional community called for the improvement of the patent resources of the area.

The lack of widespread and easily obtainable information about resources and their availability creates problems for scientists and engineers, particularly when they need information in fields unrelated to their specialties--which they do with some frequency. The speed and efficiency with which engineers, scientists, and special librarians locate information decreases as they move into fields peripheral to their major areas of concern, and even more so when they search for information in totally disparate fields. Scientists and engineers alike noted that the energy involved in tracking down several bits of information in other fields is disproportionate to the value or urgency of obtaining the information. "As a result," said one chemist, "they don't bother and remain uninformed."

Some of the activities of the in-service training program discussed below can serve additionally as public information devices. Seminars for librarians, scientists, and engineers on library use and information search strategy utilizing the resources of the METRO region

would be particularly useful. A public information program should be aimed at internal house organs in industry, which reach wide audiences.

This is the one area of activity in which the local chapters of scientific and technical societies should be encouraged to participate. Their chapter meetings and publications should be used as media for the dissemination of information about libraries and information services. Public programs for the managers of research enterprises, or even seminars and colloquia for these people within corporations, would put information concerning the region's information resources into the hands of those who are in strong positions to amplify the message and to foster fuller use of these resources to the benefit of both local industry and the libraries concerned. This activity might well be considered for funding as a part of the State Technical Service program since it seems to meet a principal objective of the State Technical Services Act.

Probably no other activity is as essential to the future of all library activities as is the continued education of librarians and their technical support personnel. Throughout the librarian's career, which under normal conditions will span a period of 40 years, he must obviously absorb far more new information about library and information science philosophies and techniques than he acquires during his formal years of professional training. Much will come from his own reading, attendance at professional meetings, and experiences on the job. But in an age of rapid change, particularly involving highly complex technology, this haphazard performance of continued education activities is insufficient. Well-planned in-service training programs for librarians in the METRO area are vital to efforts to integrate library facilities and services within the region, because it is through these programs that the fundamentals of new ways of operating can be made to become a part of librarians' thinking. If nothing else, they will learn how to utilize the region's resources more effectively. This they must do before these resources can be justifiably augmented.

In-service training, therefore, should have a high priority among all the activities recommended in this report. Although it is recommended that a permanent staff be set up by METRO to assist with the planning and conduct of such training activities, experience shows that good and reasonable in-service training on a regional basis can be managed with volunteer help from a relatively few librarians with backgrounds in education. Financial support for programs, to cover expenses for materials and honoraria for instructors, can be obtained from course and meeting fees, providing the market has

been adequately assessed. It is possible that certain programs, particularly those involving lecture courses and series, can be underwritten by an extension division of a local university. The activities of the San Francisco Bay Region Chapter of the Special Libraries Association and the University of California Extension Division in the early 1960s should be studied as a model.

It is not difficult to generate a list of suggested topics for lecture series and courses, given the findings of this Project. Among them would be:

New reference tools in science and technology.
Acquisition of specialized materials (reports, patents, etc.).
Communication of specialized information.
Search strategy among New York Metropolitan area libraries (in general and by subject or problem area).
National activities in scientific and technical information service and network development.
Techniques of information analysis and services.
Nonconventional information and literature control techniques.
Problems, prospects, and developments in publishing in science and technology.
New York City libraries and information resources.

The determination of program goals and activity objectives should be made by the Science Library and Information Service Council (Recommendation 13). All techniques of training should be considered, including programed instruction for self study, seminar and lecture series, supervised discussions, courses in local colleges and universities, conferences, institutes, and similar devices. The Council can probably best work at this matter through a task force composed of a few of its members and an education specialist. Levels of instruction involving all of these techniques should be provided for library technicians, for librarians, and for interested members of the science and engineering community.

16. A formal, organized network, to be known as Metropolitan Access to Scientific Information Network (MACSINET) composed of selected physical science and engineering libraries and information services in the METRO area should be established to facilitate the communication of questions and answers involving scientific and technical data and information, bibliographic information, requests for location of publications and arrangements for their use, and the transmission of visual images (both hard and soft).

An informal system of relatively few libraries in the METRO area already exists and supports most of the public service to the scientific and engineering community. These libraries are linked in

a network by the regular telephone and public transportation systems. But because of its informality, it is a loose system of libraries that exists chiefly in the habits of users (scientists and librarians) who tend to use the most obvious public, and the largest semipublic collections. It is a passive system that responds largely only when approached by users. Messages are seldom passed between more than two libraries on any problem unless they are regenerated by the user as he is referred from one library to another.

This recommendation is really a proposal that the informal system be officially and formally recognized, and that it be given more powerful communication capability in order to increase the probability of user success in obtaining information and publications with less expenditure of time.

The creation of a network is an important step beyond the existing informal and voluntary interlibrary activity in that it would require: (a) an agreement among the libraries to perform a mission that tells users what outputs they can expect, thus reducing misunderstandings among librarians and the science community; (b) a commitment of specified resources by individual libraries to community service, and a determination of what other resources are required that they cannot find among them; (c) dedicated and separate communication facilities; (d) rules and routines for invoking action among system elements to satisfy customer demands; (e) an elevation of the strengths of the region's libraries and information services through public information programs for more to see, know, and use; (f) recognition by higher administrative authorities of the management and financial implications of regional interlibrary activity.

The major elements of the network should be those libraries and information services that have been identified as already engaged heavily in services to the public, and the new facilities recommended in this report. These are:

Public libraries:	New York Public Library
	Brooklyn Public Library
	Queensborough Public Library
	Yonkers Public Library
Academic libraries:	Columbia University
	New York University
	Fordham University
	City University of New York (all units)

Societies and association libraries and services:	Chemists' Club Engineering Societies Library American Institute of Aeronautics and Astronautics, Technical Information Service
Other agencies:	American Museum of Natural History United States of America Standards Institute New York Hall of Science
New facilities recommended in this report:	Central Advisory and Referral Service Central Translation Facility Central Serials Supply Service Delayed Access Storage Center

The communication of questions, answers, and other information about collections, as well as the handling of reference questions is a major task among the librarians and information officers of these agencies. Much of this communication is either the prelude to, or may be substituted for direct access by scientists to collections, hence is an important element in equalizing the disparity in access that exists because of the size of the geographic region and transportation problems. While it is true that the region's libraries are already tied into a network with telephone communications, this is an inefficient instrument for certain aspects of library communication. Where communication traffic is heavy enough or can be generated in sufficient quantity (perhaps between the largest of the libraries in MACSINET), dedicated voice and perhaps simple graphic communication facilities ought to be introduced. These can be adjusted to provide quick signalling and, if available, will free the regular telephone system for internal library administrative matters and for the occasional communication with little-used libraries that are not a part of the dedicated facility network.

The exact configuration of communication facilities required to make MACSINET operational can be specified only after further study. Presumably a central unit (MACSINET Central) would be required to serve as a switching and information transfer center in order to make the network economically feasible. All forms of communication should be considered, including Teletype or Telex, telephone, Dataphone, closed circuit TV, facsimile, messengers, and any other systems to be developed for the transmission of data, information, and materials. Direct and limited access linkages between units of the network would be included should demand warrant them. Not all units in MACSINET would require the full range of communication facilities. They should

all, however, have both input and output capability. The network would be tapped both by individuals on the premises of MACSINET libraries and by others, including organizations, through electronic links presumably with MACSINET Central.

Another presentation of the concept of MACSINET, including additional information, is contained in the Technical Memorandum at the close of this report.

17. A research and development program, to be called Metropolitan Access to Scientific Information Experiments (MACSINEX), should be established to work on products and systems aimed at enhancing the establishment operation, and continued upgrading of a fully integrated system of information resources and information transfer facilities in the New York Metropolitan region.

The rapid growth of certain types of communication facilities, some of which have a high potential for specialized purposes suggests that a new era of communication, particularly for digitalized data and graphic images will soon be at hand. CATV, the Morchand Process,[1] developments from Project INTREX, and techniques still to be tested are more likely than ever to be available for application to the problems of providing physical access to library materials.[2]

During the METRO Science Library Project, scientists responded favorably to suggestions of the utility of services based on innovations in electrical communication, although they recognized that many technical problems have yet to be solved before these innovations can be introduced in an economically feasible library-customer communication service. Industrial research and development on equipment and network performance stops short of the problems of application in a setting such as exists among the libraries in the New York Metropolitan area. Those who wish to create such networks will themselves have to mobilize resources to sustain developments and modifications of generalized equipment for application to specialized purposes. The library world will have to conduct sufficient developmental design and testing activities to be able, at least, to prepare specifications for equipment and channels for their own networks--hence this proposal for MACSINEX.

This program of experiments, patterned after Project INTREX at M.I.T., but broader in its view of the environment requiring new communication capabilities, should involve as many agencies as possible (e.g., libraries, academic and industrial research groups, industrial product development laboratories, manufacturers associations, and information services such as Engineering Index and International

Aerospace Abstracts) as possible to work on the problems of equipping and operating MACSINET. Research and development should concentrate on equipment design, system and network design and equipment configuration, the integration of computer facilities for network communication control, data storage and access, computer time-sharing for a mixture of kinds of activities (e.g., library technical processing, information retrieval from stored text, bibliographic search and verification, and data retrieval) regional technical processing of library materials, and the software to accompany network and system operation. The design and supervision of such a program should be handled by one agency (a university group) under contract to METRO.

These experiments should be accompanied by a thorough study of various social aspects of regional information communication system operation on a cooperative basis. Such matters as the administration of systems that contain many elements with their own separate administrations with different fundamental philosophies (such as with industrial, public, and private academic libraries) need principles of guidance that have not yet been developed. The economics of public scientific information communication networks are insufficiently developed. Economic theories that have import for other aspects of modern social operations in other segments of life must be examined for their potential to assist regional library and information system establishment and operation. The philosophy of man's right to knowledge may well be a relevant area for study. We are here considering what are likely to be exceedingly costly systems to create and operate. What are the units of measure and the techniques of application on the scale of priorities against which one measures a scientist's need to know before giving him access to sophisticated tools that allow him to get at information?

The problems and prospects of the transmission of images extracted from literature must be closely watched for it is in this area of technology that we find the most powerful potential for equalizing the rights of physical access by dispersed scientists to scarce literature resources. The outcomes of the tests with facsimile transmission among libraries in New York State, California, Nevada, and Texas, although perhaps less than reassuring about the prospects of long distance image transmission as a desirable, useful, and economical communication technique, should not be taken as conclusive and final.

Regional library communication system planners may find themselves in a different and perhaps more favorable position with regard to the use of communication equipment and channels for highly specialized purposes. The economics of short distance communication are

significantly different from those of long distance. Something like the Central Serials Supply Service, with simplified materials handling and perhaps even micro-image storage of journal articles, utilized by several hundred industrial research laboratories, presents an entirely different circumstance to communication system engineers than has ever been tested publicly. If these elements can be put together, they will warrant another test of facsimile transmission.

18. In order to obtain full power from the programs and activities proposed in this report, a number of them should be integrated into one administrative unit for coordination and ease of exploitation.

Obviously a number of the facilities and services recommended in this report are interrelated. The Central Serials Supply Service and the Serials Utility Register together should be able to provide maximum physical access to scientific serials. The Central Referral and Advisory Service should be a key factor in enhancing high quality output from the special bibliographic services proposed.

In order to offer the public a program that would realize the fullest potential from library community's effort to mobilize a wide range of information technologies and facilities, a new Science and Technology Information Center should be created in the New York Public Library, replacing the existing Science and Technology Division, which would provide integrated administration for a number of the activities recommended in this report.

The heart of the Science and Technology Information Center would be the collections of the present Science and Technology Division. Browsing, current-awareness and general interest reading, and circulation services for scientists, engineers, and students would be the mission of the Mid-Manhattan Library. The facilities of the Science and Technology Information Center would be reserved for ready reference, extensive research, and specialized information services to the professional community.

The Science and Technology Information Center should administer a Library Division for scholars who wish to use the research collections of the New York Public Library. In addition, the Center should administer the following units recommended in this report:

Delayed Access Storage Center (DASC)
Central Advisory and Referral Service (CARES)
Central Serials Supply Service (CENSSUS)
Serials Utility Register (SURE)
Special Information and Bibliographic Service (SPINBIBS)
Central Translation Facility (CENTRAN)
MACSINET Central

It is recommended that these units remain identifiable as separate divisions of the Center in order to protect their missions and to provide management data for the assessment and control of the kinds of services they offer.

When fully operational, the Center should be able to provide both continuing and specialized information and bibliographic services, based on the best possible collections of resources of all kinds. Some of its services would be generated on its own initiative according to its assessment of the needs of the community: others would be provided on demand. The Center would stand ready to offer any kind of service involving information and data, regardless of its source, under contract with users and organizations, and tailored to their specifications. It would be able to make quick contacts with other major elements of the region's pool of information resources, with the resources of other regions, and with various national information centers. Through MACSINET Central and the Central Advisory and Referral Service it would be in a position to assume command of a user's probe of the region's resources when circumstances require, regardless of his point of access. The Center would have computer search capability. It would be the one guaranteed complete communication center in the region's library enterprise, and would perform developmental experiments in information science and service as part of the proposed MACSINEX program.

Such centers have been proposed before and few exist. A survey such as this one does not have to be undertaken to produce this concept. In this case, the evidence in the comments freely offered by the scientists and engineers, bit by bit, piece by piece, builds to a recommendation that somewhere in New York City, some agency must move to create a new and innovative public information service utility. It can be done, and in New York City, fortunately, many elements of such a utility already exist.

Notes

1/ Morchand (1967).

2/ The supplementary papers by Albert Hill ("Technology and Television") and J.C.R. Licklider ("Televistas: Looking Ahead through Side Windows") published in Public Television: a Program for Action (1967) present some of the most exciting prospects for the use of visual electronic communication facilities that have ever been presented for consideration by agencies such as libraries. They are worth reading as supplements to this section of the METRO Science Library Project report.

The Regional Library

The program for improving reference and research resources in science and technology in libraries in the METRO region is straightforward, but not easy to implement. Although the collections in the area are excellent overall, they still require extensive augmentation in order to fulfill all of the needs of the diverse and widely dispersed community of scientists and engineers. This augmentation will be expensive.

The price tag on the program is raised also by the recommendations that aim to take the METRO region beyond the level of traditional library service that is largely passive and aims simply to provide physical access to materials as required. Instead, it is proposed that the METRO region library community offer to the professional scientists and engineers a level of intellectual and physical access to information and literature that is quite advanced beyond anything available in any other region of the country. The already excellent libraries, operating more or less independently, have a chance to become outstanding through cooperation and the provision of mechanisms for planned and easy sharing of resources of all kinds. A system of libraries and services can be created that has a high probability of success in supporting a wide range of users and of predictability of performance throughout that would add to public confidence in libraries. The aim of the program is to see that the region's libraries do all that technology and the standards of performance permit, and that every scientist and engineer in the region has access to the full power of the region's resources, regardless of his subject and institutional orientation.

Under the terms of this report, improved library services are predicated on the public use of the strongest libraries in the open sector and on some yet to be established facilities. This way of operating recognizes the simple pattern of library use through which the public has already created an informal system for its use. The idea here is to formalize this system, which raises administrative and organizational questions that will be difficult to settle and sell.

What is required is an improved public library enterprise built from parts of the existing public libraries and segments of those important semipublic and private resources that can administratively and legally accept additional responsibilities for the public,

and are capable of supporting the public's intellectual efforts. The new creation is really an overlay on the existing libraries, cutting a plane through them in such a way that each library's primary clientele has full access to its own library resources undiminished by this new structure, while the public in general has clearly defined, nonintervening access to portions of the individual libraries. Full access by primary clientele requires the continuation of local autonomy in the administration of each library. Funding the overlay is a public responsibility that might well bring with it some aspects of public involvement in the administration of the system.

An economic philosophy for cooperative library service that is as yet fully untested in public regional operations is required to justify a financial structure to support such a system. Three elements of income would have to be utilized. First, each library would have to continue to obtain full funding for that portion of its effort that it would conduct under normal circumstances (without involvement in a regional program) from whatever authority gives the library its charter to operate. Second, a broader authority, either a city, county, state, or federal agency, would have to support the supranormal functions overlaid on the normal library facilities to create the new public library utility. This higher authority could do this only if it accepts the thesis that the objective of the regional library system was required for the public welfare. Third, the users would have to be charged a small fee for some of the extraordinary services and facilities. These fees should not in any way be considered as a source of revenue for the system, except in certain limited instances where the costs of the services rendered could be more or less covered by the kind of price per unit of output that an individual could afford to pay repeatedly (e.g., copying services at low cost per exposure). Instead these fees should be considered as rationing devices, the point being that entirely free services would be unable to keep up with demand. Further, the fee accounting system would provide libraries with management data that would be useful in administration as an indicator of system load and trends among the various services. Without new economics there is little likelihood that sufficient funds can be justified to sustain the program herein proposed.

The recommendations of this report assume three roles for libraries. First, they are the archives that preserve the world's culture that has been processed in print. Second, they are the agencies that provide intellectual and physical access to these archives as needed by the public. Third, they are agencies that capitalize on their missions as administrative units in the information industry by

offering innovative services. In this latter capacity they may also instigate the creation of new information, and would have the authority to analyze information for specific applications as a surrogate for the public.

The New York Metropolitan area has the resources, the demand, and the general administrative agents required to create a most unusual science information service environment of the greatest power, and potential viability of any region in the country. The concept of one great library that would in essence be created if these recommendations were adopted is neither startling nor original. The late Watson Davis, a man of great vision in the field of the communication of scientific information and of sound practicality in creating communication enterprises, called for such an agency in the 1930s. Nearly three decades later he pondered philosophically among documentalists and librarians at a large national meeting about our failure to mobilize our resources for what is known to be an urgent task--providing access to scientific information.

> Is cooperation (he said) between librarians and organizations so difficult that "one big library" cannot be accomplished? A little organization, cheerful argument, and gentle pressure from users and financial supporters such as the government and foundations would make it possible. The know-how exists and we only need the let's do.[1]

Next Steps

As recommended in this report, the implementation of the program to improve reference and research resources in science and engineering libraries should be directed by a Council of the librarians of these collections. It will not prejudice their efforts, however, to indicate those activities that the Project staff sees as most urgent and most likely of attainment in the immediate future.

Since collections adequate to regional demands are fundamental to the program for action, the librarians of the area should capitalize on the momentum gained in analyzing their collections for this Project by beginning now to examine collections in far more detail than was done here in order to begin the acquisition of new material, and added copies, as required, of already heavily used materials. A committee or, if possible, the Science Library and Information Service Council, should be appointed to plan and supervise the analysis. This is the kind of analysis that could not be done across the board during this

study. The region's collections are so good that to have concentrated on them in the depth of analysis that would have been required to locate weaknesses would have consumed all of the Project's staff time and that of most of the science librarians in the area for the full year. At least the next steps can be guided by the patterns that have been set in the recommendations in this report.

Collection development will require constant attention to keep the region's resources abreast of changes in science and engineering. Selection policy statements should be prepared that will serve as guides to long-term development programs. However it is managed, cooperation in acquiring the widest possible range of materials for the scientists and engineers of the region should become a permanent and high priority activity. It will not be possible to examine holdings in all subjects at once, but the program should be scheduled for orderly progression through the sciences. All of the highly specialized and unique collections should be identified and described as quickly as possible in sufficient detail to allow readers' advisers to guide users to appropriate collections with assurance that their needs will be met. Determination of how and to what extent the continued development of these specialties should be continued on behalf of the public will depend upon who and how extensive that public is, and how important the special collections are to them.

Work on the public information, promotional, and educational programs should also begin immediately. Greater effectiveness can still be obtained from existing public resources even without their augmentation in this fashion. Although it is important that all of the major collections and services be described in operational terms for the public, it is suggested that early efforts be devoted to problem-oriented public relations publications. For example, a brochure should be prepared telling how and where to obtain copies of journal articles in various subjects, with clear notations of speed of access to the collections and prices of copies, a description of the translation industry, including information about translation collections in New York area libraries and in national translation centers throughout the world would be useful. In-service programs for librarians should have the highest priority. Courses and lecture series should be started as soon as possible, concentrating at first on new reference and bibliographical tools in science and engineering and the acquisition and use of specialized formats of communication of scientific information.

Work should start soon, too, on a finding list of scientific and technical serials. This list, it should be remembered, should

be a key to the location of a standard list of serials, and not a union list of serials in all or even many of the libraries in the region. No location should be given for a serial unless the titles can be made available in some way to the public in the libraries listed. Also as soon as possible, a separate serials collection for the support of copying services should be established. To some extent this can be done with discards from industrial libraries, although it would undoubtedly be necessary to purchase long runs of standard society journals.

Finally, some aspects of the Central Advisory and Referral Service and the Central Translation Facility could be established with a minimum investment, and expanded as funds became available. Although it was proposed that these services become a part of a new Science and Technology Information Center, they could be headquartered in the METRO offices until another home in the science library community could be found for them. The translation activity would require only the establishment of form contracts and the announcement to the community that the service is available. The translators can be located through standard directories or in the file created for this project, at least until it becomes too dated.

Additional Studies

Obviously the METRO Science Library Project did not cover all aspects of the field of science library and information work and did not touch on all aspects studied with equal force. Very particularly, more time will have to be spent on methods of inventorying collections in ways that will lead to their better development and use. The problems of the faculties of small colleges in the suburbs were not fully covered. The needs of this group ought to be studied in depth. They were included only to the extent that they responded to the general questionnaire that went to scientists and engineers. Their needs ought to be determined and examined in detail. Unlike their colleagues in the large universities, the urban colleges, and industrial laboratories, faculty members of small colleges do not have access to large collections at their place of employment and may be far removed from the large public resources.

This same kind of study should be made in the life sciences. Although the medical libraries of the area already have undertaken some cooperative programs, problems of public access to material might still exist. The Science and Technology Division of the New York Public Library does not collect extensively in the life sciences, and the configuration of museum, association, and other kinds of

library collections is different. While it was not difficult during this Project to sort out the physical science users and problems from those of the life sciences, there were evidences that the lines between these two major segments of science are not clear and inviolable among scientists.

These are but a few of the ideas noted as the Project came to a close. The problems of interregional communication and sharing of resources, of regional technical processing from which regional inventories could be generated, and of public accessibility to computer-based bibliographic and information services are important too. Hopefully, METRO can go on with studies like these, for from them can come new principles of regional library service that would be nationally useful.

Note

1/ Davis (1965).

REFERENCES CITED

Bradford, S.C. Documentation. Second edition. London: Crosby Lockwood & Son, 1953.

Cooperative Library Service for Higher Education: a Library Research Program Report. New York: Council of Higher Educational Institutions in New York City, 1960.

Davis, Watson. "The Universal Brain: Is Centralized Storage and Retrieval of All Knowledge Possible, Feasible or Desirable?" Proceedings of the Fourteenth Annual Meeting and Convention, National Microfilm Association. Vernon D. Tate, editor. Annapolis: National Microfilm Association, 1965. Pp. 136-43.

Gates, Alice J. Catalogue of Technical Periodicals, Libraries in the City of New York and Vicinity. New York: Engineering Societies Library, 1915.

Hanson, C.W. "Research on User's Needs: Where Is It Getting Us?" Aslib Proceedings, 16:64-78, 1964.

_____. Survey of Information/Library Units in Industrial and Commercial Organizations. London: Aslib, 1960.

Herner, S. "The Information Gathering Habits of Workers in Pure and Applied Science," Industrial and Engineering Chemistry. 46:228-36, August, 1954.

Lapp, Ralph E. "Where the Brains Are," Fortune, 73:154-56, March, 1966.

Morchand, Charles A. Preliminary Study for an Improved Information Transfer System for METRO Libraries. New York: New York Metropolitan Reference and Research Library Agency, 1967. (METRO Miscellaneous Publication 2.)

Public Television: a Program for Action. The Report of the Carnegie Commission on Educational Television. New York: Bantam Books, 1967.

Shaw, R.R. "The Research Worker's Approach to Books--the Scientist," The Acquisition and Cataloging of Books. W.M. Randall, editor. Chicago: University of Chicago Press, 1940. Pp. 284-309.

Stevens, R. Characteristics of Subject Literature. Chicago: American Library Association, Association of College and Research Libraries, 1953. (ACRL Monograph 6.)

Union List of Periodicals Currently Received by the New York and Brooklyn Libraries. Edited at Columbia College Library. New York: New York Library Club, 1887.

Vickery, B.C. "The Use of Scientific Literature," Library Association Record, 63:263-69, August, 1961.

Voigt, M. "The Researcher and His Sources of Scientific Information," Libri, 9:177-93, 1959.

BIBLIOGRAPHY:

SELECTED READINGS ON REGIONAL LIBRARY COOPERATION

AND INTERLIBRARY COOPERATION

Becker, Joseph. "Communication Networks for Libraries," Wilson Library Bulletin, 41:383-87, December, 1966.

Boaz, Martha T. Strength through Cooperation in Southern California Libraries: a Survey. Los Angeles: Los Angeles Public Library, 1965.

Bonn, George S. "Science-Technology Periodicals: a Preliminary Report on a One-Year Use Study at NYPL," Library Journal, 88:954-58, March 1, 1963.

Brewster, Evelyn. "Denver: Rapport and Round Robin," Wilson Library Bulletin, 38:275-78, November, 1963.

Brown, George, James G. Miller, and Thomas A. Keenan. EDUNET. Report of the Summer Study on Information Networks Conducted by the Interuniversity Communications Council. New York, John Wiley & Sons, 1967.

Brown, Jack E. "The National Science Library: Information Centre for Industry," Industrial Canada, 65:22-27, March, 1965.

Brown, Keith G. "The Need for Coordination Between Public and University Libraries and Special Libraries of Corporations," Texas Library Journal, 28:17-22, March, 1952.

Buckland, Lawrence F. Problems of Recording Text Information in Machine Form for Use in a Scientific Information Communication Network. Maynard, Massachusetts: Inforonics, Inc., 1966.

Burgarella, Mary, and Helen Tedford. "Regional Library Systems: a Bibliography," Bay State Librarian, 56:7-10, January, 1966.

Carrington, David K. "Bibliography of Library Cooperation," Special Libraries, 57:395-99, July, 1966.

Carter, Launor F., and others. National Document-Handling Systems for Science and Technology. New York: John Wiley & Sons, 1967.

The Center for Research Libraries. The Report of a Survey with an Outline of Programs and Policies. Chicago: The Center for Research Libraries, 1965.

Chipp, Rodney D. "Community Antenna Television Systems," IEEE Spectrum, 3:58-66, July, 1966.

Cooperative Library Service for Higher Education: a Library Research Program Report. New York: Council of Higher Educational Institutions in New York City, 1960.

Darling, Louise. "MEDLARS Regional Center at UCLA: a Progress Report," Bulletin of the Medical Library Association, 54:311-15, October, 1966.

Dissemination of Information for Scientific Research and Development: with Special Reference to the Work of Research Information Service, The John Crerar Library. Chicago, The John Crerar Library, 1954.

Downs, Robert B. "College Library Cooperation in Arkansas," Illinois Libraries, 47:197-202, March, 1965.

_____. "Cooperative Program for Kansas City Libraries," Missouri Library Association Quarterly, 25:34-37, June, 1964.

A Draft Program for a National Technical Information Center. Merlo Park, California: Stanford Research Institute, 1958.

Dubester, Henry J. "Communication in Libraries": Libraries and Automation. Proceedings of the Conference on Libraries and Automation held at Airlie Foundation, Warrenton, Virginia, May 26-30, 1963. Washington: Library of Congress, 1964. P. 220.

Ebersole, J.L. "An Operating Model of a National Information System," American Documentation, 17:33-40, January, 1966.

Emerging Library Systems: the 1963-66 Evaluation of the New York State Public Library Systems. Albany: The University of the State of New York, State Department of Education, Division of Evaluation, 1967.

Emling, J.W., J.R. Harris, and H.J. McMains. "Library Communications," Libraries and Automation. Proceedings of the Conference on Libraries and Automation Held at Airlie Foundation, Warrenton, Virginia, May 26-30, 1963. Washington: Library of Congress, 1964. Pp. 203-19.

_____. "Communications Systems for Libraries: Some Examples and Problems," Libraries and Automation. Proceedings of the Conference on Libraries and Automation held at Airlie Foundation, Warrenton, Virginia, May 26-30, 1963. Washington: Library of Congress, 1964. Pp. 221-24.

"ERIC Announces Clearinghouse Network," Library Journal, 91:5144-45, October 15, 1966.

Evans, Luther H., and others. "Revision of the Copyright Law," Law Library Journal, 59:1-21, February, 1966.

"Exchange Network to Link Area Data Resources," Houston, 39:79-80, January, 1967.

Estes, Rice. A Study of Seven Academic Libraries in Brooklyn and their Cooperative Potential. New York: The Council of Higher Educational Institutions in New York City, 1963.

Goldstein, Harold (ed.). The Changing Environment for Library Services in the Metropolitan Area. Papers Presented at an Institute Conducted by the University of Illinois Graduate School of Library Science, October 31-November 3, 1965. Champaign, Illinois, 1966.

Gosnell, Charles F. "Copying Grab Bag: Observations on the New Copyright Legislation," ALA Bulletin, 60:46-55, January, 1966.

Graff, W.J., S.G. Whitten, and H.A. Blum. Phase I, Final Report of a Feasibility Study for a Regional Information Center. Dallas: SMU School of Engineering, 1961.

Haas, Warren J. "Statewide and Regional Reference Service," Library Trends, 12:405-12, January, 1964.

Harris, Kathleen G. "Metropolitan Reference Services: Patterns, Problems, Solutions," Library Journal, 88:1606-11, April 15, 1963.

Hayes, O.R. "Improved TWX Strengthens New York's Interlibrary Loan Network," The Bookmark, 25:51-55, November, 1965.

Henderson, Madeline M., and others. Cooperation, Convertibility, and Compatibility Among Information Systems: A Literature Review. Washington: Government Printing Office, 1966. (National Bureau of Standards Miscellaneous Publication 276.)

Holley, Edward G. "The Houston List," Library Journal, 88:959-61, March 1, 1963.

_____. "Resources for Research in Urban Areas," Wilson Library Bulletin, 4:502-9, January, 1967.

Hoshovsky, A.G., and H.H. Album. "Toward a National Technical Information System," American Documentation, 16:313-22, October, 1965.

Initial Report on a Study to Plan Development and Implementation of a Connecticut Library Research Center: a Study Supported by the Connecticut Research Commission for the Connecticut State Library. Farmington, Connecticut: United Aircraft Corporate Systems Center, 1966.

Joeckel, Carleton B., and Amy Winslow. A National Plan for Public Library Service. Chicago: American Library Association, 1948.

Knox, William T. "National Information Networks and Special Libraries," Special Libraries, 57:627-30, November, 1966.

Laich, Katherine. "Regional Reference Library Service, an Outline of Cooperative Services, Existing or Proposed," News Notes of California Libraries, 56:254-65, Spring, 1961.

The Library and Information Networks of the Future. Chicago: American Library Association, 1963.

Library of Congress, Copyright Office, Register of Copyrights. Copyright Revision. Part 6: Supplementary Report of the Register of Copyrights on the General Revision of the U.S. Copyright Law--1965 Revision Bill. Washington: Government Printing Office, 1965. (Printed for the House Committee on the Judiciary, May 1965. 89th Congress, 1st Session.)

Martin, Gene. "Interlibrary Cooperation in Missouri," Wilson Library Bulletin, 40:166-71, October, 1965.

McComb, Ralph W. "Pennsylvania's Regional Library Resource System," Pennsylvania Library Association Bulletin, 19:8-11, November, 1963.

McCoy, Ralph E. "A University Library Serves the Area," Illinois Libraries, 43:676-79, November, 1961.

McKay, Mildred P. "New Hampshire's Single State Library System," Library Trends, 13:279-86, January, 1965.

Meise, Norman R. "Conceptual Design of an Automated National Library System." Unpublished Master's thesis, Rensselaer Polytechnic Institute, Hartford Graduate Center, June, 1966.

Meyerhoff, Erich. "The Medical Library Center of New York: An Experiment in Cocperative Acquisition and Storage of Medical Library Materials, Bulletin of the Medical Library Association, 51:501-6, October, 1963.

"Missouri Bibliographic Center," Wilson Library Bulletin, 35:689-90, May, 1961.

Moon, Eric. "The Medical Library Center of New York," Library Journal, 90:2952-57, July, 1965.

Mohrhardt, Foster E., and Blanche L. Oliveri. "National Network of Biological-Agricultural Libraries," College and Research Libraries, 28:9-16, January, 1967.

Morchand, Charles A. Preliminary Study for an Improved Information Transfer System for METRO Libraries. New York: New York Metropolitan Reference and Research Library Agency, 1967. (METRO Miscellaneous Publication 2.)

Morehouse, H.G. Telefacsimile Services Between Libraries with the Xerox Magnavox Telecopier. Reno: University of Nevada Library, December 20, 1966.

A National Technical Information Center. Menlo Park, California: Stanford Research Institute, 1957.

Nelson, Charles A., Richard H. Logsdon, and Scott Adams. "Library Cooperation: Panacea or Pitfall?" Special Libraries, 56:571-78, October, 1965.

New Directions in Library Service for Colorado. Report of a Survey Undertaken for the Colorado State Library. New York: Nelson Associates, 1965.

Overhage, Carl F.J., and R. Joyce Harman. INTREX. Report of a Planning Conference on Information Transfer Experiments, September 3, 1965. Cambridge, Massachusetts, The M.I.T. Press, 1965.

A Plan for an Inter-Library Service Program for North Texas. (No place or publisher given), July 31, 1965.

Prospects for Library Cooperation in New York City: Planning for More Effective Utilization of Reference and Research Resources. New York: Nelson Associates, 1963.

Poole, Herbert. "Teletypwriters in Libraries: a State of the Art Report," College and Research Libraries, 27:283-86, July, 1966.

Proposed United Engineering Information System--its Services, Logical Elements, and Network Concept. New York: Engineers Joint Council, 1966.

Rather, John. "Library Cooperation: a Bibliographic Essay Prepared for the California State Library and the California Library Association," California Librarian, 16:299-310, October, 1955.

A Recommended Design for United States Medical Library and Information System. Washington: Herner and Co., 1966 (2 volumes)

Rogers, Frank B. "MEDLARS Operating Experience at the University of Colorado," Bulletin of the Medical Library Association, 54:1-10, January, 1966; 54:316-20, October, 1966.

Rohlf, Robert H. "A Plan for Public Library Development in Illinois," Illinois Libraries, 46:217-53, March, 1964.

Rubinoff, Morris (ed.). Toward a National Information System: Second Annual National Colloquium on Information Retrieval, April 23-24, 1965, Philadelphia, Pennsylvania. Washington: Spartan Books, 1965.

Sabsay, David. "The North Bay Cooperative Library System," News Notes of California Libraries, 58:335-47, Summer, 1963.

Schatz, Sharon. "Facsimile Transmission in Libraries: a State of the Art Survey," Library Resources and Technical Services, 12:5-15, Winter, 1968.

Schwartz, Julia. "A Bibliography of Cooperative Reference Service," RQ, 6:73-81, Winter, 1966.

Seiden, Martin A. Economic Analysis of Community Antenna Television Systems and Television Broadcasting Industry. Washington: Government Printing Office, 1965.

Shera, Jesse H., Allen Kent, and J.W. Perry. Information Resources--A Challenge to American Resources and Industry. New York: Interscience, 1958.

Sparks, C. Glenn. "Academic Institutions in North Texas Organize for Cooperation," Texas Library Journal, 41:6-8, Spring, 1965.

Stearns, John F. "A National Referral Center for Science and Technology," College and Research Libraries, 25:205-8, May, 1964.

_____. "National Referral Center's First Year," Special Libraries 55:20-23, January, 1964.

A Study of the Library Needs of Lower Manhattan. Report of the Special Committee on the Lower Manhattan Project. New York: New York Public Library, 1956.

Swank, Raynard. "The Pacific Northwest Bibliographic Center," Libraries and Librarians of the Pacific Northwest, Morton Kroll, editor. Seattle, University of Washington Press, 1960. Pp. 200-40.

"Teletype Equipment Installed in Four Pennsylvania Regional Centers," Library Journal, 90:89-90, January 1, 1965.

"Three Examples of Approaches to the Provision of Regional Reference Services," Library Journal, 89:1676-87, April 15, 1964.

The 3-R's Program: Meeting Industry's Informational Needs. Report to the Division of Library Development, New York State Library. Cambridge, Massachusetts: Arthur D. Little, Inc., 1967.

Verschoor, Irving A., and Mary Lee Bundy. Regional Library Systems Development in Massachusetts. Boston: Board of Library Commissioners, 1963.

Warren, Stafford L. "Proposed National Science Library System," Library Planning for Automation, Allen Kent, editor. Washington: Spartan Books, 1965. Pp. 3-33.

Wezeman, Frederick. "Racine's Teletype System Changes Library Thinking," Library Journal, 75:1222-44, July, 1950.

Williams, Gordon R. "Library Cooperation--Key to Greater Resources," Special Libraries, 56:565-70, October, 1965.

TECHNICAL MEMORANDUM

MACSINET

Much has been written and said on the subject of library systems and networks. Most material views the situation from the perspective of the librarian, the user, the library administrator, the government agency, and so on. And seemingly, there are varying levels of imaginative ingenuity, ranging from a repetition of the way it was done somewhere else to a new arrangement to old standards. In contrast, approaches or plans for new networks based on cost-performance, engineering standards, or other quantitative measures are limited.

The opportunity arises with MACSINET (Metropolitan Access to Scientific Information Network) and its experimental series, MACSINEX (Metropolitan Access to Scientific Information Experiments), to apply good design practice early enough to have, hopefully, long-range beneficial results. It is possible to accomplish MACSINET in a preplanned manner that embodies the opportunity to measure results against standards and to make corrections and adjustments in pilot programs.

Most any information network includes resources (documents & data), people, machines and procedures. For the most part MACSINET starts with the understanding that:

1. The resources are in place, but somewhat inaccessible to a broad audience;

2. Some of the people necessary to implement the Network are available. They may be working in related tasks but can be converted. Others must be identified and trained;

3. Machines of a wide variety and capability are available, but remain to be system integrated in accordance with an overall plan; and,

4. Procedures can be outlined initially, but will be tested and reformulated in a series of experiments.

Prepared by Robert W. Levesque, Director, Information Services Laboratory, Syracuse University Research Corporation, Syracuse, New York.

MACSINET will best develop as it engages in the MACSINEX series of experiments. For example, preliminary to any equipment definition or purchase, there is need for a design phase which the basic elements of the network can be modeled and computer-simulated if need be. While MACSINET is an approach to a developing information network, MACSINEX will insure that the Network is timely, well grounded in good planning and responsive to user needs.

Because MACSINET is inherently flexible, it need not represent a definitive or final arrangement. Rather, it is a start that builds on library and librarian strengths while developing new communications arrangements for service to an extended audience.

MACSINET should not be allowed to fall prey to too much of a total system concept that demands everything and anything be included on the justification of efficiency. It will be sufficient to engage the communications and data flow problems without disturbing the internal operations of MACSINET member organizations. MACSINET can also avoid another extreme and focus too early on a particular data transmission, document handling, or communications approach. The determination of what is best for METRO and MACSINET are the substance of the MACSINEX experiments.

Many aspects of just how MACSINET will go about its business remain to be developed. It can be expected, though, that the METRO Science Library Information Services Council will make numerous recommendations while preparing a critical review of the METRO Science Libraries Report. Matters of concern as shown by the Science Library and Information Service Use Survey of this Project include the predominance of engineering degree holders among potential users. They have an indicated preponderance of need for "current information on specific topics" and "specific facts or figures." As the bulk of respondents (75 percent) were more than 10 years out of school, their inquiries can be expected to require heavy reliance on an interpretive function. Inquiries of this type would require at some point in processing a complete written description. The inquiry message and first, second, or third interpretive responses might be passed from one MACSINET participant to another before completion and user satisfaction.

As noted in the survey, an emphasis on current trade, society, and professional research journals would seem to show that a great many requests for MACSINET service could be satisfied via the Central Serials Supply Service (CENSSUS). These would be unidirectional

queries from a variety of initiating points to CENSSUS perhaps in teletype or telephone format with a photocopy by mail or facsimile (for urgent requests) responses.

The variety of inquiries and responses would indicate a need to keep careful records of transactions from which to analyze and optimize service. Over a period of time, this feedback would enable system planners and developers to initiate a cost/benefit analysis resulting in measures of service suitable for reimbursing elements of the MACSINET for services rendered. The cost/benefit analysis based on use and performance also provides a method for allocating charges. Although MACSINET is envisioned as a subsidized operation, it is vital to recognize, introduce, and encourage measures of performance, since it is axiomatic that products can not be sold nor services rendered economically over the long term without user satisfaction.

Despite unknowns in certain use and procedural matters, the development of a new network serving the technical community can proceed in an orderly manner. The planning of a MACSINET library communication and information transfer network can be treated as a problem needing the appplication of scientific methods. (Why not plan a science information network with scientific methods?) With such an approach, solutions to the problem are achieved most readily by following certain logical steps. Summarized they are:

1. Identify and define the problem.
2. Gather and analyze the available facts.
3. Develop alternate solutions.
4. Test the solutions for efficiency and effectiveness.
5. Select the optimum solution.
6. Implement the solution.
7. Evaluate and follow-up.

In applying the scientific method to the problem of designing the MACSINET Network, the steps summarized above can be reformulated in terms of goals or expected achievements as follows:

1. Identify the MACSINET data transfer problem and formulate the objectives to be sought from improved interlibrary communications.

2. Gather and analyze the pertinent facts for such specifications as: (a) volume of science data flow activity anticipated; (b) type of material (books, reports, etc.); (c) urgency of information requests (personal, business); and (d) accuracy of information required.

3. Design alternate communications and data transfer systems that will meet the MACSINET objectives and Science Library and Information Service Council specifications.

4. Develop alternate or optional systems to the level necessary for determining the costs of each.

5. Evaluate by comparing each of the alternate approaches to prescribed standards and determining how well the various MACSINET systems: (a) meet the METRO objectives; (b) satisfy the MACSINET specifications; (c) cost to install and operate; and (d) provide other user and library benefits; then make a best approach decision.

6. Put in place and test for performance the chosen arrangement of MACSINET libraries, communications, and data flow procedures.

7. Evaluate and follow-up to: (a) satisfy via an independent view that the chosen system does actually meet or exceed the prescribed specifications; and (b) determine if the original requirements have changed, thus requiring new specifications.

What is MACSINET?

The acronym stands for Metropolitan Access to Scientific Information Network.

Basically it is a group of New York Metropolitan libraries and information services already engaged in providing the research public with technical, physical science, and engineering data.

MACSINET will make a wide variety of science-related materials more readily accessible and useful to wider audiences.

Why Have a MACSINET?

MACSINET will facilitate the communication, interpretation, location, response, and delivery of technical data for research persons and organizations having need for advanced scientific materials.

Emphasizing communications, MACSINET will have as its prime purpose to make more readily available to library users the data and copy known to exist in the Metropolitan New York area.

What is the Cornerstone of MACSINET?

- Central Public Scientific & Technical Library
- Central Information Service
- Large Collection of Current Scientific & Technical Literature
- Extensive Bibliographic Search Apparatus
- "Hot-Line" Telephone Service
- Translation Services
- Advisory & Referral Services to The Public
- Communications Facilities Linking MACSINET Libraries

How Does MACSINET Relate to a State and National Role?

- The MACSINET Communications Central Office Provides Focus
- Central Office for METRO Scientific & Technical Information Needs
- Major Access Point for Regional Technical Data Needs
- Major Nodal Unit for New York State Library Systems
- Major Nodal Unit for National Information Systems

How Much Would MACSINET Cost?

A network of libraries serving the scientific and technical community would have as its major cost elements planning, personnel and equipment. Planning costs would be upwards of $100,000 for a period of one to two years. Monies spent here for competitive design, multiple consultants and long-term retainer agreements will result in economical yet flexible arrangements in the implementation and operational phases. Equipment costs for rentals for amortized purchases would be dependent upon system design and the number of participating institutions. Costs here could range to $200,000/year initially. Personnel costs would be comparable.

Thus, MACSINET would start at a half-million dollars per year figure, rising into the million-plus per year category as operations expanded. The necessity for good planning, stressing independent judgments, is apparent.

WHAT AGENCIES WOULD BE IN THE INITIAL MACSINET?

MACSINET — Metropolitan Access to Scientific Information Network

OTHER AGENCIES	SOCIETIES & ASSOCIATIONS	PUBLIC LIBRARIES	UNIVERSITY LIBRARIES
• American Museum of Natural History	• Chemists' Club (Library)	• New York	• Columbia University
• New York Hall of Science*	• Engineering Societies (Library)	• Brooklyn	• Fordham University
• U.S.A. Standards Institute	• American Institute of Aeronautics and Astronautics (Technical Information Service)	• Queensborough	• New York University
		• Yonkers	• City University of New York (all units)

"TO ENHANCE THE WIDEST INTELLECTUAL & PHYSICAL ACCESS TO PUBLICATIONS & INFORMATION FOR THE SCIENTIFIC AND TECHNICAL COMMUNITY"

Note: Major elements of the network are those already engaged in public-oriented technical, scientific, and engineering information services.

* Pending inauguration of Information Service

HOW DO WE INSURE THAT MACINET WILL BE WELL PLANNED AND EFFECTIVE?

STEP 1

Identify & define the MACSINET Library Network Problem & Outline the Network Objectives.

For example:

Rapid location of Technical Data;
Shorten the Delivery Time between Libraries and to Users;
Lower Operating Costs;
Reduce Local Inventory;
Provide Central Service.

STEP 2

Gather & Analyze Library User & Library Resource Facts

(Partly Done by METRO Science Library Project)

Distribution & Location of Resources
Pertinence & Nature of MACSINET Holdings
Volume of Data Flow (Current & Projected)
Type & Format of Data to be Transferred
Urgency of Response
Accuracy Levels Required

STEP 3

Design of Alternative Technical Data
Communication Networks

User Operated Equipment
Library Operated Equipment
Equipment Use Selection Procedures
Operating Manuals
Data Transmission Media
Central Processing Arrangements
Terminal Equipment
System Operation Procedures

STEP 4

Develop Cost/Performance Levels for alternate systems

Equipment
Services
Personnel Requirements
Level, Training and Motivation Required
Materials and Supplies Costs
Space Required

STEP 5

EVALUATION OF ALTERNATE MACSINET SYSTEMS

How well do the various systems outlined meet the objectives?

How well does each system meet the specifications?

How much does each system cost?

Initially?
To Operate?
Over a Time Period?

How easily can each system be revised?

How readily can each system be expanded?

What are the benefits & Disadvantages of each?

SELECT THE BEST SYSTEM

STEP 6

Implement & Test The MACSINET System Selected

STEP 7

Follow-up & Evaluation via MACSINEX Experiments

Assure the MACSINEX Network meets the Objectives & Specifications

Determine Changing Needs and Network Adjustments.

WHAT OTHER NEW ACTIVITIES AND SERVICES WOULD BE RELATED TO MACSINET OPERATIONS?

SPECIAL SERVICES

CENTRAL ADVISORY AND REFERRAL SERVICES (CARES)

- A Librarians Central
- To Help Librarians Develop Search Strategies
- To Facilitate Interlibrary Loans and Arrange Photocopying
- Centralize Billing and Funds Transfer
- Maintain an Inventory of Libraries, Information Centers and Services in METRO Region
- Prepare Public Relations and Training Publications

CENTRAL TRANSLATION FACILITY

- Maintain a Roster of Commercial Translators by Language & Subject
- Serve as Broker Between Those Needing Translations and Those Who Translate
- "Quicktran" for Indicative Translations on Demand
- Maintain a Translations Inventory
- Translations Repository
- Enhance Local Utilization of Translation Pools

CENTRAL SERIALS SUPPLY SERVICE (CENSSUS)

- Provide Quick Photocopy and Interlibrary Loans of Technical Periodicals
- To relieve Research and Circulating Libraries of Providing Public with Journal Copies
- Maintain Inventory of Frequently Used Journals
- Build Comprehensive Collection of Trade Journals
- Provide Back Issue Journals on Microfilm

DELAYED ACCESS STORAGE CENTER

- Store Little-used Material
- Less Expensive Space Than in Active Library
- Capable of Delivering Material in 1-3 Days
- Reduce Morbidity in Mixed High-use - Lo-use Libraries

SEARCH SERVICES

- Bibliographic Services
- Centered at New York Public Library
- Abstracting Services
- Current Awareness Bibliography
- Current Science Developments

SERIALS UTILITY REGISTER

HOW DO WE IMPLEMENT MACSINET?

VIA THE METRO SCIENCE LIBRARIES INFORMATION SERVICES COUNCIL

MEMBERSHIP FROM -

- METRO Libraries
- Technical Societies
- Science Community

INITIAL FUNCTIONS

- Critique the METRO Science Project Report
- Develop Plans to Implement Science Project Recommendations

CONTINUING FUNCTIONS

- Determine Resource Requirements for Future Regional Network Programs
- Give Viability to a Continuing Review and Development Program for the Improvement of Science Information Resources in The METRO Region
- Provide a Forum for Discussion of Problems and Potential Developments in Science Information Services
- Initiate Further Studies Aimed at Delineating Problems, Examining Alternatives, Selecting Courses of Community Action and Assessing Results

METHODS OF ACTION

- Advise and Assist METRO Board of Trustees
- Advise and Assist METRO Committees
- Advise and Assist METRO Libraries

APPENDIX A

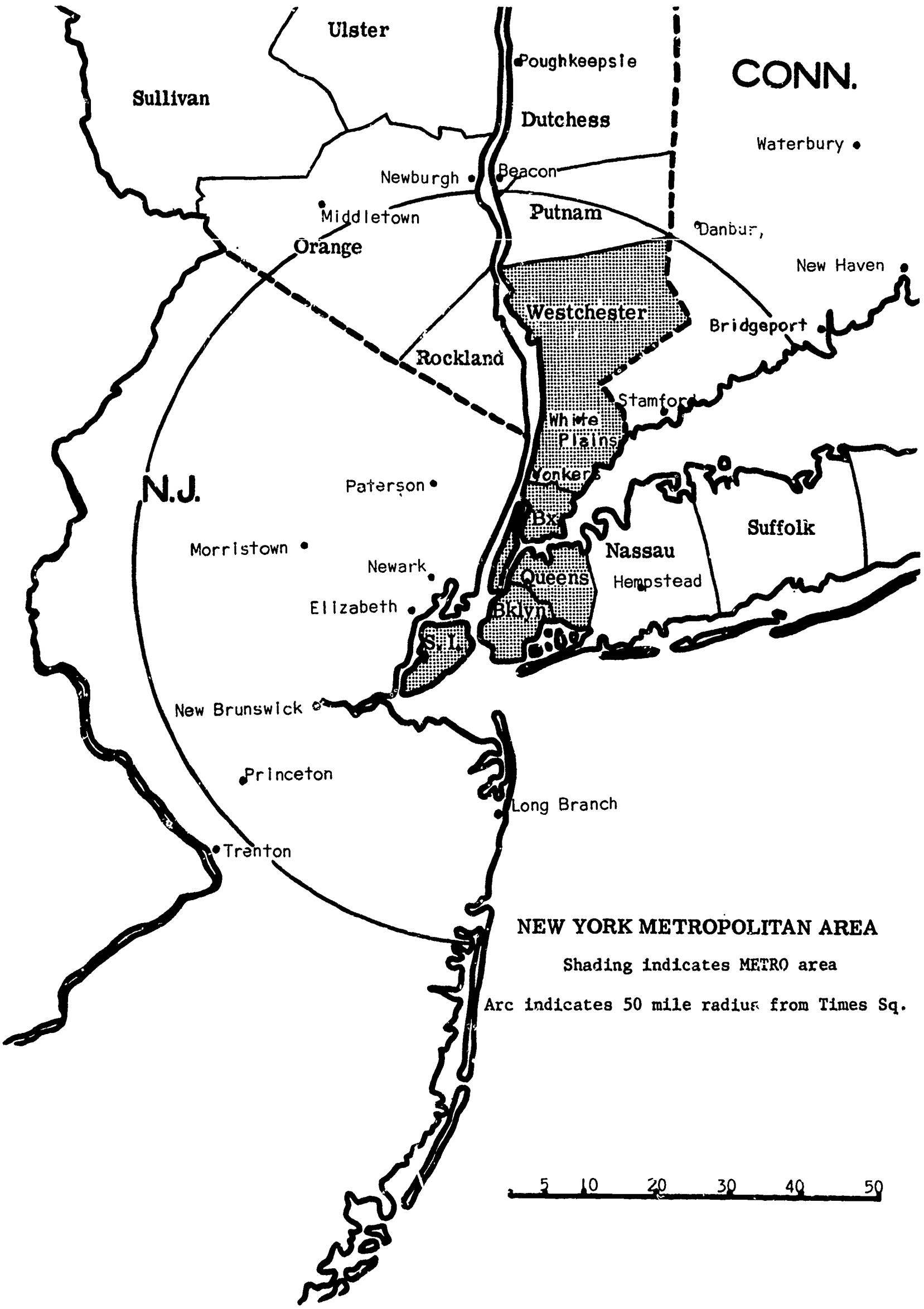
MAPS

New York Metropolitan Area

Manhattan Area: Selected Library Locations

New York: Selected Library Locations (Manhattan Excluded)

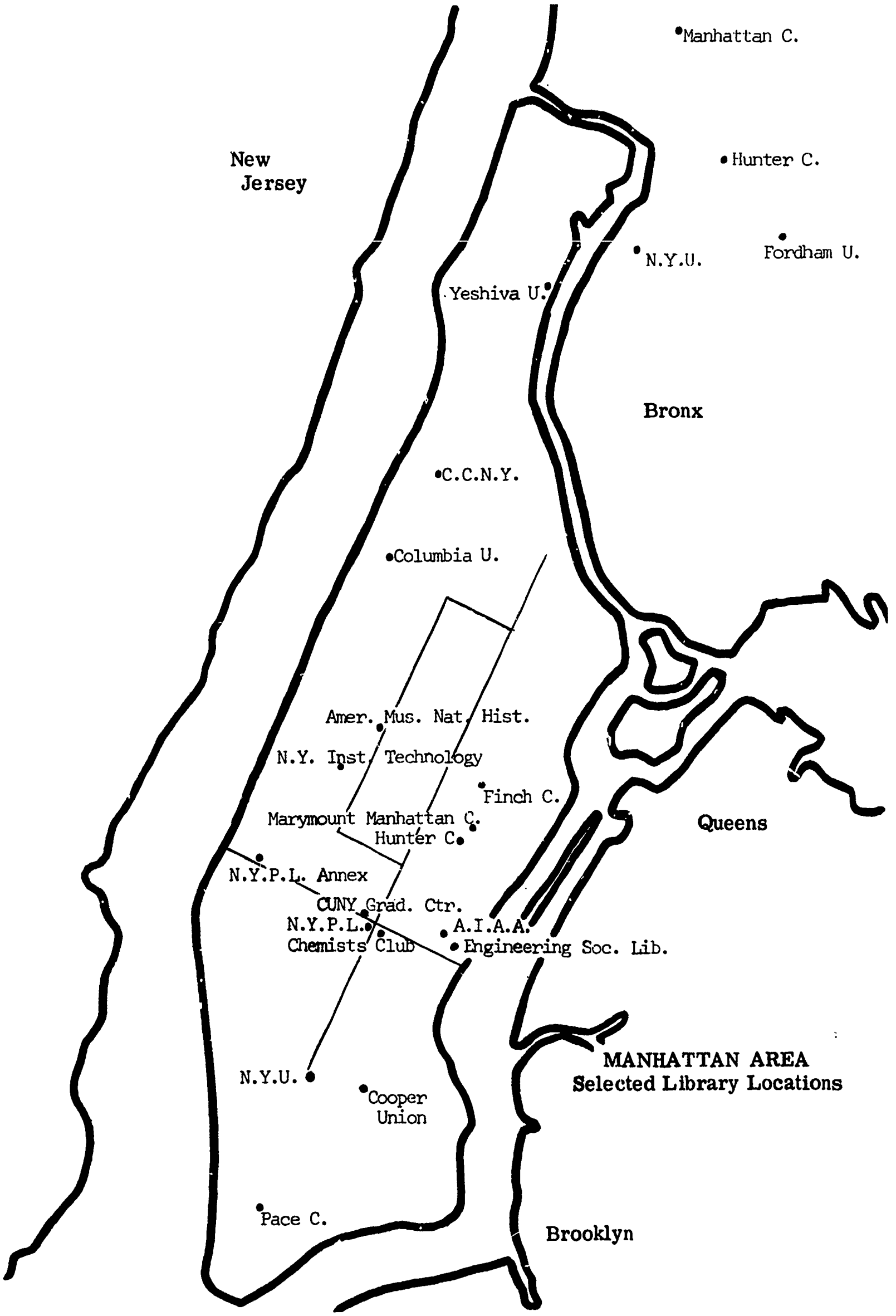
Westchester County: Selected Library Locations



NEW YORK METROPOLITAN AREA

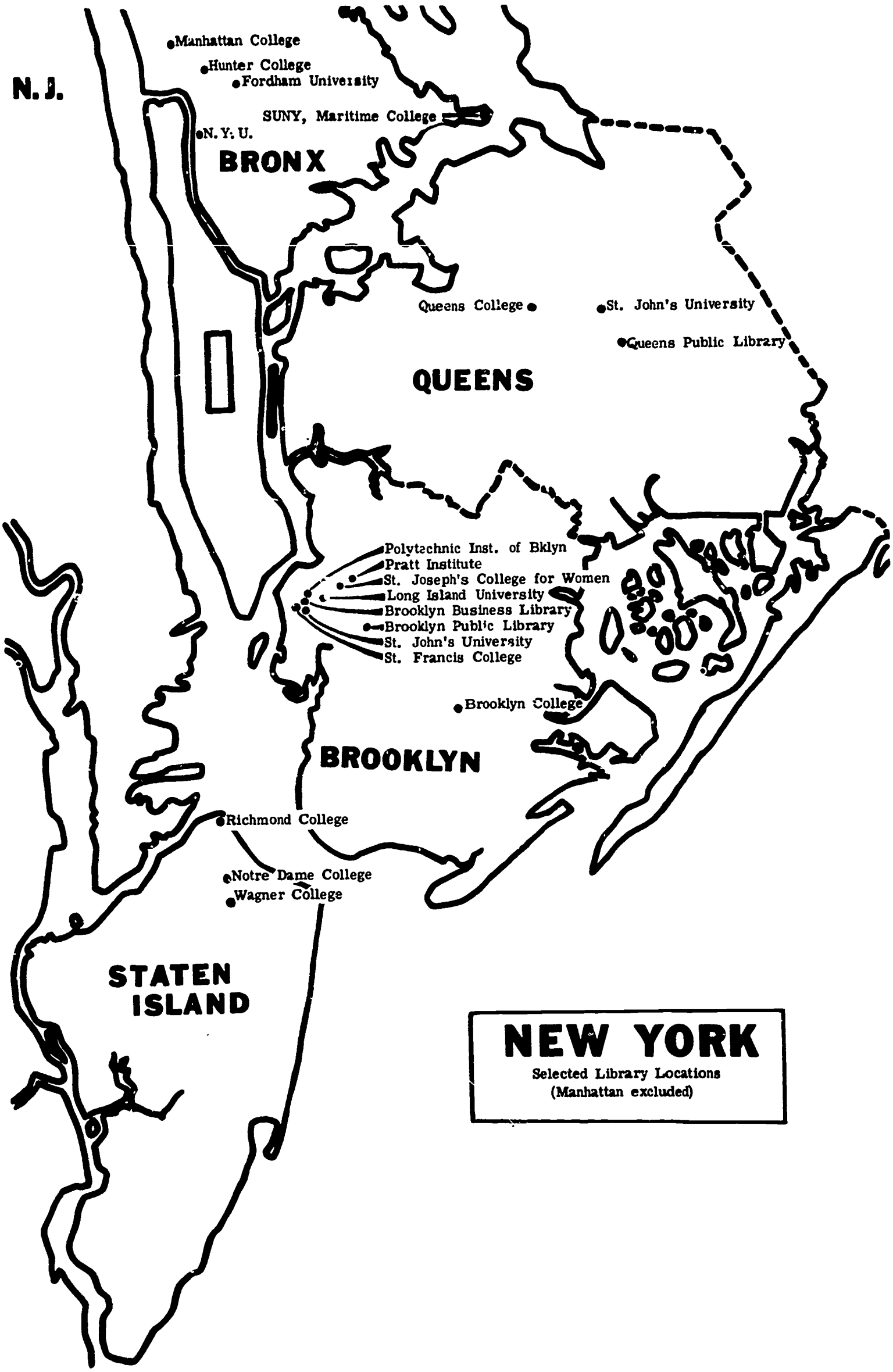
Shading indicates METRO area

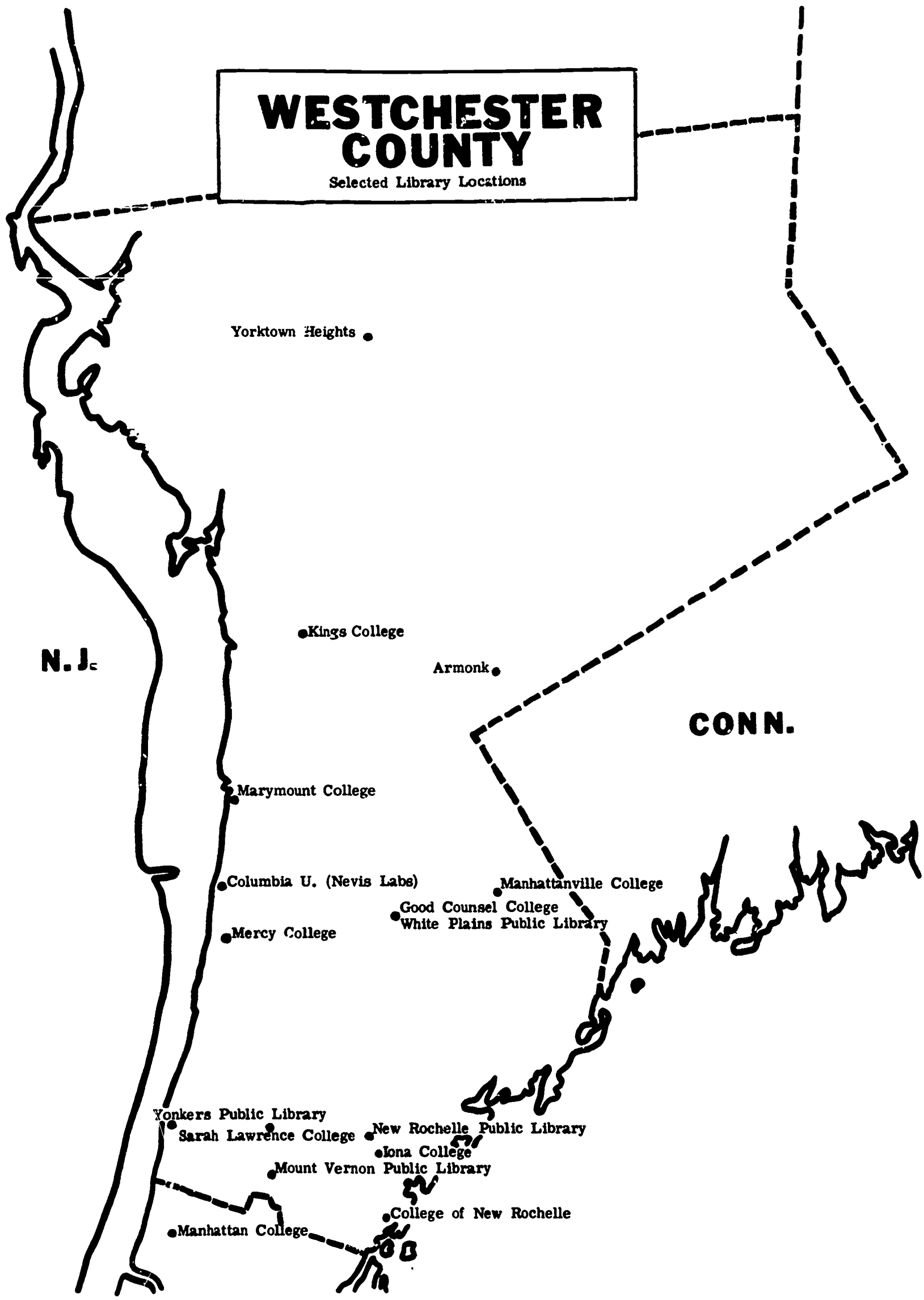
Arc indicates 50 mile radius from Times Sq.



MANHATTAN AREA
Selected Library Locations

3


N. J.
Manhattan College
Hunter College
Fordham University
SUNY, Maritime College
N. Y. U.
BRONX
Queens College
St. John's University
Queens Public Library
QUEENS
Polytechnic Inst. of Bklyn
Pratt Institute
St. Joseph's College for Women
Long Island University
Brooklyn Business Library
Brooklyn Public Library
St. John's University
St. Francis College
Brooklyn College
BROOKLYN
Richmond College
Notre Dame College
Wagner College
STATEN ISLAND
NEW YORK
Selected Library Locations
(Manhattan excluded)


WESTCHESTER COUNTY
Selected Library Locations
Yorktown Heights
Kings College
N.J.
Armonk
CONN.
Marymount College
Columbia U. (Nevis Labs)
Manhattanville College
Good Counsel College
White Plains Public Library
Mercy College
Yonkers Public Library
Sarah Lawrence College
New Rochelle Public Library
Iona College
Mount Vernon Public Library
College of New Rochelle
Manhattan College

APPENDIX B

QUESTIONNAIRES AND FORMS

Science Library and Information Service Use Survey

Undergraduate Questionnaire

Graduate Questionnaire

Special Library Interlibrary Use Survey

Science Library Resources Survey

Collection Development and Storage Opinion Survey

Manufacturers Association Questionnaire

(All figures are in percentages unless otherwise indicated.)

NEW YORK METROPOLITAN REFERENCE AND RESEARCH LIBRARY AGENCY, INC.

SCIENCE LIBRARY AND INFORMATION SERVICE USE SURVEY, 1967

1. Respondent's Name _____

2. Employing Organization _____

3. Position/Title _____

4. Please check the category below that best describes your organization:

5/1 ___Manufacturing (47.0)
2 ___Utilities (2.9)
3 ___Transportation (1.5)
4 ___Communications (5.2)
5 ___Education (10.7)
6 ___Service (9.6)
7 ___Printing and Publishing (0.3)
8 ___Sales/Distribution (3.2)
9 ___Other (specify) (26.8)

5. Please check the category below which best describes your principal responsibility:

6/1 ___Teaching (8.5)
2 ___Research (26.7)
3 ___Development (39.2)
4 ___Production (8.2)
5 ___Marketing (3.8)
6 ___Science Writing (2.1)
7 ___Other (specify) (27.3)

6. Mair product or service of your employer: _____

_____

7. Brief description of your current position: _____

_____

8. Highest college degree:

7/1 ___Bachelor's (38.9)
2 ___Master's (35.9)
3 ___Doctor's (23.0)
4 ___Other (specify) (2.3)

9. Subject area of highest degree:

5 ___Physical Scien. e (22.9)
6 ___Biological Science (2.4)
7 ___Engineering (63.1)
8 ___Mathematics (4.1)
9 ___Other (specify) (7.5)

10. Location of college or university awarding highest degree:

8/1 ___U.S. (93.2)
2 ___Foreign (6.8)

11. In which of the following periods did you receive your highest degree?

9/1 ___Prior to 1940 (16.7)
2 ___1940-1949 (22.1)
3 ___1950-1959 (36.6)
4 ___1960-1967 (24.5)

12. Please list the professional societies to which you now belong.

_____

_____

_____

13. Please check the discipline most closely related to your current primary job assignment:

10/1	___Architecture	(1.1)		Engineering	
2	___Astronomy	(0.6)	11/1	___Chemical	(17.0)
3	___Chemistry	(13.4)	2	___Civil	(2.9)
4	___Physics	(10.9)	3	___Electrical	(26.9)
5	___Mathematics	(6.8)	4	___Mechanical	(19.8)
6	___Earth Sciences	(2.8)	5	___Industrial	(5.2)
7	___Botany	(0.5)	6	___Mining	(0.9)
8	___Zoology	(0.3)	7	___Metallurgical	(4.3)
9	___Other Science (specify)	(3.7)	8	___Aeronautical	(2.5)
			9	___Other engineering (specify)	(8.0)
			0	___Other discipline (specify)	(3.6)

14. How frequently in the past six months have you needed the following kinds of information?

	Very Frequently	Occasionally	Seldom or Not at All
General background information	12/1 42.4	2 50.4	3 7.2
Extensive amount of data	4 23.3	5 46.6	6 30.1
Current information on specific topic	7 53.8	8 43.7	9 2.5
Analytical and testing techniques	13/1 18.0	2 40.6	3 41.4
A specific fact or figure	4 39.5	5 46.0	6 14.5
Names and addresses of people and organizations	7 22.1	8 42.6	9 35.3
Information to complete bibliographic references	14/1 12.4	2 33.2	3 54.4
Other (specify) _____	4 ___	5 ___	6 ___
_____	7 ___	8 ___	9 ___

15. How frequently in your current job assignment do you use the following *sources* of information?

	Very Frequently	Occasionally	Seldom or Not at All
Current trade magazines	15/1 66.9	2 26.2	3 6.9
Current society and professional research journals	4 63.6	5 29.4	6 7.0
Back issues of trade magazines	7 15.5	8 49.7	9 34.8
Back issues of society and professional research journals	16/1 33.5	2 49.8	3 16.8
Textbooks	4 40.5	5 49.6	6 9.9
Advanced monographs	7 24.5	8 39.1	9 36.3
Scientific and technical reports	17/1 43.7	2 46.1	3 10.2
Other government documents	4 24.2	5 47.8	6 27.9
Reference books	7 39.0	8 52.2	9 8.8
Abstracting and indexing services	18/1 17.9	2 34.7	3 47.5
Patents	4 9.3	5 28.5	6 62.2
Other (specify) _____	7 ___	8 ___	9 ___

16. How rapidly do you find you have to obtain information and publications in the *large majority* of cases?

	Information	Publications
Within minutes	19/1 9.2	20/1 5.4
Within hours	2 32.6	2 14.2
Within a day	3 28.1	3 26.9
Within a few days	4 28.3	4 47.9
Longer than the above	5 1.9	5 5.6

17. Have you used any microfilm, microfiche, or microcard services and publications in the past six months?

31.9 Yes 68.2 No

If you answer to Question 17 was yes:

18. Have you found these microforms 55.0 more time consuming / 45.0 less time consuming to use than other media?

19. Have you had any difficulties in the use of equipment associated with microform publications?

29.3 Yes 70.7 No

20. Is the readability of microform material on the market adequate?

69.8 Yes 30.2 No

21. Does the company or organization for which you work maintain a library?

89.9 Yes 10.1 No

22. Name the libraries that you have used in the past six months, including your own company or organization library, and indicate the frequency of your use by placing a check mark in the appropriate column.

Name and/or location (for branches)	Daily 26/1	Weekly 2	Monthly 3	Bimonthly 4	Less Frequently 5
(various)	20.7	43.1	19.4	7.3	9.5

23. In Column A below please check the kinds of publications you use in the library of the organization for which you work. In Column B please check the kinds of publications you use in other libraries. If the organization for which you work does not have a library, ignore Column A.

Publications Used In: A Own Organization Library	B Other Library	
27/1 72.8	28/1 23.8	Current professional research journals
2 69.3	2 12.8	Current trade magazines
3 53.2	3 35.9	Older (1 year or more) issues of research journals
4 36.5	4 22.5	Older (1 year or more) issues of trade magazines
5 61.7	5 37.5	Scientific and technical reports
6 41.0	6 25.7	Other government publications
7 33.8	7 24.4	Monographs
8 9.7	8 10.7	Other (speciy) _____

24. How would you rate your knowledge of the techniques of using library facilities and services?

14.8 Excellent 47.7 Good 32.8 Fair 4.7 Poor

25. With what frequency have you gone to libraries *in the past six months* to obtain the following kinds of information, and how often have you been successful in obtaining the information you sought in libraries?

		A. Sought Information in Libraries			B. Obtained Information in Libraries		
		Very Frequently	Occasionally	Seldom or Not at All	Very Frequently	Occasionally	Seldom or Not at All
		1	2	3	4	5	6
New research results	30	24.3	39.6	36.1	33.0	40.4	26.6
Analytical techniques	31	12.6	36.7	50.7	24.9	37.9	37.2
Test and experimental techniques	32	13.4	39.1	47.5	24.7	38.0	37.3
Product specifications	33	14.7	31.8	53.6	22.0	31.7	46.3
Other specifications and standards	34	10.7	33.4	55.8	19.4	34.5	46.1
		1	2	3	4	5	6
State of the art reviews	35	22.2	48.4	29.4	30.5	42.4	27.1
Names and addresses of people and organizations	36	14.0	31.8	57.2	26.1	28.4	45.4
Information to complete bibliographic references	37	10.2	30.1	59.7	25.1	31.1	43.8
Physical and chemical data	38	20.8	42.2	37.0	39.7	34.2	26.1
Other facts and figures	39	16.9	48.8	34.3	28.8	45.0	26.3

26. With regard to your use of libraries, please check in each row below the frequency with which you visit and call libraries yourself for information, and the frequency with which you have a colleague visit or call libraries for you.

	Very Frequently	Occasionally	Seldom or Not at All
Go to library myself	40/1 36.6	2 47.4	3 16.0
Call library myself	2 18.0	5 40.8	6 41.2
Send colleague to library	7 10.7	8 33.5	9 55.8
Have colleague call library	0 8.0	x 25.8	y 66.3

27. Please indicate to what degree your use of libraries might be increased if there were improvements in the following characteristics of libraries you normally use.

Improvements in:	Might Increase My Use: Greatly	Somewhat	Little	No Opinion
Convenience of location to my place of work	41/1 26.0	2 32.4	3 31.5	4 10.2
Convenience of location to my place of residence	5 23.3	6 25.8	7 39.4	3 11.6
Evening hours of service	9 24.0	0 25.7	x 37.9	y 12.4
Access to stacks	42/1 21.9	2 25.7	3 33.9	4 18.6
Space for studying	5 12.2	6 22.9	7 45.7	8 19.2

28. Please indicate to what degree your use of libraries might be increased if there were improvements in the following characteristics of librarians in the libraries you normally use:

Improvements in:	Might Increase My Use: Greatly	Somewhat	Little	No Opinion
Librarians' knowledge of your subject field	43/1 23.5	2 33.0	3 28.8	4 14.7
Librarians knowledge of library materials in general	5 13.2	6 32.2	7 35.7	8 19.0
Librarians' knowledge of reference books	9 17.3	0 32.9	x 33.4	y 16.5
Librarians' knowledge of indexing and abstracting services	44/1 17.7	2 30.4	3 33.5	4 18.4
Librarians' attitude towards public	5 13.7	6 23.5	7 36.3	8 26.6
Staff time available for assisting public	9 17.7	0 26.7	x 30.8	y 24.7

29. Please indicate to what degree your use of libraries might be increased if there were improvements in the following elements of library collections.

Improvements in:	Might Increase My Use: Greatly	Somewhat	Little	No Opinion
Breadth of coverage of subjects of interest to you	45/1 36.8	2 39.7	3 15.3	4 8.2
Number of copies of journals	2 11.8	6 30.9	7 43.8	8 13.5
Number of copies of books	9 14.2	0 34.9	x 38.8	y 12.1
Availability of patents	46/1 12.5	2 18.3	3 46.8	4 22.
Availability of scientific and technical reports	5 27.1	6 37.8	7 24.0	8 11.2
Availability of indexing and abstracting services	9 22.7	0 31.9	x 29.6	y 15.8
Availability of translations	47/1 22.5	2 27.0	3 32.3	4 18.2

30. Please indicate to what degree your use of libraries might be increased if there were improvements in the following elements of library services:

Improvements in:	Might Increase My Use: Greatly	Somewhat	Little	No Opinion
Organization of card catalogs	48/1 16.5	2 35.7	3 33.3	4 14.5
Amount of information in card catalogs	5 18.9	6 35.8	7 30.8	8 14.5
Photocopy services	9 26.1	0 30.3	x 30.4	y 13.2
Bibliography compilation services	49/1 18.2	2 25.7	3 36.6	4 19.6
Quality of reference question answering services	5 21.5	6 29.2	7 30.0	8 19.3
Speed of reference question answering services	9 21.0	0 27.0	x 32.7	y 19.3

31. Generally, in the subject area in which you work, how adequate are the collections of the following kinds of materials in the libraries of the New York metropolitan area?

	Outstanding	Adequate	Poor	Don't know
Trade magazines	50/1 24.2	2 37.7	3 11.6	4 26.5
Society and professional research journals	5 33.3	6 35.5	7 11.4	8 19.7
Textbooks	9 23.0	0 39.4	x 17.6	y 20.1
Advanced mongraphs	51/1 14.0	2 26.4	3 14.4	4 45.3
Indexing and abstracting services	5 8.7	6 28.3	7 15.1	8 47.9
Patents	9 10.8	0 19.5	x 11.7	y 58.1
Scientific and technical reports	52/1 13.3	2 38.3	3 17.9	4 30.5
Other government documents	5 8.4	6 26.9	7 17.5	8 47.3
Other (specify) _____	9 ___	0 ___	x ___	y ___

32. When using libraries do you frequently find useful information other than that for which you are searching?

83.2 Yes 16.9 No

33. When you use libraries, how frequently do you ask librarians to:

	Very Often	Occasionally	Seldom or Not at All
Direct you to catalogs and indexes	54/1 14.2	2 49.3	3 36.6
Search indexes for you to give you references	4 6.6	5 33.3	6 60.1
Locate specific books for you	7 17.3	8 57.0	9 25.6
Answer simple factual questions	55/1 8.8	2 41.3	3 49.9
Answer extensive information questions	4 1.9	5 13.0	6 85.2
Compile bibliographies	7 1.4	8 9.8	9 88.8

34. When using libraries, which of the following would you prefer to do yourself, and which do you prefer to have library staff members do for you?

	Prefer to do myself	Prefer to have library staff do
Search indexes for you to locate specific references	56/1 63.8	57/1 36.2
Search for information for you	2 74.0	2 26.0
Search for extensive amounts of information	3 55.0	3 45.0
Obtain specific publications from the shelves and files	4 38.3	4 61.7
Compile bibliographies	5 35.9	5 64.1

35. How frequently in the past six months have you needed Xerox or photocopying services to expedite your use of library materials?

58/1 ___Frequently (51.1)
2 ___Often (16.8)
3 ___Occasionally (19.4)
4 ___Seldom (6.2)
5 ___Never (6.5)

36. How do you rate the availability of copying services for library materials in the New York metropolitan area?

59/1 ___Outstanding (15.0)
2 ___Good (39.9)
3 ___Fair (27.6)
4 ___Poor (14.7)
5 ___Essentially non-existent (2.8)

37. Does the cost of copying services in local libraries deter you from using these services more often?

39.4 Yes 60.6 No

38. What do you usually copy?

61/1 ___Just one or two pertinent pages of an article, book, etc.
2 ___A complete short article in a journal, magazine, or newspaper. (55.6)
3 ___A number of pages and articles at one time. (15.0)
4 ___Other (specify) _____ (1.1)

39. How often in the past six months have you needed translations of foreign language materials in science?

62/1 ___Frequently (5.2)
2 ___Often (5.4)
3 ___Occasionally (25.1)
4 ___Seldom (25.2)
5 ___Never (39.0)

40. Where do you usually obtain translations?

63/1 ___From commercial translators and translation services (26.3)
2 ___From library files (18.5)
3 ___From other translation pools (5.6)
4 ___On demand from your own company or agency's translators (49.6)

41. In general, how difficult is it to obtain translations of scientific materials?

64/1 ___Not difficult at all (17.4)
2 ___Occasionally difficult (28.0)
3 ___Frequently quite difficult (19.3)
4 ___Nearly impossible (5.3)
5 ___(I have had no experience in trying to obtain translations) (30.3)

42. What difficulties have you encountered in trying to obtain translations?

65/1 ___Indexes to available translations are inadequate (22.6)
2 ___Translators are not readily available (20.4)
3 ___Translations are too expensive to have done (28.2)
4 ___Published copies of previously translated materials are too expensive (2.4)
5 ___Libraries have too few copies of published translations (12.8)
6 ___Other (specify) _____ (13.7)

43. A number of techniques have been considered by libraries in the last few years to improve information services. Some of these techniques are listed below. In your judgment, which of these, might you or your organization be willing to utilize if a reasonable charge could be established for them?

45.1 Quick access to facts through computerized retrieval and special telecommunication services.

30.4 Delivery of material to your office through electronic facilities (i.e. facsimile).

23.8 Simplified techniques for communicating questions to libraries using such methods as teletype, facsimile, direct telephone tie-lines, etc.

12.4 Office space and closed working areas in libraries with large research collections.

28.8 Facilities to route requests for information and publications from a library convenient to you to other appropriate sources.

36.5 A service that searches current literature on subjects of interest to you on a regular basis.

32.4 A service that compiles bibliographies and extracts information to your specifications on demand.

44. The concepts for improved information services described above represent some possibilities for future systems. We would appreciate your comments on these and other suggestions you might have for improvements in science library and information resources and facilities in the New York metropolitan area.

NEW YORK METROPOLITAN REFERENCE
AND RESEARCH LIBRARY AGENCY, INC.
11 WEST 40TH STREET, N.Y., N.Y. 10018
Telephone: 212 695-6732

METRO, a non-profit agency chartered by the Regents of the State of New York, is studying science and engineering library resources and services in the New York City area. Our goal is to obtain information that will assist the region's libraries in programs designed to improve library facilities and services for scholars.

We are very much interested in some of the details of the use of local libraries by undergraduate students who are taking science courses this semester. We hope that you will take the few minutes required to fill out this questionnaire. Please return it to METRO by May 25, 1967. A stamped, self-addressed envelope is enclosed to facilitate your response.

Many thanks in advance for your assistance.

Russell Shank
Supervisor, Science Library
Project

1. Your name: _____ _____
(optional)

2. Your school: _____ _____

3. Year in school:

(7-1) 11 Freshman
(2) 26 Sophomore
(3) 30 Junior
(4) 34 Senior

4. Major subject:

(8-1) 8 Architecture
(2) 0 Astronomy
(3) 26 Chemistry
(4) 1 Earth Sciences (any)
(5) 7 Mathematics
(6) 9 Physics
(7) 32 Engineering
(8) 21 Other (Specify) _____
_____

5. Please list by name the science courses you are taking this term:

6. Please give the approximate time it takes you to go from your place of residence to your school's library. If your school maintains a branch library for the science subject course in which you received this questionnaire, use that location in your calculation. Estimate the time in minutes. Assume normal means of transportation for yourself and non-rush-hour traffic.

(9/11) Time of travel: ____ minutes

(Figures reported ranged from 5 to 120 minutes)

7. Please check below the approximate frequency with which you have used your school's library for science materials and information this term:

(12-1) 3 Daily

(2) 20 Several times a week

(3) 15 Weekly

(4) 29 Several times a month

(5) 34 Less than any of the above

8. Please check below the periods of time during which you normally prefer to use the collections and services of your school's library (not just its reading rooms for study hall purposes) for any course work:

(13-1) 60 During daytime hours (prior to 5 P.M.)

(2) 14 During evening hours (subsequent to 5 P.M.)

(3) 9 On weekends

(4) 28 Regularly throughout the term

(5) 16 Chiefly near examination and term paper times

(6) 24 For brief intervals of time

(7) 6 For concentrated and extended periods of time (many hours or several days at a time

(8) 3 Other (Please specify): _____

9. On the scale below, indicate your degree of satisfaction with the following categories of resources, facilities and services of your school's library in science subject areas. (Circle the appropriate number on the scale.)

		Unsatis-factory				Satis-factory	No Opinion (Average of Responses)
Breadth of scope of library collections	(14)	1	2	3	4	5	6 (3.4)
Number of copies of books in general	(15)	1	2	3	4	5	6 (2.9)
Number of copies of books on reserve	(16)	1	2	3	4	5	6 (2.6)
Quality of reference book collection	(17)	1	2	3	4	5	6 (3.0)
Number of abstracting and indexing journals	(18)	1	2	3	4	5	6 (3.0)
Number of different journals	(19)	1	2	3	4	5	6 (2.9)
Number of copies of heavily used journals	(20)	1	2	3	4	5	6 (2.5)
Number of hours of service during the week	(21)	1	2	3	4	5	6 (3.9)
Number of hours of service on the weekends	(22)	1	2	3	4	5	6 (2.7)
Copying services (cost)	(23)	1	2	3	4	5	6 (3.5)
Copying services (availability)	(24)	1	2	3	4	5	6 (3.3)
Library staff time available to help you	(25)	1	2	3	4	5	6 (3.3)
Library staff knowledge of subjects	(26)	1	2	3	4	5	6 (2.9)
Study space	(27)	1	2	3	4	5	6 (3.3)

10. Is there another college or public library closer to your place of residence (in minutes of travel time) than your school's library?

(28-1) 70 Yes; (2) 28 No; (3) 1 Don't know

11. If your answer to Question 10 is yes, what is the name of the library?

If your answer to Question 10 is yes, please answer Questions 12-15. Otherwise, go on to Question 16.

12. What is the approximate travel time in minutes between your place of residence and that library? Make your estimate just as you did in Question 6.

(29/31) Time of travel: _____ Minutes

(Figures reported ranged from 2 to 60 minutes)

13. Have you used that library in connection with your science courses this term?

(32-1) 39 Yes (2) 61 No

14. Please check your reasons for having used that library instead of your own school's library:

(33-1) 83 It is more convenient to my home

(2) 2 It is more convenient to my place of work

(3) 8 It is open longer hours than my school library

(4) 12 It is open during holiday and vacation periods

(5) 26 It has more material on topics of interest to me

(6) 16 It has more copies of heavily used books

(7) 11 It has more copies of heavily used journals

(8) 27 Its books and journals seem more readily available than in my school library

(9) 20 It has a better collection of reference books

(0) 5 It has better copying facilities than my school library

(x) 4 It has cheaper copying facilities than my school library

(y) 17 Other (Please specify) _____

_____

15. What degree of difficulty did you have in gaining access to that library's materials because it was assumed you should use your own school's library?

(34-1) 87 Very little or none at all

(2) 6 More than a little

(3) 7 Considerable

16. Do you normally spend holiday or vacation periods during the school year in another area (outside the New York Metropolitan area)?

(35-1) 23 Yes (2) 77 No

If your answer to Question 16 is yes, answer Questions 17 and 18. Otherwise go on to Question 19.

17. Do you use the libraries in that other area for any of your school work?

(36-1) 53 Yes (2) 47 No

18. Generally, how well do the libraries of that area serve your school-related needs?

(37-1) 14 Very well

(2) 30 Adequately

(3) 36 Poorly

(4) 20 Not at all

19. Estimate the travel time in minutes from your place of residence to each of the following libraries (to the best of your ability). Make your estimate just as you did in Question 6.

(38/40) New York Public Library (5th and 42nd) 15-60 minutes

(41/43) Queens Borough Public Library (Central Library) 5-35 minutes

(44/46) Brooklyn Public Library (Central Library) 5-30 minutes

20. What suggestions do you have for the improvement of library collections, services, and facilities in your school and in the New York Metropolitan area generally, so that they might better serve the needs of college students in science?

METRO
NEW YORK METROPOLITAN REFERENCE
AND RESEARCH LIBRARY AGENCY, INC.
11 WEST 40TH STREET, N.Y., N.Y. 10018
Telephone: 212 695-6732

To: Graduate Students in Science
New York Metropolitan Area Colleges and Universities

The State of New York has taken initial steps to assist in the improvement of reference and research library resources in local regions. METRO, a non-profit agency among whose members are nearly fifty of the area's libraries, has been chartered by the Regents of the University of the State of New York to plan and inaugurate programs to improve reference and research library resources in the area.

One of METRO's first tasks, under the terms of a grant from the New York State Science and Technology Foundation, is a study of the area's science and engineering library and information resources and services. The support of graduate students in this region is urgently needed in the completion of our task.

The enclosed questionnaire has been designed to obtain your opinion and comments about various aspects of science library and information services and your use of them. Some of the questions require rather detailed analyses of your patterns of information gathering, and the resources that serve you. We do hope, however, that you will take the time to give us the benefit of your thoughts and experiences. The potential payoff in terms of improved library and information facilities in the New York area, is great, but will occur only if the scientific and technical community indicates its interests and needs.

For our guidance, we ask that you fill out and return the questionnaire to METRO by 5 June 1967. As a matter of fact, may we suggest that you answer the questions now while you have the form in hand. A stamped, self-addressed envelope is enclosed to facilitate your response.

Many thanks in advance for your cooperation and assistance.

Russell Shank
Science Project Supervisor

NEW YORK METROPOLITAN REFERENCE
AND RESEARCH LIBRARY AGENCY, INC.

SCIENCE LIBRARY AND INFORMATION RESOURCE SURVEY, 1967

Graduate Student Survey

1. Your name: _____
(Optional)

2. Your school: _____

3. Degree for which you are studying:

(7-1) 24 MA/MS (2) 75 PhD/DSc (3) 1 Other (Specify_____)

4. Are you taking courses this semester? (8-1) 68 Yes (2) 32 No

5. Major subject in which you are obtaining your degree:

Science:

(9-1) 0 Architecture
(2) 0 Astronomy
(3) 19 Chemistry
(4) 4 Earth Sciences (any)
(5) 14 Mathematics
(6) 12 Physics
(7) 3 Other (Specify)

Engineering:

(10-1) 18 Chemical
(2) 5 Civil
(3) 0 Electrical
(4) 0 Industrial
(5) 4 Mechanical
(6) 2 Mining/Metallurgical
(7) 9 Nuclear
(8) 4 Aeronautical
(9) 6 Other (Specify)

6. Are you currently working on a thesis or dissertation?

(11-1) 65 Yes (2) 35 No

7. What is the topic of your thesis or dissertation?

8. What departments (or branches) of your school's library do you use? (List them in the order of frequency of use, most frequently used department or branch first.)

(1) _____ (3) _____

(2) _____ (4) _____

9. In your judgement, what is the quality of the following elements of your school's library operation? Indicate your rating by circling the appropriate number on the rating scale to the right of each element in the list.

		Excellent				Poor	No Opinion	(Wtd. Ave. Response)
Collections in your areas of interest	(12)	1	2	3	4	5	6	(2.7)
Hours of service	(13)	1	2	3	4	5	6	(2.0)
Space for studying	(14)	1	2	3	4	5	6	(3.3)
Subject knowledge of staff	(15)	1	2	3	4	5	6	(3.3)
Reference services	(16)	1	2	3	4	5	6	(3.0)
Amount of staff time available to help you	(17)	1	2	3	4	5	6	(2.9)
Photocopying services	(18)	1	2	3	4	5	6	(2.8)
Interlibrary borrowing services	(19)	1	2	3	4	5	6	(3.0)

10. How frequently do you find that the following kinds of materials you want are not owned by your school's library? Indicate the frequency by circling the appropriate number on the rating scale to the right of each element in the list.

		Very Frequently				Seldom or Never	No Opinion	
Current trade magazines	(20)	1	2	3	4	5	6	(3.9)
Current professional and society research journals	(21)	1	2	3	4	5	6	(3.7)
Back issues of journals	(22)	1	2	3	4	5	6	(3.5)
Textbooks	(23)	1	2	3	4	5	6	(3.0)
Advanced monographs	(24)	1	2	3	4	5	6	(3.0)
Abstracts and indexes	(25)	1	2	3	4	5	6	(3.9)
Scientific and technical reports	(26)	1	2	3	4	5	6	(3.0)
Reference books	(27)	1	2	3	4	5	6	(3.4)
Other (Specify) _____	(28)	1	2	3	4	5	6	

11. How frequently do you find that the following kinds of materials are not available in your school's library <u>because they are in use</u>? Circle the appropriate number on the rating scale.

		Very Frequently				Seldom or Never	No Opinion	Wtd. Ave. Response
Current trade magazines	(29)	1	2	3	4	5	6	(4.1)
Current professional and society research journals	(30)	1	2	3	4	5	6	(3.9)
Back issues of journals	(31)	1	2	3	4	5	6	(4.0)
Textbooks	(32)	1	2	3	4	5	6	(2.6)
Advanced monographs	(33)	1	2	3	4	5	6	(3.5)
Abstracts and indexes	(34)	1	2	3	4	5	6	(3.5)
Scientific and technical reports	(35)	1	2	3	4	5	6	(3.8)
Reference books	(36)	1	2	3	4	5	6	(3.2)
Other (Specify) _____	(37)	1	2	3	4	5	6	

12. If your school's library were able to expand its program of acquisition of library materials, what priority should it assign to the selection policy elements listed below? Indicate your rating by circling the appropriate number on the rating scale. (This assumes that libraries may not be able to expand their collections in all areas at once due to the lack of funds and personnel.)

		Top Priority				Lesser Priority	No Opinion	
More <u>copies</u> of books	(38)	1	2	3	4	5	6	(2.7)
More <u>copies</u> of journals	(39)	1	2	3	4	5	6	(3.6)
A larger collection of different books	(40)	1	2	3	4	5	6	(2.1)
A larger collection of different journals	(41)	1	2	3	4	5	6	(2.2)
More reference books	(42)	1	2	3	4	5	6	(2.2)
More indexes and abstracts	(43)	1	2	3	4	5	6	(3.3)
More advanced monographs	(44)	1	2	3	4	5	6	(2.3)
More scientific and technical reports	(45)	1	2	3	4	5	6	(2.2)
Other (Specify) _____	(46)	1	2	3	4	5	6	

13. In Column A below list the specific topics in science in which you are currently interested, and in Column B indicate by circling the appropriate number on the rating scale the quality of your school's library in these topics. Rate the collections as a whole, and in terms of your needs as a graduate student.

A		B					
		Excellent				Poor	No Opinion
_____	(47)	1	2	3	4	5	6
_____	(48)	1	2	3	4	5	6
_____	(49)	1	2	3	4	5	6
_____	(50)	1	2	3	4	5	6

14. If you wish, specify here details of the shortcomings of any parts of your school's library collections in the topics listed above. (e.g. too few professional society journals in crystallography; too few foreign journals in any aspects of machine design.) You may, if you wish, list titles of specific books and journals in which you are interested that are not held by your school's library.

15. Is your school adding publications to its library in subject fields of your interest:

In adequate amounts?	(51-1)	30	Yes	(2)	29	No	(3)	41 Don't know
Rapidly enough?	(4)	21	Yes	(5)	36	No	(6)	43 Don't know
With adequate notification to you of its receipt	(7)	27	Yes	(8)	41	No	(9)	32 Don't know

16. Have you tried to obtain materials in the current academic year from other libraries on interlibrary loan?

(52-1) 25 Yes (2) 75 No

If your answer to Question 16 is yes, please answer Questions 17-19. Otherwise go on to Question 20.

17. How successful have you been in obtaining material on interlibrary loan?

(53-1) 39 Always successful

(2) 27 Most usually successful

(3) 17 Occasionally successful

(4) 17 Seldom or never successful

18. From what libraries have materials been borrowed on interlibrary loan for you?

_____

_____

19. In Column A below please check the kinds of materials that have been borrowed for you on interlibrary loan this academic year. In Column B cneck the approximate number of volumes (not titles) that have been borrowed of each kind of material.

	A	B					
	Have Borrowed	Number of Volumes Borrowed					
		1-4		5-9		10 or More	
Current research journals	13	(54-1)	11	(2)	0	(3)	2
Current trade journals	3	(4)	3	(5)	0	(6)	0
Back issues of any journal (More than one year old)	16	(7)	13	(8)	2	(9)	1
Textbooks	7	(0)	6	(x)	1	(y)	0
Advanced monographs	5	(55-1)	3	(2)	2	(3)	0
Scientific and technical reports	10	(4)	8	(5)	0	(6)	2
Other government documents	2	(7)	1	(8)	1	(9)	0
Patents	0	(0)	0	(x)	0	(y)	0
Theses and dissertations	10	(56-1)	10	(2)	0	(3)	0
Other (Specify)_____	0	(4)	0	(5)	0	(6)	0

20. Please list below any libraries other than your school's library that you have used in the past academic year, and check the approximate frequency of use you have made of these other libraries.

Name and Location of Library	Frequency of Use: Very Frequent (57-1)	Occasional (57-2)	Very Seldom (57-3)
(99 libraries listed)	34	49	17

21. Please check below the reasons that have led you to use these other libraries.

These other libraries are or have:

(58-1) 30 More convenient to my place of residence

(2) 74 Better collections in my subject areas

(3) 13 More convenient hours of service

(4) 28 Better physical facilities

(5) 23 More knowledgeable staff

(6) 32 Better organized and arranged

(7) 16 Better copying facilities

(8) 3 Cheaper copying services

(9) 29 More indexes, abstracts, and bibliographies

(0) 17 Other (Please specify) _____

22. Please describe any difficulties you have had in gaining access to libraries other than those of your school.

23. Name the library that is most convenient to your place of residence that has collections adequate to serve your needs as a graduate student in science.

24. Please check below the kinds of materials you use most frequently in libraries.

In Your Own Schools' Library (59)	In Other Libraries (60)	
(1) 81	(1) 55	Current research journals
(2) 13	(2) 10	Current trade magazines
(3) 80	(3) 62	Back issues of research journals (more than 1 year old)
(4) 11	(4) 10	Back issues of trade magazines (more than 1 year old)
(5) 75	(5) 43	Textbooks
(6) 41	(6) 32	Advanced monographs
(7) 52	(7) 36	Abstracts and indexes
(8) 38	(8) 49	Scientific and technical reports
(9) 62	(9) 41	Reference books
(0) 20	(0) 13	Theses and dissertations
(x) 26	(x) 27	Conference and congress proceedings
(y) 0	(y) 2	Other (Please specify) _____

25. How frequently in the past academic year have you needed copying facilities?

(61-1) 54 Very often (2) 40 Occasionally (3) 6 Seldom or never

26. Are copying facilities (e.g. Xerox, Photostat) readily available to you?

(62-1) 84 Yes (2) 15 No (3) 1 Don't know

27. Are the costs of copying services generally reasonable?

(63-1) 68 Yes (2) 25 No (3) 8 No opinion

28. Have you used any publications in microform (microfilm, microfiche, microcard) in your graduate studies.

(64-1) 33 Yes (2) 67 No

29. How satisfactory are the microforms you have used from the standpoint of the following criteria?

		Good		Fair		Poor
Readability	(65-1)	44	(2)	34	(3)	23
Ease of use of equipment	(4)	54	(5)	26	(6)	19

30. In recent years a number of services have been proposed by some libraries in the New York region that hopefully would improve their ability to serve graduate students. Please indicate by circling the appropriate number on the rating scale below the degree of improvement each of these services would be in your judgement.

		Great				Little or None at All	No Opinion
Instruction in the use of libraries	(66)	1	2	3	4	5	6 (3.4)
Longer hours of service each day	(67)	1	2	3	4	5	6 (2.6)
More weekend hours	(68)	1	2	3	4	5	6 (2.1)
Universal library privileges in the area's college libraries	(69)	1	2	3	4	5	6 (2.0)
Private study rooms and desks in the large research libraries	(70)	1	2	3	4	5	6 (2.2)
Announcement lists of new books received by libraries throughout the region	(71)	1	2	3	4	5	6 (2.1)
An inventory of science journals held by all libraries in the area	(72)	1	2	3	4	5	6 (1.7)
Facsimile transmission between libraries of journal articles	(73)	1	2	3	4	5	6 (2.0)
Other (Please specify)							
_____	(74)	1	2	3	4	5	6
_____							

31. What suggestions do you have (1) for your school library, and (2) for libraries in the New York region in general that would tend to make them more useful to graduate students in science?

METRO
NEW YORK METROPOLITAN REFERENCE
AND RESEARCH LIBRARY AGENCY, INC.
11 WEST 40TH STREET, N.Y., N.Y. 10018
Telephone: 212 695–6732

24 April 1967

TO: New York Area Special Librarians

The New York Metropolitan Reference and Research Library Agency is sponsoring a study of the region's science library resources, facilities, and their use. As part of this study we would like to obtain some measures of the system load among special libraries in the New York area. To that end we would like your cooperation in the following project.

Would you be willing to make a record for five days (May 1 through May 5) of your use of other libraries, not part of your own corporate or agency structure, to obtain data on (a) answers to reference questions; (b) books or journals on interlibrary loan; and (c) photocopies of materials. We are interested in your library's interaction with all other libraries, including those outside of the New York region. This will help us identify the gaps in regional collections and services. Also, by examining the outgoing requests we will be able to assess the incoming load on the libraries you use and the difficulties librarians have in locating sources of information and publications.

All information will be kept confidential and will be used by METRO for planning purposes only. Only summary information will be published about system load, and no references will be made that will in any way link your library with the titles of publication, contents of reference questions, or names of other libraries.

If you need more forms, call the METRO office (212 695-6732) or produce facsimile copies of your own. If you are unable for any reason to participate in this phase of our study, return the forms to me in the enclosed envelope. I would ask, however, that you indicate the name of your library on the return envelope so that I may have an accurate control of the analysis of the results of the study.

Many thanks for your cooperation.

Sincerely yours,

Russell Shank

Russell Shank
Science Project Supervisor

METRO SCIENCE LIBRARY SURVEY 1967

INTERLIBRARY USE REPORT

NOTES

1. Record all contacts by phone, in person, and by mail. Record all attempts to borrow each item. That is, if you call several libraries to try to borrow a book, obtain a photocopy, or have a question answered, list all of the libraries contacted.

2. If you locate an item by phone and later have to send a messenger or write a letter to borrow or copy it from the library in which it was located, record the successful completion of the contact at the time of the phone call: do not record the same event a second time when you write the letter or send the messenger.

3. If you send a letter to another library to try to locate a reference, or have a question answered, and a reply is not received by the time you return the forms to METRO, indicate "no response" in the right-hand column.

4. You may abbreviate titles and reference questions, but include enough information for meaningful analysis. We are interested in titles, kinds of publications, and dates of publications. Length of articles requested would be useful.

5. You may abbreviate the names of libraries contacted, but include enough information for positive identification.

6. Your entries need not be typed--handwritten notes will do.

7. If you have any questions, call me, or leave a message at either of the following numbers:

Columbia University: 212-280-2283

METRO: 212-695-6732

RUSSELL SHANK

April 1967

METRO SCIENCE LIBRARY SURVEY 1967

SPECIAL LIBRARY INTERLIBRARY COOPERATION

Name of reporting library_____

Address of library_____

Type of primary patron served

Science/Technology ____

Business ____

Other (specify) _____

Number of people in the primary population your library is designed to serve (approximate)_____

Principal industry served_____

_____

Size of library

Volumes (books and bound journals)_____

Current serials subscriptions _____

Principal responsibility of the patrons you are organized to serve (you may check more than one):

Teaching____ Development____ Marketing____ Studying____

Research____ Production____ Science Writing____

Other (specify)_____

METRO SCIENCE LIBRARY PROJECT 1967

INTERLIBRARY USE REPORT

Name of Reporting Library _____

Date	Library Contacted	Means of Communication	Item Requested or Question Asked		Item Obtained? Yes	Item Obtained? No	If Not Obtained, Give Reason
			EXAMPLES				
5/8	Columbia U.	Phone	Tech report UCRL 3617			x	Not on shelf
5/8	Atomic Indus. Forum	Phone	" " " "		x		
5/9	Linda Hall Lib	Mail	Indian J. of Magnetics, 1955, pp.34-37(Xerox)			x	No response

METRO
NEW YORK METROPOLITAN REFERENCE
AND RESEARCH LIBRARY AGENCY, INC.
11 WEST 40TH STREET, N.Y., N.Y. 10018
Telephone: 212 695-6732

To: Public and Academic Library Directors

For the past few months under METRO's auspices, I have been conducting a study of the library resources devoted to the physical sciences in the New York region. Your assistance is now needed in beginning an assessment of the science collections in the area's libraries.

Specifically, we would like to obtain from you and your staff a delineation of (a) the major physical science subject areas in which you maintain collections, structured according to Dewey classification elements; (b) the specialities, if any, you have developed or are developing within these major subject areas; (c) the qualitative level of collections you are trying to maintain in these subject areas; and (d) the current input of volumes and serial titles in these subjects.

I am aware of the very formidable nature of the task I am asking you to perform. Statistics of the kind we need are seldom maintained by libraries. On the other hand, previous regional inventories of library collections, concentrating as they have on simple listings of subject areas in which libraries maintain collections, without any quantitative or qualitative descriptions, have been only minimally useful as guides to library users and to regional planners. This current inventory will, we hope, serve as a sound basis for judgments on starting points for cooperative programs of acquisition and of service.

Procedures will be recommended in my report to the METRO Board of Trustees for a continuing evaluation of science library resources in the New York area. Through successive evaluations, your inventory statements can be expanded, tested and refined in depth and accuracy. Your response at this time in no way commits you, however, to future inventory operations, nor to any cooperative programs. Any decisions on cooperative acquisition and service operations will be made only with the full, and open, participation of the libraries that wish to work together.

I would appreciate having the enclosed forms completed and returned to METRO office by 25 September, 1967. The results of this phase of the study will be presented in my report and should be available for your use at an early date. According to present plans a meeting of representatives from the libraries who participate in this inventory operation will be held early in the fall, on a date to be determined, to discuss the findings.

Many thanks in advance for your cooperation.

Russell Shank
Supervisor, Science Project

August, 1967

METRO

NEW YORK METROPOLITAN REFERENCE
AND RESEARCH LIBRARY AGENCY, INC.

11 WEST 40TH STREET, N.Y., N.Y. 10018

Telephone: 212 695-6732

METRO SCIENCE LIBRARY RESOURCES SURVEY

In this phase of the METRO Science Library Study, academic and public libraries in the METRO region are being asked to assist us in assessing science collections in the physical sciences (astronomy, physics, chemistry, earth sciences, engineering) and mathematics. The procedure is generally as follows:

(a) Each library surveyed is being asked to apply a standard scale of levels of collecting (enclosed) to the assessment of its collections;
(b) All libraries are to use the same outline of science topics (as given on the collection evaluation form enclosed), at least at the general level of classification;
(c) Each library is being asked to estimate the number of volumes and serial titles now in the collections in each of the topics, and the number of volumes added to the collections in the period July 1, 1966 through June 30, 1967.

This attempt to use a uniform standard of measurement and to conform to a single outline of science topics should give a more meaningful structure to the inventory for future planning of collection development and public service than has been possible in the past with the laissez-faire, rather open-ended inventory operations (e.g., the Special Libraries Association directory of special libraries in Greater New York, Ash, and Downs).

An evaluation form should be completed for each separate branch or campus library unit in your library system in which science collections are maintained. Please evaluate your science collections at both of the following two classification levels:

A. General: These are the basic fields of science with which the study is concerned and are identified by Roman numerals on the attached form.
B. Specific: These are the major topical areas into which the basic fields of science are divided for classification purposes (Dewey) and are identified by Arabic numerals on the attached form. If you prefer, you may insert descriptive phrases of your own to identify specific fields in which you concentrate your collecting efforts. If you do, please try to insert these topical descriptions under the appropriate heading of the outline on the evaluation form.

What is being requested is actually two separate evaluations, at two levels of classification specifity. When giving the holdings in the various topics, therefore, you will be counting your collections twice--first according to the total holdings by major subject field, and second according to the specific science topics to which the materials are devoted in a more detailed subject classification.

In filling out the enclosed forms, please refer to the comments relating to each column, as listed below.

INSTRUCTIONS

Column

2. Insert the appropriate letter identifying the statement of the level of collecting that most nearly applies to your acquisition efforts under normal circumstances in each of the general and specific topics listed (or opposite the specific topics you might yourself insert). Refer to the statements of Levels of Collecting attached to the Collection Evaluation Form.

3. If for any reason you think that your level of collecting in any subject field is too low or too high when matched with the needs of the public you are primarily organized to serve, indicate the level it would be desirable to maintain by inserting the appropriate letter designator from the Levels of Collecting scale.

4. Give the approximate number of volumes in your collections, as of 30 June, 1967, in each of the general and specific topics listed. As nearly as possible use the definition of "volume" given in the ALA Statistics Handbook. ("A volume is a physical unit of any printed, typewritten, handwritten, mimeographed, or processed work contained in one binding or portfolio, hardbound or paper bound, which has been cataloged, classified, and/or made ready for use.")

5. Give the approximate number of serial titles in your collections, as of 30 June, 1967, whose major fields of coverage support each of the subject fields listed. Do not list any title more than once under any of the specific topics.

6. Give the approximate number of volumes added to your collections in each of the subject areas in the period 1 July, 1966 through 30 June, 1967.

7. Note any qualifications concerning the definitions of subjects, the special emphases on kinds of materials, languages, etc. that are purposefully included or excluded from your collections in any of the topics, and any other information that might be considered useful in assessing the quality of your collections.

LEVELS OF COLLECTING

A. BASIC INFORMATION COLLECTION. A collection of general materials, or materials outside the scope of a special science collection, which may support a minimum service to aid readers' immediate understanding of a subject which is properly within the scope of a special science collection. Such a collection consists of a dictionary, encyclopedia, handbook, or texts, or a combination of these, in the minimum number which will serve the purpose. A basic information collection is not sufficiently intensive to support any courses in the subject area involved. (Note that this type of collection may be present in various departmental libraries in a library system where a more intensive collection in the same subject area is located in another department of the system.)

B. WORKING COLLECTION. A collection which is adequate to determine the current knowledge of a subject in broad outline, and the most important historical aspects of the area. It consists of one or more dictionaries, an encyclopedia, handbooks, yearbooks, a reasonable selection of monographs in the best editions, and several of the basic journals. Such a collection will support undergraduate courses in the subject.

C. COMPREHENSIVE RESEARCH COLLECTION.* A collection which includes the major portions of materials required for dissertations and independent research. It includes dictionaries and encyclopedias, and the most important handbooks, books, periodicals and journals, and other publications in the languages usually associated with the subject, and in the latest and best editions, as well as comprehensive bibliographies, and indexing and abstracting journals. Some weeding of obsolescent material may take place.

D. EXHAUSTIVE COLLECTION.** A collection which endeavors, so far as is reasonably possible, to include everything written on the subject, in all languages, and in all formats (e.g., journals, monographs, technical reports, patents). Under the prevailing conditions of library finance and the proliferation of publishing throughout the world, the responsibilities for an exhaustive collection can be assumed only in the most exceptional circumstances. Older material may be saved for historical research.

---

* After examination of the returns and the site surveys it was deemed advisable to redesignate collections at this level as Working Research Collections. See the note on the following page.

** After examination of the returns and the site surveys it was deemed advisable to redesignate collections at this level as Comprehensive Research Collections. See the note on the following page.

Note on definitions of collections

While it was obvious from the data supplied by the librarians and from the view of library collections gained in the site surveys, that there were indeed several levels of research collections among the libraries, the definitions and designations given to them in the collection evaluation forms were inappropriate.

The comprehensive collections in reality were adequate for most needs central to the subject areas they served, but usually were less than adequate in peripheral areas. Furthermore, they invariably lacked certain kinds of research literature (e.g. scientific reports and patents) that would be required to make them truly comprehensive research collections. It seemed more appropriate, therefore, to label these collections working research collections, and this is how they are identified in the report.

The collections listed as exhaustive by their curators were indeed exceptional collections. Their strengths in ephemeral and lesser-used, particularly older, materials, was obvious. Furthermore, they usually covered a much wider range of aspects of the topics in which they specialized than other libraries, and they collected in more languages than many libraries. Nevertheless, as noted in the evaluation form, few libraries can be truly exhaustive, except perhaps in a limited number of topics, and all of the collections surveyed were limited in some way. These collections, therefore, have been designated comprehensive research collections in the report.

COLLECTION EVALUATION FORM

Name of Library and Division or Branch: _____

Subject Field (1)	Estimated Level of Collecting		Estimated Holdings June 30, 1967		Volumes Added 1966/67 (6)	Notes (7)
	Present (2)	Desirable (3)	Bound Volumes (4)	Current Serial Titles (5)		
I. ASTRONOMY						
1. CELESTIAL DYNAMICS						
2. OBSERVATORIES & INSTRUMENTS						
3. DESCRIPTIVE ASTRONOMY, ASTROPHYSICS						
4. EARTH						
5. GEODESY						
6. CELESTIAL NAVIGATION						
7. TIME MEASUREMENT						
8. ASTRONOMICAL MAPS/CHARTS						

Subject Field (1)	Estimated Level of Collecting		Estimated Holdings June 30, 1967		Volumes Added 1966/67 (6)	Notes (7)
	Present (2)	Desirable (3)	Bound Volumes (4)	Current Serial Titles (5)		
II. CHEMISTRY						
1. PHYSICAL CHEMISTRY						
2. APPARATUS & EQUIPMENT						
3. ANALYTICAL CHEMISTRY						
4. QUALITATIVE ANALYSIS						
5. QUANTITATIVE ANALYSIS						
6. INORGANIC CHEMISTRY						
7. ORGANIC CHEMISTRY						
8. CRYSTALLOGRAPHY						
9. MINERALOGY						

Subject Field (1)	Estimated Level of Collecting		Estimated Holdings June 30, 1967			
	Present (2)	Desirable (3)	Bound Volumes (4)	Current Serial Titles (5)	Volumes Added 1966/67 (6)	Notes (7)
III. EARTH SCIENCES						
1. PHYSICAL & DYNAMIC GEOLOGY						
2. PETROLOGY						
3. ECONOMIC & APPLIED GEOLOGY						
4. GEOLOGY OF VARIOUS WORLD REGIONS						
5. PALEONTOLOGY (all kinds)						
6. METEOROLOGY						

Subject Field (1)	Estimated Level of Collecting		Estimated Holdings June 30, 1967		Volumes Added 1966/67 (6)	Notes (7)
	Present (2)	Desirable (3)	Bound Volumes (4)	Current Serial Titles (5)		
IV. ENGINEERING						
1. AERONAUTICAL ENGINEERING						
2. CHEMICAL ENGINEERING						
3. CIVIL ENGINEERING						
4. INDUSTRIAL ENGINEERING						
5. MECHANICAL ENGINEERING						
6. METALLURGICAL ENGINEERING						
7. MILITARY ENGINEERING						
8. MINING ENGINEERING						
9. NUCLEAR ENGINEERING						
10. PETROLEUM ENGINEERING						

Subject Field (1)	Estimated Level of Collecting		Estimated Holdings June 30, 1967			
	Present (2)	Desirable (3)	Bound Volumes (4)	Current Serial Titles (5)	Volumes Added 1966/67 (6)	Notes (7)
V. MATHEMATICS						
1. ARITHMETIC						
2. ALGEBRA						
3. GEOMETRY						
4. TRIGONOMETRY						
5. CALCULUS						
6. SPECIAL FUNCTIONS						
7. MATHEMATICAL STATISTICS						

METRO NEW YORK METROPOLITAN REFERENCE
AND RESEARCH LIBRARY AGENCY, INC.
11 WEST 40TH STREET, N.Y., N.Y. 10018
Telephone: 212 695-6732

September 22, 1967

To: New York Metropolitan Area Librarians

The enclosed questionnaire is the final data gathering instrument for the current phase of the METRO Science Library project. It has been designed to obtain some facts and opinions on several aspects of library operations that are important for regional planning.

Your continuing support for the METRO project in which I am engaged has been gratifying and most appreciated. Again, I hope that your dedication to the goals of the 3-R's program in New York State will induce you to give us the benefit of your library's contribution to this phase of the study.

Extra copies of the questionnaire have been enclosed for the larger libraries. They may be used for internal working documents. Each library system should submit one consolidated form for the entire system. Additional copies may be obtained from the METRO office.

If you have questions about this phase of the study, please write to me at the METRO office, or call me collect in Washington, D. C. at the following number: 202-381-5203.

Please return the completed questionnaire to the METRO office in the enclosed stamped, self-addressed envelope by October 20, 1967.

Please accept my sincerest thanks for your cooperation.

Russell Shank
Supervisor Science Project

RS/dp
Encls. (8)

NEW YORK METROPOLITAN REFERENCE AND
RESEARCH LIBRARY AGENCY, INC.

SCIENCE LIBRARY PROJECT

Collection Development and
Storage Opinion Survey

(Note: In all of the following questions the term "physical sciences" refers to astronomy, chemistry, geology and other earth sciences, physics, engineering and mathematics.)

1. In the left-hand column below indicate the approximate number of people (full-time equivalents) employed by your library system to give service to people using your physical science materials, and the approximate number of dollars expended for books and journals in the physical sciences and their binding, all in the period of time between 1 July 1966 and 30 June 1967. Exclude all people assigned to acquisition and cataloging tasks.

In the right-hand column below give your best estimate of the amount of staff and library materials money that would have been required in order to have allowed you to maintain the ideal collection and services in the physical sciences in the period between 1 July 1966 and 30 June 1967. The term "ideal" is meant to imply the level of operation that in your judgement would have filled all of the unexceptional needs of your primary public and the reasonable needs of others (from outside your organization, jurisdiction or region) who might seek to use resources in which you maintain specialties unique to the region.

	1966/67 Actual	1966/67 Ideal
Staff (FTE)		
Professional	_____	_____
Nonprofessional	_____	_____
Resources*(Dollars)		
Books	_____	_____
Journals	_____	_____
Other materials	_____	_____
Binding (Dollars)	_____	_____

*How much, if any, resource money was obtained from the Federal government under the terms of the Higher Education Act? _____

Cooperative Acquisitions

2. Describe any formal cooperative acquisitions programs in which you are participating in the physical sciences. Specify the libraries involved in the programs, the subjects, languages, kinds of materials involved, and other selection criteria that describe your input under terms of the programs.

3. How much money, if any, was earmarked especially for these cooperative acquisition programs in the period 1 July 1966 through 30 June 1967, and from what sources did you obtain these funds (e.g. regular budget, Title II of HEA, special institutional funds)?

4. What special arrangements are there, if any, among the cooperating libraries for joint use of material acquired under the terms of these special programs?

5. What would you judge is the utility of these cooperative programs in terms of service to the user? Describe any shortcomings of these cooperative programs as they now operate.

6. What materials (specify in detail the kinds, languages, subjects, etc.) do you now collect specifically because you have unilaterally decided that your library has an obligation to the region's users to maintain certain collections?

7. What materials (specify in detail the kinds, languages, subjects, etc) in the physical sciences do you not collect specifically because you have unilaterally decided that some other library in the region has a collection of these items?

8. Please specify by circling the appropriate number on the rating scale below the degree of importance of the following services in your judgement to the successful operation of regional programs of service based on cooperative collection development.

	Of Little or No Importance				Essential	No Opinion
a. Union catalogs and lists.	1	2	3	4	5	6
b. Centralized referral services.	1	2	3	4	5	6
c. Delivery services.	1	2	3	4	5	6
d. TWX or other quick communication facilities.	1	2	3	4	5	6
e. Uniform access by users to material cooperatively collected.	1	2	3	4	5	6
f, Other (Specify)						
_____	1	2	3	4	5	6
_____	1	2	3	4	5	6

9. Specify in detail below areas of collection development in the physical sciences in which you think cooperative acquisition programs in the New York region might well be organized. You need not make entries in every column below.

Subjects	Languages	Kinds of Publications	Age of Material	Price Ranges	Criteria

10. Please specify below (a) the amount of space currently assigned in your library system for readers using physical science library materials, and (b) the stack capacity currently <u>available</u> for active (i.e. non-stored) physical science library material. Also estimate the figures for the same library space utilization that will be available within the next five years.

In the figure for reader space include only those areas specifically assigned as physical science reading areas. If the physical science facilities are integrated with the life science facilities, prorate the reader spaces approximately according to the ratio of library holdings for these two major divisions of science. If your reader spaces are interspersed with your stacks, assume 25 square feet per reading station. Assume stack capacity to be 100 volumes per single-faced section of 36-inch shelves, seven shelves per section (i.e. 21 lineal feet of stack shelving per 100 volumes).

	Currently Available	Planned (Total) Within Next 5 Years
Readers' Space (Sq. ft.)	_____	_____
Stack Space (Volumes capacity)	_____	_____

11. What portion (percentage) of the current stack space listed in Question 10 is now filled, and at your current rate of input when (date) will the stacks available for physical science materials be filled.

12. Describe briefly (giving at least location, readers' space, stack capacity, subjects to be accommodated, and dates of availability) the building plans at your institution covering approximately the next decade that will affect the housing of your physical science library collections and services.

13. How many volumes of library materials in the physical sciences do you have in storage (i.e. shelved separately in locations less accessible and paged on a more restricted schedule than other material in the same subjects)?

_____

14. How many volumes of physical science materials were added to this storage facility in the period 1 July 1966 through 30 June 1967?

_____

15. At current rates of input of physical science material when will your presently available storage areas be filled to capacity?

_____ _____

16. How many storage areas does your library utilize for physical science material and how far removed in travel time from the more accessible material in the physical science subjects are these storage areas?

17. Under normal circumstances, what is the average, the minimum and the maximum amount of time patrons are likely to have to wait for delivery of materials from the storage areas? Assume that the patrons apply for the stored material at the same point in your system from which similar, but unstored, material is normally circulated.

_____ Average time

_____ Minimum time

_____ Maximum time

18. Whether or not you currently use storage space for physical science materials, would a regional storage facility have any value to you for the housing and maintenance of your collections in the physical sciences:

Immediately?	___ Yes	___ No
Over the next 5 years?	___ Yes	___ No
Over the next 10 years?	___ Yes	___ No

19. If your answer to any portion of Question 18 is yes, approximately how many volumes do you think it might be useful for you to transfer to a regional storage facility:

Immediately? _____

Over the next five years? _____

Over the next ten years? _____

20. Please indicate the desirability, in your opinion, of each of the following patterns of organization of regional storage centers for lesser used materials in the physical sciences. (Circle the appropriate number on the rating scale.)

	Undesirable			Desirable		No Opinion
(a) Cooperating libraries each accept responsibility for storing certain portions of the region's lesser used materials.	1	2	3	4	5	6
(b) Cooperating libraries jointly operate a separate storage facility with each library retaining title to its own material.	1	2	3	4	5	6
(c) Cooperating libraries transfer title of stored material to a jointly owned center, with elimination of duplicate titles from stored collection.	1	2	3	4	5	6
(d) Same as either (b) or (c) above but with the addition of an active acquisition program by the storage center of material that none of the libraries want individually to collect.	1	2	3	4	5	6
(e) Other (Please specify)	1	2	3	4	5	6

21. Please indicate by circling the appropriate number on the rating scale below how important each of the following services would be in the successful operation of a regional storage facility for materials in the physical sciences.

	Degree of Importance for Successful Operation					
	None				Essential	No Opinion
(a) Delivery service to your library (Specify frequency) _____	1	2	3	4	5	6
(b) Regional inventory of stored material (a union catalog at the storage center).	1	2	3	4	5	6
(c) Space for patrons at the storage center.	1	2	3	4	5	6
(d) Copying services at the storage center.	1	2	3	4	5	6
(e) Other (Please specify) _____						
_____						
_____						
_____	1	2	3	4	5	6

22. Please feel free to add any comments you wish bearing on the tasks of collection development and housing.

_____
Library

_____
Name of person submitting report

METRO

NEW YORK METROPOLITAN REFERENCE
AND RESEARCH LIBRARY AGENCY, INC.

11 WEST 40TH STREET, N.Y., N.Y. 10018

Telephone: 212 695-6732

For some time, METRO, a non-profit agency chartered by the Regents of the State of New York, has been studying science and engineering library resources and services--the traditional sources of scientific and technical information. Now METRO plans to make a study of trade associations to assess their role, if any, in satisfying the region's need for information.

To assist us in this task we would appreciate your taking a few minutes to fill out this questionnaire. Please return it to METRO by 11 August, 1967. A stamped, self-addressed envelope is enclosed to facilitate your response.

Many thanks for your assistance.

Russell Shank
Supervisor, Science Library Project

1. Your name: _____

2. Name of your organization: _____

3. Please specify the subject fields with which your organization is concerned.

4. Do you provide information services for anyone other than your own members?

(7-1) __ yes

(2) __ no

5. If your answer to the preceding question was "yes," answer A, B, and C.

A. What type of services do you provide?

B. Whom do you serve?

C. Do you charge for your services?

(8-1) __ Yes

(2) __ No

6. If you provide information services to anyone other than your own members, please estimate how frequently the following sectors of the New York metropolitan area scientific community use them. (Circle the appropriate number on the scale.)

Organization staffs		Several times a day	Daily	Several times a week	Weekly	Less than weekly
Public libraries	(10)	1	2	3	4	5
Academic libraries	(11)	1	2	3	4	5
Professional society libraries	(12)	1	2	3	4	5
Other trade and manufacturers' associations	(13)	1	2	3	4	5
Other libraries	(14)	1	2	3	4	5
Individuals						
Scientists and businessmen	(15)	1	2	3	4	5
Students (at any level)	(16)	1	2	3	4	5
Other (specify)	(17)	1	2	3	4	5

_____

7. Does your organization maintain any of the following?

Library	(18-1)	__ Yes	(2)	__ No	
Staff of subject specialists	(19-1)	__ Yes	(2)	__ No	
Roster of subject specialists	(20-1)	__ Yes	(2)	__ No	
Roster of other information sources	(21-1)	__ Yes	(2)	__ No	
Special data and information files other than in your own library (If you do have these files, please give a general description of contents.)	(22-1)	__ Yes	(2)	__ No	

8. If you maintain a library, describe its resources.

Number of volumes	_____
Number of periodical titles currently received	_____
Number of technical reports	_____
Number of films	_____
Number of slides	_____
Number of vertical file drawers	_____
Subject of specialized collections (if any)	_____

9. How frequently do the services you offer require that you make use of the following information resources? (Circle the appropriate number on the scale.)

		Several times a day	Daily	Several times a week	Weekly	Less than weekly
Public libraries	(23)	1	2	3	4	5
Academic libraries	(24)	1	2	3	4	5
Members' libraries	(25)	1	2	3	4	5
Other association libraries	(26)	1	2	3	4	5
Other information services (specify) _____	(27)	1	2	3	4	5
Other libraries (specify) _____	(28)	1	2	3	4	5

10. We would appreciate your comments about the availability of scientific and technical information in the New York region, the problems of obtaining access to it, and any suggestions you might have for improvement in science library and information resources and facilities in the New York metropolitan area.

11. If you have a brochure describing the activities of your association, please send it along with this questionnaire.

APPENDIX C

SOURCES OF DATA

Notes

New York Metropolitan Area Public, Academic, Association and Museum Libraries Serving Professional Scientists, Engineers and students and Included in the Population Studied by the Metro Science Library Project, 1966/67

Other Libraries and Agencies Visited or Contacted

Public Accessibility of Respondent New York Metropolitan Area Manufacturers and Trade Associations

Agencies Represented at Small Group Seminars

SOURCES OF DATA

NOTES

Professional Community

The identification of the professional community in terms that would suggest a sampling technique and the mechanism for approaching the sample proved difficult. The Project wished to reach a wide range of scientists and engineers by subject, and at least the most advanced performers. Scientific societies were suggested as likely sources of assistance. Too many problems were encountered in working with them, however. Some societies could not provide mailing lists as a matter of policy. While some of the societies had local chapters that included only New York City residents or employees, others extended their chapter boundaries into New Jersey and Connecticut. Still other chapters were restricted to one or more boroughs. Some societies had no local chapters. Although all societies had their mailing lists arranged according to zip codes, thus simplifying the location of an appropriate sample, the suppliers of the mailing lists were located in dozens of cities. Altogether over 165 societies were identified as logical sources.

Ultimately questionnaires were mailed to subscribers of the journal Industrial Science and Technology. About one-half of the questionnaires were mailed to Manhattan addresses; the remainder went to the other four boroughs and Westchester County. International Science and Technology is designed for experienced scientists and engineers, including those in management, and particularly those who have a wide range of interdisciplinary interests. Thus, although the list is not representative of every level of performance in science and technology, at least it contains the names of those who are likely to make many and unusual demands on libraries and information systems. A system designed for them will also serve those in lesser positions and with less experience.

The mailing list appeared to be weak in the names of those in education. A separate list of faculty members was created, therefore, from the catalogs of the 31 colleges and universities offering degrees in science, and the questionnaire was mailed to every seventh name on the list, starting with the sixth name.

Altogether, 4,273 questionnaires were mailed, of which 1,048 (24.5 percent) were returned, and 898 (21.1 percent) were analyzed.

Industrial Library Survey

A special report form for this portion of the survey was mailed to all of the 190 industrial libraries listed in Special Libraries of Greater New York* under the following headings: Chemical Industry; Communications; Engineering; Petroleum; Science; Technology; and Transportation. (Another 12 libraries were listed, but had been closed or moved from New York City prior to the start of this Project.) Of these libraries 67 (35.3 percent) returned forms, and the data on 49 (25.8 percent) of them were analyzed.

Undergraduate Students

The sample of undergraduate students was approached through faculty members of the 31 academic institutions in the area that offer degrees in science. A list of the faculty members in the science departments was created from faculty listings in the catalogs of the schools. Every seventh faculty member, starting with the seventh name on the list, was asked if he would participate by distributing questionnaires in one of his undergraduate classes. Those who agreed to assist distributed 542 questionnaires. Of these 231 (42.7 percent) were returned and 221 (40.7 percent) were anlyzed.

Graduate Students

The sample of graduate students was approached through the faculty departments in those academic institutions that offered advanced degrees in science. The questionnaire was distributed to 563 students selected by these departments. The distribution was made late in the academic year (1966-67), and although most of the departments indicated that their graduate students would be on campus most of the summer, only 167 (29.7 percent) of the questionnaires were returned, of which 162 (28.8 percent) were analyzed.

Manufacturers Associations

The questionnaire used to gather data for assessment of the interaction between libraries and manufacturers associations was mailed to 308 associations. These were selected from the Trade Association Directory for New York City** and were principally those that could be identified as being concerned with technical aspects of product manufacture and use, including the processing of basic raw materials. A few trade associations were included where it seemed likely that they might be sources of technical data of the products with which they were concerned. Of the questionnaires mailed 72 (42.7 percent) were returned, of which 69 (22.4 percent) were analyzed.

---

*Special Libraries of Greater New York. 10th edition. New York: Special Libraries Association, New York Chapter, 1963.

**Trade Association Directory for New York City. 2nd edition. New York: Department of Commerce and Industrial Development, (no date).

Academic Institutions

The academic institutions chosen for inclusion in various parts of the survey were those listed in the New American Guide to Colleges* that offered degrees in science for four or more years of study. There were 31 such entries for the five boroughs of New York City and Westchester County. In the final study design, only 13 of the 16 small colleges were included. Estimates of various elements of library facilities for these colleges, and for those that did not respond to calls for information, were made when required, based on evidence from colleges in the area of similar size (student bodies and library collections).

---

*Hawes, Gene R. The New American Guide to Colleges. 3rd edition. New York: Columbia University Press, 1966.

NEW YORK METROPOLITAN AREA PUBLIC, ACADEMIC, ASSOCIATION AND MUSEUM LIBRARIES SERVING PROFESSIONAL SCIENTISTS, ENGINEERS AND STUDENTS AND INCLUDED IN THE POPULATION STUDIED BY THE METRO SCIENCE LIBRARY PROJECT, 1966/67

	Included in Study Phase:* (1)	(2)	(3)	(4)	(5)
Academic Institutions					
Brooklyn College	x	x	x		x
City College of New York	x	x	x	x	x
College of New Rochelle		x	x	x	
College of Notre Dame		x	x		
Columbia University	x	x	x	x	x
Cooper Union	x	x	x	x	x
City University of New York (Graduate Division)		x	x	x	
Fordham University	x	x	x	x	
Good Counsel College	(Not surveyed)				
Hunter College	x	x	x		
Iona College	x	x	x		
Kings College	(Not surveyed)				
Long Island University (Brooklyn)	x	x	x	x	
Manhattan College	x	x	x	x	
Manhattanville College of the Sacred Heart	x	x	x	x	
Marymount Manhattan College		x	x		
Marymount College		x	x		
Mercy College		x	x		
New York Institute of Technology	x	x	x	x	
New York University	x	x	x	x	x
Pace College	x	x	x		
Polytechnic Institute of Brooklyn	x	x	x	x	x
Pratt Institute	x	x	x	x	
Queens College	x	x	x	x	
St. Francis College	(Not surveyed)				

*Study phases:

(1) Faculty and student opinion surveys
(2) Collection evaluation survey
(3) Space and cooperative acquisition survey
(4) Site visit
(5) Group seminar participants

	Included in Study Phase: (1)	(2)	(3)	(4)	(5)
St. John's University	x	x	x		
St. Joseph's College for Women	x	x	x		
Sarah Lawrence College		x	x		
SUNY - Maritime College	x	x	x		
Wagner College	x	x	x	x	
Yeshiva University	x	x	x	x	
Public Libraries					
Brooklyn Public Library		x	x	x	x
Mt. Vernon Public Library		x	x	x	
New Rochelle Public Library		x	x		
New York Public Library		x	x	x	x
Queensborough Public Library		x	x	x	x
White Plains Public Library		x	x		
Yonkers Public Library		x	x	x	
Association and Museum Libraries					
American Institute of Aeronautics and Astronautics		x	x	x	
American Museum of Natural History		x	x	x	
Chemists' Club		x	x	x	x
Engineering Societies Library		x	x	x	x
United States of America Standards Institute				x	

OTHER LIBRARIES AND AGENCIES VISITED OR CONTACTED

Bell Telephone Laboratories Library, Holmdel, New Jersey

Carnegie Institute of Technology Library, Pittsburgh, Pennsylvania

Carnegie Library of Pittsburgh

ERIC Central, North American Aviation, Washington, D.C.

Houston, Texas Chamber of Commerce

Industrial Information Service, Dallas Texas

John Crerar Library, Chicago, Illinois

Mellon Institute, Pittsburgh, Pennsylvania

Pittsburgh Interlibrary Center

Project INTREX, M.I.T., Cambridge, Massachusetts

Regional Information and Communication Exchange, Rice University, Houston, Texas

U.S. Atomic Energy Commission, Technology Utilization Program, Germantown, Maryland

U.S. National Science Foundation, Washington, D.C.

U.S. Office of State Technical Services, Washington, D.C.

University of Houston Library

Westchester Library System, Headquarters Office, Mt. Vernon, New York

University of Pittsburgh Library

Western Union, Sales Division, New York, N.Y.

PUBLIC ACCESSIBILITY OF RESPONDENT NEW YORK METROPOLITAN AREA MANUFACTURERS AND TRADE ASSOCIATIONS

	Services Available to the Public	
	Yes	No
Acoustical Materials Association		x
Alloy Casting Institute	x	
Aluminum Association	x	
American Boat Builders and Repairers Association		x
American Carpet Institute	x	
American Gas Association	x	
American Iron and Steel Institute	x	
American Paper Institute	x	
American Tin Trade Asscciation		x
American Transit Association	x	
American Water Works Association	x	
American Zinc Institute	x	
Asphalt and Vinyl Asbestos Tile Institute	x	
Asphalt Roofing Industry Bureau	x	
Atomic Industrial Forum	x	
Burlap and Jute Association		x
Business Equipment Manufacturers Association	x	
Chemical Specialties Manufacturers Association	x	
Chemurgic Council		x
Chlorine Institute	x	
Cigar Manufacturers Association of America	x	
Coffee Brewing Center	x	
Commercial Chemical Development Association		x
Compressed Gas Association	x	
Copper Development Association	x	
Coordinating Research Council	x	
Flight Safety Foundation	x	
Gas Appliance Manufacturers Association	x	
Glass Container Manufacturers Institute		x
Gravure Technical Association	x	
Grocery Manufacturers of America	x	
Hard Fibres Association		x
International Air Transport Association	x	
International Radio and Television Society	x	
Licensed Beverage Industries	x	

	Services Available to the Public	
	Yes	No
Man-made Fiber Industry and its Products	x	
Manufacturers Standardization Society of the Valve and Fittings Industry	x	
Mechanical Contractors' Association of New York		x
Mica Industry Association	x	
National Association of Costume Jewelers		x
National Association of Doll Manufacturers		x
National Association of Engine and Boat Manufacturers	x	
National Association of Importers and Exporters of Hides and Skins		
National Association of Photographic Manufacturers	x	
National Builders Hardware Association	x	
National Burlap Bag Dealers Association		x
National Council for Stream Improvement		x
National Dairy Council	x	
National Darymen Association	x	
National Electrical Manufacturers Association	x	
National Forest Products Association	x	
National Fruit and Syrup Manufacturers Association		x
National Industrial Conference Board		x
New York Cotton Exchange	x	
Package Designers Council	x	
Paper Stationery and Tablet Manufacturers Association		x
Pleaters, Stitchers, Embroiderers Association		x
Pulp Chemicals Association	x	
Pulp, Paper and Paperboard Export Association of the United States		x
Rubber Reclaimers Association	x	
Society of the Plastics Industry	x	
Sporting Arms and Ammunition Manufacturers Association	x	
Stationery and Office Equipment Board of Trade	x	
Steel Shipping Container Institute	x	
Toilet Goods Association		x
Synthetic Organic Chemical Manufacturers Association		x
United States of America Standards Institute	x	
United States Shellac Importers Association	x	
Wallcoverings Council	x	

AGENCIES REPRESENTED AT SMALL GROUP SEMINARS

American Cyanimid Company, Stamford, Connecticut

American Institute of Physics

American Iron and Steel Institute

American Petroleum Institute

Brooklyn College

Brooklyn Public Library

Chemists' Club

City College of New York

Columbia University

Cooper Union

Copper Development Association

Engineering Societies Library

Lederle Laboratories, Pearl River, New York

Lummus Corporation, Newark, New Jersey

New York Public Library

New York University

Newmont Mining Corporation

Polytechnic Institute of Brooklyn

Queensborough Public Library

Richmond College

United Nuclear Corporation

United States Naval Applied Science Laboratory

United States Steel Corporation

Western Electric Company

APPENDIX D

TABLES

TABLE D.I

NUMBER OF ENGINEERS, SCIENTISTS, AND TEACHERS OF ENGINEERING, SCIENCE AND TECHNOLOGY IN NEW YORK STATE, NEW YORK CITY AND WESTCHESTER COUNTY

Occupation	New York State	New York City	Westchester
ALL ENGINEERS, SCIENTISTS, TEACHERS	142,732	58,318	5,593
Engineers and architects	86,393	35,060	3,024
Aeronautical	1,702	213	---
Chemical and ceramic	7,271	2,809	252
Chemical	6,998	2,791	251
Ceramic	273	18	1
Civil and construction	16,022	9,122	491
Civil and construction	15,660	9,016	475
Sanitary	204	31	9
Transportation	158	75	7
Electrical and electronic	26,164	8,217	1,118
Industrial	5,443	1,997	158
Industrial	4,835	1,726	112
Safety	608	271	46
Mechanical	22,721	8,642	770
Air conditioning, heating, and refrigeration	2,069	1,078	273
Marine engineering and naval architecture	872	743	---
Textile	102	44	---
Optical	104	11	8
Other mechanical	19,574	6,766	489
Metallurgical	1,065	388	5
Mining and petroleum	166	105	---
Sales	1,264	585	28
Engineers n.e.c.	624	494	12
Architects	3,951	2,488	190
Scientists and mathematicians	21,123	7,062	1,378
Agricultural scientists	490	27	7
Biological scientists	1,771	496	117
Chemists	9,791	3,199	820
Food technologists	154	8	101
Other	9,637	3,191	719
Geologists and geophysicists	345	226	10
Mathematicians	1,802	360	119
Metallurgists	425	108	5
Meteorologists	111	88	---
Physicists	2,763	418	30
Engineering physicists	300	---	---
Other	2,463	418	30
Research pharmacists	290	25	176
Medical scientists	3,114	2,016	93
Pathologists	681	422	28
Radiologists	665	405	22
Other	1,768	1,189	43
Scientists n.e.c.	220	99	1

Occupation	New York State	New York City	West-chester
College Teachers	17,865	10,977	111
Engineering and architecture	2,834	1,712	2
Aeronautical	103	78	---
Chemical	215	139	---
Civil and construction	359	180	---
Electrical and electronic	821	518	---
Industrial	144	59	---
Marine engineering	118	27	---
Mechanical	395	229	2
Metallurgical	119	43	---
All other engineering	46	18	---
Architecture, design or theory	514	421	---
Science and mathematics	12,228	7,562	95
Agriculture, forestry, horticulture and architectural landscaping	314	---	---
Biology	1,303	635	16
Chemistry	1,736	811	16
Geology, earth science, atmosphere science	280	170	---
Mathematics	1,595	928	30
Medical science n.e.c.	4,881	3,958	---
General science (including public health)	141	80	20
Physics and radiology	1,805	914	13
Pharmacy, pharmacology	140	33	---
All other	33	33	---
Technology	2,803	1,703	14
Airplane dispatching	84	84	---
Mechanical technology	95	41	---
Construction technology	77	60	---
Ceramics	73	8	---
Computer programming	18	17	---
Dental hygiene	90	9	6
Dental laboratory technology	203	197	---
Drafting	626	443	4
Electronic technology	1,036	458	4
Machine design, including industrial design	88	49	---
Medical laboratory technology	158	124	---
Surveying	28	14	---
Industrial production methods	22	12	---
X-ray technology	92	89	---
All other technology	113	98	---
High school teachers (licensed)	17,351	5,219	1,080
Science	8,354	2,430	551
Mathematics	8,747	2,677	519
Technical and technical-related	250	112	10

Source: New York (State) Department of Labor. Division of Research and Statistics. Technical Manpower in New York State. Special Bulletin 239. Vol. 1, Supplement A, New York, New York State Department of Labor, 1964. p. 125-7, Table 47.

TABLE D.II

NUMBER AND PERCENTAGE DISTRIBUTION OF ENGINEERS, SCIENTISTS, AND TEACHERS OF ENGINEERING, SCIENCE AND TECHNOLOGY IN NEW YORK STATE

Area	Number	Per cent
New York State	142,732	100.0
New York City	58,318	40.9
Westchester	5,593	3.9
Nassau-Suffolk	18,158	12.7
Buffalo	13,576	9.5
Albany	8,398	5.9
Rochester	8,118	5.7
Syracuse	7,239	5.1
Utica	2,766	1.9
Binghamton	2,552	1.8
All other	18,014	12.6

Source: New York (State) Department of Labor. Division of Research and Statistics. Technical Manpower in New York State. Special Bulletin 239. Vol. 1. New York, New York State Department of Labor, 1964. p. 63, Table HH.

TABLE D.III CATEGORY OF SCIENTIFIC RESEARCH PERSONNEL IN INDUSTRIAL RESEARCH LABORATORIES BY BOROUGH OR COUNTY OF EMPLOYMENT

	Total	Bronx	Brooklyn	Manhattan	Queens	Richmond	Westchester
Accoustical Engr.	5			5			
Aerospace Engr.	3			3			
Agricultural Engr.	1			1			
Auxiliary Engr.	4			4			
Business Engr.	6			6			
Ceramics Engr.	1			1			
Ceramist	1						1
Chemical Engr.	624		10	470	17		127
Chemist	2,437	12	67	1,562	135	24	637
Civil Engr.	11			11			
Design Engr.	16			16			
Designer	4			4			
Drafting & Design Tech.	23		23				
Economist	1			1			
Elect. Devel. Engr.	5						5
Elect. Engr.	959	252	15	320	292		80
Electro Mech. Engr.	1			1			
Elect. Res.	3						3
Engr.	9,228	2	78	8,941	155		52
Forestry Engr.	10						10
Geological Engr.	1			1			
Geophysicist	3			3			
Geologist	18			18			
Hydraulic Engr.	25			25			
Indus. Engr.	6		3	3			
Instrument Engr.	1			1			
Maint. Engr.	2						2
Marine Engr.	50			50			
Math.	995	7	4	912	43		29
Mech. Engr.	717	153	21	337	148		58

	Total	Bronx	Brooklyn	Manhattan	Queens	Richmond	Westchester
Mech. Elect. Engr.	12						12
Metallurgical Engr.	24			22			2
Metallurgist	259	1	10	205	23		20
Minerological Engr.	1			1			
Mining Engr.	1			1			
Model Makers	11		11				
Nuclear Engr.	26						26
Oceanographer	2			2			
Opn's. Res. Engr.	1			1			
Optical Engr.	2			2			
Other Prof'l's.	700	5	17	598	12		68
Photo Engr.	1			1			
Physical Chem.	1			1			
Physicist	825	5	7	620	98		95
Plastics Engr.	3						3
Prod. Devel. Engr.	1			1			
Programmer	51			51			
Radar Engr.	1			1			
Reliability Engr.	2						2
Researchers	200			200			
Systems Devel. Engr.	5						5
Technical Engr.	7						7
Technician	11,126	15	147	9,655	492	17	800
Textile Engr.	11			8	3		
Textile Spec.	3			3			
Technical Dir.	2			2			
Writers	250			250			
SUB TOTAL	(28,689)	(452)	(413)	(24,321)	(1,418)	(41)	(2,044)

	Total	Bronx	Brooklyn	Manhattan	Queens	Richmond	Westchester
Life Sciences and Others							
Bacteriologist	4			4			
Bacteriologist and Micro Biologist	16						16
Biologist	290	5	5	183	6	10	81
Consulting MDs	6						6
DVMs	8	1		6			1
Food Tech.	41			5	2		34
Home Economist	1						1
Lawyer	1			1			
Medical Specialist	89			89			
MDs	46			24	5	1	16
Microbiologist	1			1			
Pharmacist	13			4			14
Pharmacologist	35						35
Psychologist	76		1	71	1		3
TOTAL	(29,321)	(458)	(419)	(24,709)	(1,432)	(52)	(2,251)

Source: Industrial Research Laboratories of the United States, 12th ed. Washington, D. C.: Bowker Associates, Inc. 1965.

TABLE D.IV

AGGREGATE SIZE OF SCIENCE AND TECHNOLOGY COLLECTIONS LISTED IN THE SPECIAL LIBRARIES ASSOCIATION GREATER NEW YORK DIRECTORY (1967 ed.),* BY TYPE OF LIBRARY

	METRO area	Non-METRO in 50 mi. radius	Total in 50 mi. radius
Academic libraries			
4 or 5 year degree	(4)**	(1)	(5)
Books	178,700	53,000	231,700
Per. Titles	2,093	450	2,543
Tech. Reports	16,600		16,600
Graduate degree	(11)	(13)	(24)
Books	333,014	322,200	655,214
Per. Titles	9,637	8,985	18,622
Tech. Reports	58,000	124,200	182,200
Corporate	(74)	(101)	(175)
Books	410,228	634,018	1,044,246
Per. Titles	18,589	36,342	54,931
Tech. Reports	53,030	1,018,481	1,071,511
Government	(5)	(4)	(9)
Books	50,500	218,047	268,547
Per. Titles	1,348	1,450	2,798
Tech. Reports	58,500	268,000	326,500
Public	(5)		
Books	761,254		
Per. Titles	7,318		
Tech. Reports	6,000		
Society	(5)		
Books	324,220		
Per. Titles	4,660		
Mfg./trade assoc.	(7)		
Books	20,800		
Per. Titles	1,120		
Tech. Reports	1,000		
Other	(6)	(3)	(9)
Books	62,550	51,000	113,550
Per. Titles	28,860	50,165	79,025
Tech. Reports	190,050	90,900	280,950

*Statistics were obtained from proof copy.

**Figures in parentheses indicate number of libraries included.

APPENDIX E

LIBRARY COLLECTION SPECIALTIES

SCIENTIFIC AND TECHNICAL SUBJECT COLLECTIONS IN ACADEMIC, PUBLIC, PROFESSIONAL SOCIETY, CORPORATION,[1] AND MISCELLANEOUS SPECIAL LIBRARIES IN THE METRO AREA[2]

Aero-Space Engineering
Polytechnic Institute of Brooklyn

Aeronautics
American Institute of Aeronautics and Astronautics
New York Public Library, Science and Technology Division
Polytechnic Institute of Brooklyn

Air Conditioning Technology
Voorhees Technical Institute

Architecture
City College of New York
Columbia University, Avery Architectural Library
Cooper Union for the Advancement of Science and Art
New York Public Library, Art Architecture Division
New York Public Library, Science and Technology Division
Parsons School of Design
C. W. Post College of Long Island University
Pratt Institute

Astronautics
American Institute of Aeronautics and Astronautics
Polytechnic Institute of Brooklyn

---

[1]Whenever corporation libraries are listed, symbols are used to indicate degree of accessibility: P = Open to public; LP = Limited public access; Lib = Open to other librarians only. Corporations whose collections are closed are not listed.

[2]This list is composed of entries from the following sources:
Ash, Lee, comp. Subject Collections: A Guide to Special Book Collections and Subject Emphases as Reported by University, College, and Special Libraries in the United States and Canada. 2nd ed. New York, R.R. Bowker, 1961.

Council of Higher Educational Institutions in New York City. A Directory of Resources of Cooperative Libraries in Metropolitan New York. 3rd ed. New York, Council of Higher Educational Institutions in New York City, 1965.

Astronomy
- American Merchant Marine Library Association
- City College of New York
- New York Public Library, Science and Technology Division

Astronomy--History
- American Museum of Natural History

Atomic Energy
- Atomic Industrial Forum, Inc. (LP)
- Columbia University, Monell Engineering Library
- Ebasco Services (Lib)
- U.S. Atomic Energy Commission Library

Automobile Mechanics
- Voorhees Technical Institute

Biochemistry
- Academy of Medicine of Brooklyn
- Chemists' Club
- Evans Research and Development Corporation (Lib)
- M. J. Lewi College of Podiatry
- New York City, Department of Health, Bureau of Laboratories Library
- The Rockefeller University

Ceramics
- Columbia University, Avery Architectural Library
- New York Public Library, Art and Architecture Division

Chemical Engineering
- Chemical Construction Corporation (Lib)
- Chemists' Club
- Engineering Societies
- Ford, Bacon & Davis, Inc. (Lib)
- Hydrocarbon Research, Inc. (Lib)
- C. L. Mantell (Lib)
- New York Public Library, Science and Technology Division
- Pratt Institute

Chemical Technology
- Bronx Community College of the City University of New York

Chemistry
- Academy of Medicine of Brooklyn
- Brooklyn College
- Brooklyn College of Pharmacy of Long Island University
- Chemists' Club
- Columbia University, Chemistry Library
- Columbia University, College of Pharmacy
- Evans Research and Development Corporation (Lib)

Food Machinery and Chemical Corporation (Lib)
Manhattan College
C. L. Mantell (Lib)
New York Public Library, Science and Technology Division
New York University, Gould Memorial Library
Pepsi-Cola Company (Lib)
Polytechnic Institute of Brooklyn
Pratt Institute
U.S. Atomic Energy Commission Library
Vick Chemical Company, Research Divisions Library (Lib)

Civil Engineering
Engineering Societies
Ford, Bacon & Davis, Inc. (Lib)
Polytechnic Institute of Brooklyn

Communications
New York Public Library, Science and Technology Division
Yeshiva University Graduate Center Library

Diesel Engineering
U.S. Merchant Marine Academy

Economic Geology
Engineering Societies

Electrical Engineering
Engineering Societies
Ford, Bacon & Davis, Inc. (Lib)
New York Public Library, Science and Technology Division
Polytechnic Institute of Brooklyn
Pratt Institute
Queensborough Community College of the City University of New York
U.S. Merchant Marine Academy

Electrical Technology
Bronx Community College of the City University of New York

Electricity
Consolidated Edison Company of New York Library (Lib)
Edison Electric Institute Library (LP)
Engineering Societies
New York Public Library, Science and Technology Division

Electricity and Magnetism
Engineering Societies

Electrochemistry
C. L. Mantell Library (Lib)

Electromagnetism
Engineering Societies

Electronics
Polytechnic Institute of Brooklyn

International Telephone and Telegraph Corporation (Lib)
New York Institute of Technology
Voorhees Technical Institute

Electro-Physics
Polytechnic Institute of Brooklyn

Engineering
Chemists' Club
City College of New York
Columbia University, Monell Engineering Library
Cooper Union for the Advancement of Science and Art
Ebasco Services (Lib)
Engineering Societies
Manhattan College
New York Institute of Technology
New York Public Library, Science and Technology Division
New York University, Engineering and Science Library
Polytechnic Institute of Brooklyn
Pratt Institute
Queensborough Community College of the City University of New York
State University of New York, Maritime College
U.S. Merchant Marine Academy

Geodesy
American Seamen's Friend Society, Library for Seamen

Geology
American Museum of Natural History
American Overseas Petroleum Ltd. (LP)
Columbia University, Geology-Maps Library
Engineering Societies
Ford, Bacon & Davis, Inc. (Lib)
New York Public Library, Science and Technology Division
Standard Oil Company of New Jersey, Central Library (Lib)
Union Carbide Corporation, Mining and Metals Division (Lib)

Guided Missiles
American Institute of Aeronautics and Astronautics

Gums and Resins
Polytechnic Institute of Brooklyn

Industrial Chemistry
Chemists' Club

Industrial Design
New York Public Library, Art and Architecture Division
Parsons School of Design

Magnetism
Engineering Societies

Marine Engineering
- American Merchant Marine Library Association
- State University of New York, Maritime College
- U.S. Merchant Marine Academy

Materials Processing
- Voorhees Technical Institute

Mathematics
- Columbia University, Mathematics Library
- Hunter College
- Manhattan College
- New York Public Library, Science and Technology Division
- New York University, Courant Institute of Mathematical Sciences Library
- Notre Dame College of Staten Island
- Polytechnic Institute of Brooklyn
- Pratt Institute
- U.S. Merchant Marine Academy
- Voorhees Technical Institute

Mathematics--History
- Columbia University, Special Collections

Mechanical Drawing
- Columbia University, Avery Architectural Library

Mechanical Engineering
- Engineering Societies
- Ford, Bacon & Davis, Inc. (Lib)
- Polytechnic Institute of Brooklyn
- Pratt Institute
- Queensborough Community College of the City University of New York
- U.S. Merchant Marine Academy

Metallurgy
- Engineering Societies
- New Jersey Zinc Company (Lib)
- New York Public Library, Science and Technology Division

Metalwork
- Columbia University, Avery Architectural Library

Meteorology
- American Merchant Marine Library Association
- New York Public Library, Science and Technology Division

Mineralogy
- American Museum of Natural History
- New York Public Library, Science and Technology Division

Mines and Mineral Resources
Engineering Societies
New Jersey Zinc Corporation (Lib)
Union Carbide Corporation, Mining and Metals Division (Lib)

Mining Engineering
New Jersey Zinc Company (Lib)
Union Carbide Corporation, Mining and Metals Division (Lib)

National Aeronautics and Space Administration
New York University, Engineering and Science Library
Polytechnic Institute of Brooklyn

Nautical Science
U.S. Merchant Marine Academy

Naval Architecture
State of New York, Maritime College

Nuclear Engineering
American Seamen's Friend Society Library
Engineering Societies
U.S. Merchant Marine Academy

Nuclear Science
State University of New York, Maritime College

Oceanography
American Merchant Marine Library
State University of New York, Maritime College

Paleontology
American Museum of Natural History
American Overseas Petroleum Ltd. (LP)

Paper Making and Trade
Allied Chemical Corporation, Aniline Division Library (Lib)
New York Public Library, Science and Technology Division

Patents
Evans Research and Development Corporation (Lib)
New York Public Library, Science and Technology Division

Petroleum
American Overseas Petroleum Ltd. (LP)
Engineering Societies
Ford, Bacon & Davis, Inc. (Lib)
Hydrocarbon Research Inc. (Lib)
New York Public Library, Science and Technology Division
Sinclair Oil Corporation, Technical and General Library (Lib)
Standard Oil Company of New Jersey (Lib)

Pharmacology
- Brooklyn College of Pharmacy of Long Island University
- Fordham University

Pharmacopeias
- Columbia University, College of Pharmacy

Pharmacy
- Allied Chemical & Dye Corporation, Aniline Division Library (Lib)
- Brooklyn College of Pharmacy of Long Island University
- Columbia University, College of Pharmacy
- New York Academy of Medicine
- New York Pharmaceutical Association
- New York State Pharmaceutical Association
- Chas. Pfizer & Company, Inc., Business Library (Lib)
- Winthrop Laboratories (Lib)

Physical Sciences
- Long Island University, Zeckendorf Campus
- New York University, Engineering and Science Library
- Polytechnic Institute of Brooklyn

Physics
- Columbia University, Physics Library
- New York Public Library, Science and Technology Division
- Polytechnic Institute of Brooklyn
- Pratt Institute
- U.S. Atomic Energy Commission Library
- U.S. Merchant Marine Academy

Protective Coatings
- Polytechnic Institute of Brooklyn

Radar
- American Seamen's Friend Society Library

Radio
- American Seamen's Friend Society Library
- Western Union Telegraph Company, Industrial Library (LP)

Rand Corporation Reports
- Columbia University, Monell Engineering Library

Science
- Fordham University
- Good Counsel College
- Marymount Manhattan College
- New York Public Library, Science and Technology Division
- Notre Dame College of Staten Island
- Pace College
- Polytechnic Institute of Brooklyn
- Pratt Institute
- Queensborough Community College of the City University of New York

Queensborough Public Library
The Rockefeller University
Saint Joseph's College for Women
State University of New York, Maritime College
Staten Island Institute of Arts and Sciences
U.S. Merchant Marine Academy
Voorhees Technical Institute

Science--History
Brooklyn College of Pharmacy of Long Island University
Polytechnic Institute of Brooklyn
Yeshiva University, Albert Einstein College of Medicine

Shipbuilding
New York Public Library, Science and Technology Division
State University of New York, Maritime College

Technology
Bronx Community College of the City University of New York
Chemical Construction Corporation, Chemico Library (Lib)
New York City Community College of the City University of New York
New York Public Library, Science and Technology Division
State University of New York, Maritime College
Staten Island Community College of the City University of New York

Technology--History
Brooklyn College of Pharmacy of Long Island University
Engineering Societies

Textile Industry and Fabrics
New York Public Library, Science and Technology Division

Traffic Engineering
Municipal Reference Library

U.S. Atomic Energy Commission Depository
Atomic Industrial Forum, Inc. (P)
Columbia University, Monell Engineering Library
New York University, Engineering and Science Library