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THE ROLE OF INFORMATION CENTERS;
EVALUATION OF THEIR EFFECTIVENESS

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On November 10, 1965, I participated in a panel discussion on "How Can Effectiveness of Analysis Centers Be Measured", held during the Ad Hoc Forum of Scientific and Technical Information Analysis Center Managers, Directors and Professional Analysts at the Battelle Memorial Institute, Columbus, Ohio. During the discussion moderated by William L. Wolfe, Institute of Science and Technology, University of Michigan, some of the material presented in this memorandum was used, although not necessarily in the form given here. Transcript of the panel discussion will be included in the transactions of the Forum, to be published by the Division of Technical Information of AEC.



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THE ROLE OF INFORMATION CENTERS;
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The information needs of a scientist are quite varied. Before starting a new project he may want to make a general survey of the field. Depending on his temperament, he could be interested in collecting all the available information on the subject; others might prefer not to be overloaded with references, fearing that too much reading might blunt their own inventive ability. If he wants to do a thorough job, quite possibly he might not have time to work in the laboratory, being obliged to spend all his time studying other people's data. Many scientists are interested only in a random sampling of the literature by browsing through the material. I have a feeling that browsing is often an excuse for not doing systematic searches. It has been claimed, but seldom proved, that many "serendipitous" discoveries have been made, thanks to the ideas generated during such a casual activity.

In a recent letter to the editor in the International Science and Technology* R. G. Nisle raises the question "Why did it take so long to invent the steam engine?" This is an interesting problem because all the necessary mechanisms were known for centuries and the required metal working was also an ancient art. The writer feels that "the most typical difficulty is that humans fail to make use of the information which they have". He speculates that many wonderful inventions that could revolutionize our lives are just lying about, waiting for someone to put together the pieces; therefore, he suggests that a part of the billions now being spent on research be devoted to a search for new and unsuspected applications for the vast amount of knowledge that the scientists are so diligently collecting.

I am in agreement with that point of view. I don't think that information centers alone are guilty for not transmitting the information efficiently. The whole system of information transmission in

* November 1965, page 14.



science is undergoing a revolution at the present time. We have reached the stage that we are busy generating new knowledge, developing new tools for transmitting and do not have the time in this feverish activity to stop for a few minutes to absorb the knowledge that others want to impart us. Clearly, a new technology is needed in order to re-establish the equilibrium. Information centers are part of this developing technology and shares in its tribulations. The problem is similar to the prediction of the telephone company before the era of automatization: if the rate of growth continues, soon the whole population will be employed as switchboard operators. The automatic dialing was the answer and solved the problem. Information centers did not reach yet the point of automatic switching but they represent at least a partial answer to the problem of scientific information handling.

Having this tool at our disposal, we are faced with the problem of evaluating its usefulness. The scientist and engineer ask whether he should use this new system and break his earlier habits of acquiring information, - or rather, should he add the new tool to his old arsenal. He wants to know whether the information center is an efficient and fast medium for providing him with everything he needs to know to carry out his experimental, theoretical, production or design work. There are many demands on his time and he does not want to waste it.

The sponsoring agency of the center or the top management of the institution where it is located have similarly many demands on the funds placed at their disposal. They must weigh whether investment in an information center will bring better returns than hiring additional research personnel or buying new instruments. They are also vitally interested in the evaluation of the usefulness of the center.

I would like to discuss our experiences with the ORNL information centers. About a dozen information centers have been or are about to be formally established at the Oak Ridge National Laboratory*. Most of these centers are relatively young: only one center, transferred

* The ORNL Information Centers (A Study in Diversity), F. Kertesz, ORNL-TM-996.

from another location, has been in existence for more than fifteen years; the average period of operation of the others is less than three years.

Up to now, attention was focused mostly on the problems connected with the establishment of a new center: recruitment of the qualified personnel, finding a physical location and selection of the basic operational parameters such as the thesaurus, the indexing and the retrieval systems. Of necessity the delineation of responsibility of the center had to be carefully considered during this period; this required a definition of the input area to be covered and the type of clientele to be served.

During this initial stage it is impossible to determine the usefulness of a center. We can obtain overall production cost figures; we know how many documents have been put in the system and how many individuals were involved in this operation. But even the cost figure is not quite accurate: being non-profit organizations operating in a government-owned laboratory, the ORNL information centers do not pay any rent and their overhead is reflected in their division's budget.

The chief justification in establishing an information center in the first place is primarily economical. This is especially true for engineering systems. There are many stories in circulation about large unnecessary research expenditures which simply duplicated previous work. Had the project manager or individual scientist known about the previous work, he could have saved the needlessly spent money. We can state that a center fulfilled its mission and justified its existence if the sum saved exceeds its total cost. However, this type of information is very hard to come by.

I tried once to find documentary evidence for such unnecessary work that was due to the ignorance of previous work on the part of the people in charge. During my search I talked with many people including managers of large projects. I heard references concerning \$200,000 spent on the development of a valve during a rocket development project; according to the story, the valve needed was available on the shelf and was described in a catalog, the existence of which

was unknown to the engineer in charge. However, I was unable to unearth documentary proof. I realize that such dollars and cents data concerning the value of an information service would represent a very effective argument when one has to justify the cost of a system to sponsors who provide the funds.

Looking deeper into this state of affairs, it is not surprising that fully documented case histories are not easily available. After all, one cannot expect a project manager to state in a formal report that he spent a few hundred thousand or million dollars unnecessarily because he unwillingly duplicated an earlier work described in an obscure report. No matter how innocent he is and how difficult it would have been for him to dig out the data, such an admission of failure would be a blot on his managerial escutcheon.

Such information is somewhat easier to come by in the field of pure science, mostly because scientists watch jealously over questions of priority. This is illustrated in an interesting report entitled "Physics Articles in Obscure Journals" by Stephen G. Brush* which starts with the following line: "Note added in proof. After completing this investigation we discovered that essentially the same results had already been published by ...". According to the author, such notes appearing with great frequency represent an embarrassing acknowledgment that the work reported duplicated somebody else's already published findings. The most famous example of such forgotten findings is Mendel's discovery of the law of heredity that was published in a little known journal and remained unknown for decades. In his above-mentioned report Brush also cites the case of Joule's kinetic theory of gases, used to calculate the velocity of hydrogen molecules. The work was presented in 1848 and published in 1851. Six years later Rudolph Clausius published his own paper on the kinetic theory.

This kind of duplication occurs often and can be documented relatively easily because a large number of scientists work on the same field in geographically separate areas. Rather than covering up the

* UCRL-14205, University of California, Lawrence Radiation Laboratory, Livermore, California.

duplication, the scientists are eager to point out previous work. Professional jealousy and the urge to be recognized may play an important role in this.

I mentioned two potential evaluation methods: (1) unit cost of the input; (2) saving of money that would be unnecessarily spent because of ignorance of the availability of the data. Other criteria could be considered: the cost of making a search to satisfy a request; the rate of usage of the information center and the growth rate of the number of satisfied customers.

During the past months my colleagues and I attempted to develop a method that might be applicable to the conditions at the Oak Ridge National Laboratory. Because of the great variety of our information centers, this is not an easy task. I reached the conclusion that in view of the variety of methods used in the operation of the centers and the differing criteria involved in the evaluation process, it is not possible to develop a single set of figures or other indicators which could evaluate quantitatively the efficiency or usefulness of a center. Figures such as inquiries received or satisfied per week are meaningless if they are used to compare an engineering "current-awareness" service with an information center operating in the field of basic sciences. In the latter case, the chief role of the center is to prepare carefully selected and critically evaluated material rather than maintain an up-to-date and exhaustive collection. The director of such a center stated that he actually considers most inquiries as an indication of failure because his goal is to prepare his compilation with all due speed, placing the completed material on the desk of every physicist who might need it. A specific inquiry indicates that the distribution list is incomplete; satisfying it means that the regular operation must be disturbed. Of course, there might be occasions when a colleague might want to look at the very latest not yet completely evaluated data, but in that case the center acts as a bibliographic service rather than a technical institute.

Our panel chairman suggested that evaluation of the effectiveness is really done at three levels: (1) whether the information center is worthwhile in the context of the entire technical community

it serves; (2) whether the total product of the information center is a useful item to each individual user; (3) whether the retrieval system provides the proper amount of exhaustivity and selectivity per dollar and per request.

(1) The first point is considered very carefully whenever a new information center is established. In the case of our center, as I am sure in the case of the primarily scientific type of information centers, the working scientists themselves who felt the need for such a facility were pressing for the establishment of such new groups. They and their associates were probably looking for certain data and were not able to find them anywhere; or, if the data are available, they were not organized in a convenient manner. The obvious thing was to "do it yourself". Many information centers were thus established as a result of one man's initiative and not at the specific recommendation of a committee or an agency. This was especially true in the case of the major, now classic information centers, started toward the end of the last century by indefatigable workers such as Mellor, Gmelin or Beilstein, which operated as one-man efforts as long as the founder was physically able to cover his ever-broadening field.

The scientific importance of the ORNL information centers was determined by the division supervision, keeping in mind the general instruction from top management "no information center should be established in areas in which the Laboratory does not carry out experimental or theoretical work". Therefore, we do not have centers which are not backed up by a group of working scientists or engineers. In addition, the various program divisions of AEC check our projects carefully, making sure that no information center is established thoughtlessly. The Division of Technical Information of AEC often carries out a scoping study to establish the need for a given center by estimating the number of potential users and the anticipated growth of the literature in that field.

(2) The second point "is the total product of the information center a useful item to each individual user?" is much more difficult to evaluate. We do not expect that every item should be of interest

to everybody. When I want to find the telephone number of a friend in New York City, I am interested in only that particular piece of information. It must be one-hundred percent correct but in order to satisfy my need, the telephone company must assemble and keep up to date five or six volumes of names and numbers because the Bronx or Brooklyn volumes are of no use to me if I am interested only in Manhattan. The same thing is true of the output of the information centers. Even though the activity of the center is restricted to a narrow field, the scientists often operate in even narrower subfields and may not care about the neighboring areas except in a vague, general manner.

(3) As to the third item, - whether the retrieval system provides the proper amount of exhaustivity and selectivity per dollar and per request, - I feel that this is not a proper question as far as we are concerned. Instead, I would like to set up separate criteria for each center and determine the necessary parameters using the Aslib-Cranfield type or a similar technique. Changes (hopefully improvements) could be followed as a function of time. In view of the great diversity in the scope and the modes of operation of our centers I do not think that we have the right to use a single yardstick for comparing the usefulness and efficiency of the centers for the above-outlined reasons.

I realize that my job is only starting. Up to now, I was a very much interested bystander at the startup of several centers and helped to smooth out some of the initial difficulties during the first years of operation. There was a tremendous enthusiasm on the part of the people directly involved and supervision; we attracted the benevolent attention of top management but now we have reached the point that people above keep asking the question: "Are information centers worth while?" In view of the amount of money spent we will have to justify the existence of the centers.

However, the question is whether strictly economical grounds are justified or whether other considerations should enter in the judgment? If the branch office of a chain store does not make the profit its top management deems to be necessary for its continued existence it will be closed, because in that case the profit motive is the only criteria. On the other hand, the Post Office Department cannot do this, even

though many of its smaller offices operate at a loss. In that case there might be an overriding national or political reason for maintaining the service.

There are other examples. In the public library, books may be borrowed without charge; still, the librarians maintain statistics on the total circulation in order to justify existence of the library to the town fathers or the board of trustees. On the other hand, an organization such as the Bodleian Library does not have to justify its existence on strictly economic grounds; the value of the services rendered is sufficient reason for supporting it. I feel that in case of some of the information centers we must follow a similar path. The criteria, on the basis of which the center's value is judged, may be purely scientific which cannot be expressed in dollars and cents.

I believe that an organization of interested persons such as one that might be formed as a result of this Ad Hoc Forum discussions should assume the leadership in supporting studies on the general economic bases of information handling. The cost of unit input into the system, that of indexing and abstracting received only little attention. At a symposium held on this subject* the figures quoted for indexing an article ranged all the way from \$5 to \$50; the cost spread for abstracts was equally broad. Quality of the input must also be examined. The Saul Herner & Company compared the cost of various types of abstracts, reaching the conclusion that expensive abstracts made by experts in the field are justified if the whole information transmission process is considered. I do believe that we need more of such "unit process" data before (if ever) we can compare meaningfully the efficiency of information centers' services. In the meantime I believe that it is best to limit the evaluation of the ORNL centers to a comparison of past and present performances; one must avoid attempting to compare apples with pears.

I also believe every effort should be made to increase the use factor of the centers by making them better known to the potential

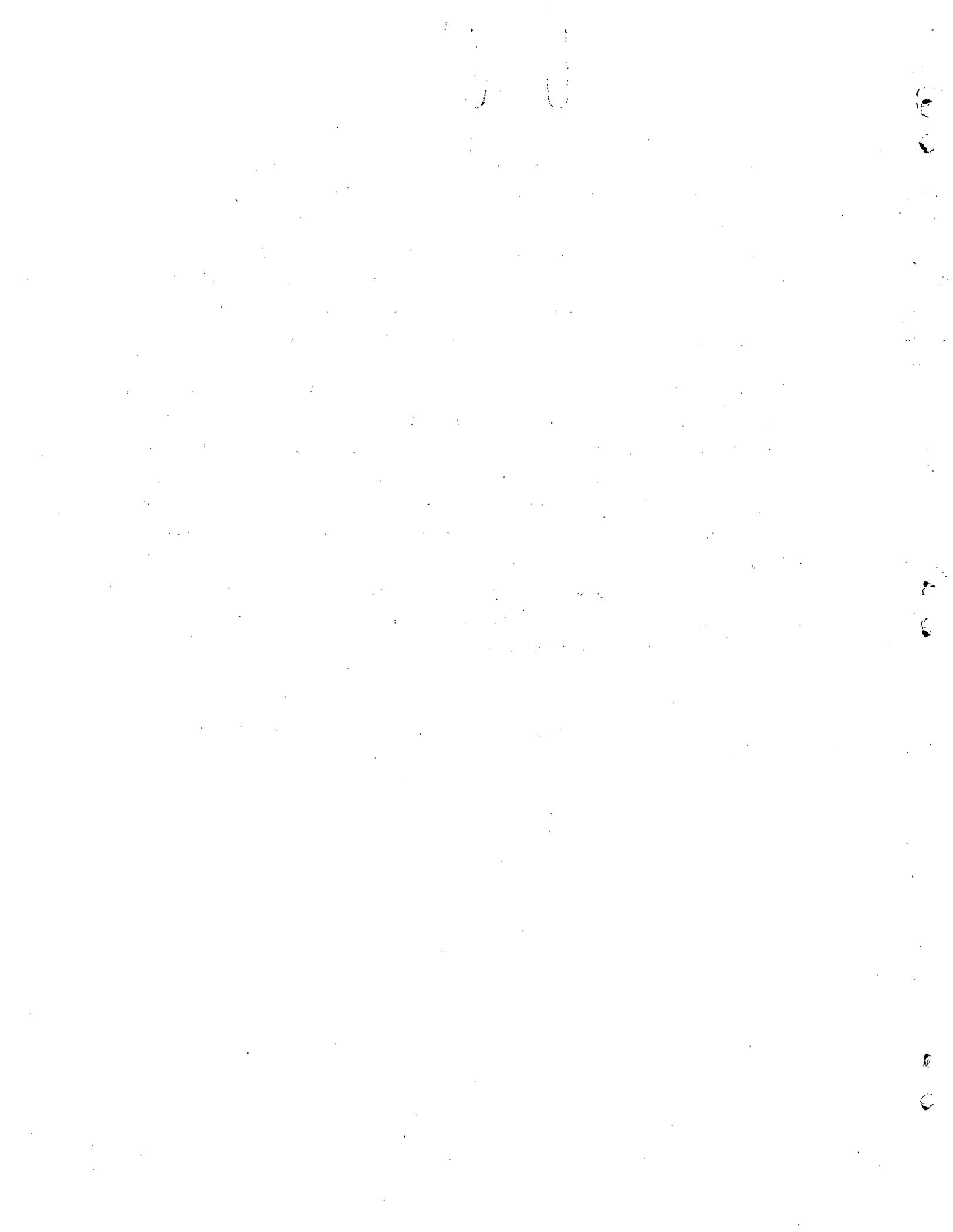
* Meeting of the American Documentation Institute in Philadelphia, October 1964.

users who often are not aware of the existence of the center or of the available services. The center managers should start a vigorous advertising campaign, pointing out how they can contribute to the efficient use of the scientific literature.

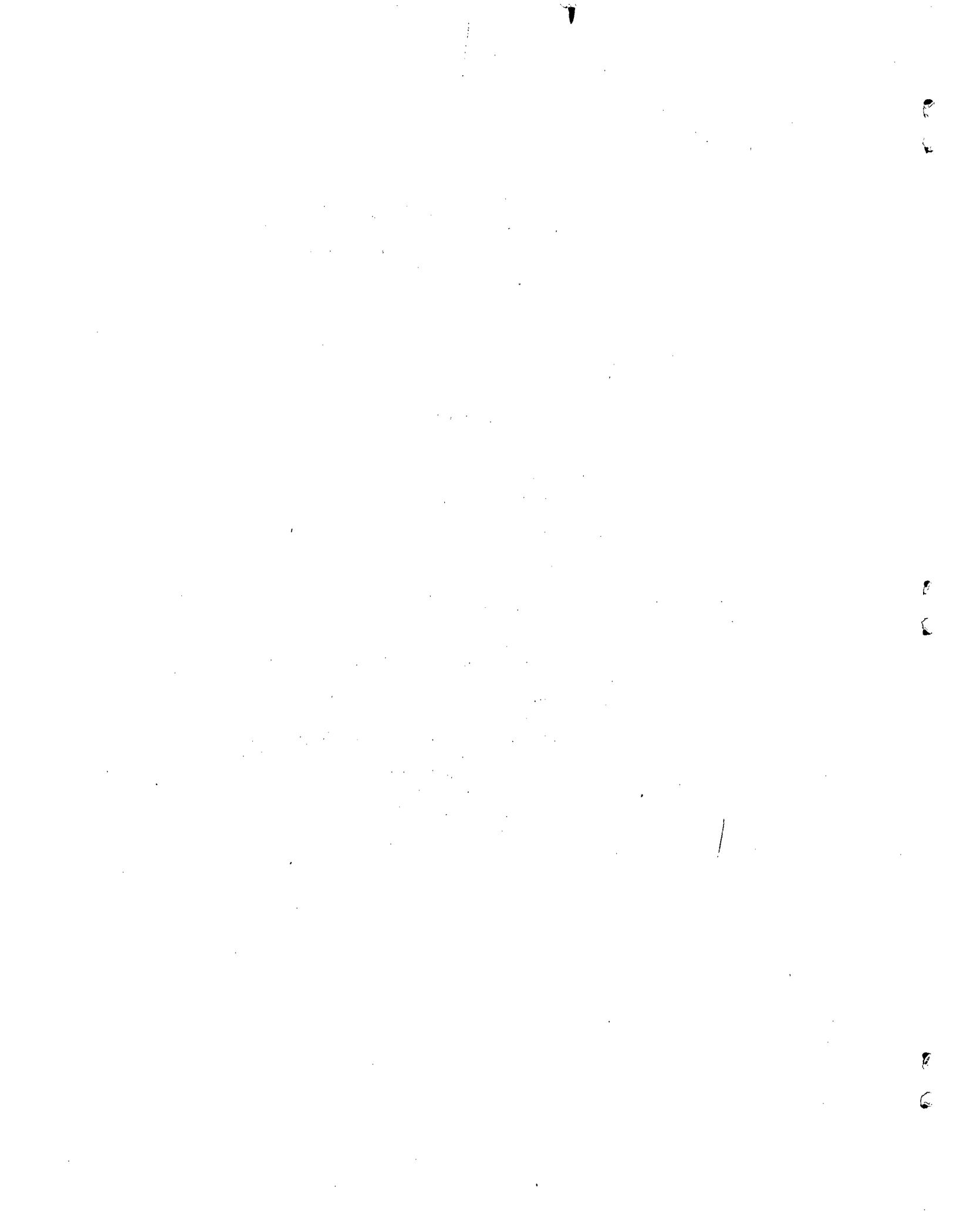
This subject deserves to be discussed separately at great length; therefore, I do not want to go into details. However, I would like to mention two obvious lines to follow: education of the graduate students and organization of specialized information center symposia at technical society meetings.

We are attempting to follow both lines of attack. Special exhibits were shown at the 1965 Annual Meeting of the American Nuclear Society. In addition, I requested the program chairman of the next annual meeting to set aside a half day session for a detailed discussion of information centers of interest to nuclear engineers and scientists. If the proposal is accepted, I hope to be able to assemble speakers who can discuss the services of the various centers. I would eliminate all description of methods of retrieval, organization, indexing, etc. which are of primary interest to center managers and analysts because I have found from experience that most technical men do not care about such items.

I realize that I did not give any actual methods for evaluating the performance but I hope that I clarified somewhat the philosophy, and within the near future I will be able to present more facts.



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