STRENGTHENING THE COVERAGE OF THIRD WORLD SCIENCE

The Final Report of the Philadelphia Workshop and of the Discussions Preceding and Following that Workshop

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THE BIBLIOGRAPHIC INDICATORS OF THE THIRD WORLD'S CONTRIBUTION TO SCIENCE

Deliberations, Conclusions, and Initiatives of an *ad hoc* International Task Force for Assessing the Scientific Output of the Third World

July 1985

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Issued by Michael J. Moravcsik, Institute of Theoretical Science, University of Oregon, Eugene, Oregon 97403 USA February 1986

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SUMMARY

The attached report of an international task force is about a critical issue in world science: Is the science done in the third world adequately represented in international bibliometric indicators of scientific productivity?

The Task Force The membership of the task force of scientists and policy analysts is listed with brief professional biographies on pages 4-11. The task force received financial support from the U.S. National Science Foundation and the Rockefeller Foundation.

The Conclusion There are a variety of databases for science, some computerized, some still manually operated. The degree to which they cover third world scientific activities varies considerably and is complicated by the variety of outlets in which third world scientists publish, including the "gray" literature of reports and other non-journal sources. At the workshop considerable attention was paid to the Science Citation Index (SCI) created by the Institute for Scientific Information (ISI) since it is one of the most comprehensive and widely used throughout the world. Workshop participants estimated that only about half of the scientific output of the third world which meets international standards of excellence is included in the SCI.

Recommendations Our philosophy was to suggest catalytic programs in five categories which could yield significant improvement for small investments of funds (full discussion of the specific initiatives can be found on pages 24-33).

I. Studies
   1. An analysis of the nature and usage of the science and technology literature from developing countries (presently 4,500 journals) as acquired by the British Library Lending Commission.
   2. A study to explore, in depth, the barriers to scientific research in the developing countries due to deficiencies in access to databases, secondary sources, and other information sources.
   3. A study of the editorial practices in international scientific journals vis-a-vis articles submitted by authors from the developing countries.

II. Steps Requiring Scientific Consciousness Raising But Minimal Resources
   4. Guidelines are given for journal editors about features that will facilitate the inclusion of their journal in international databases, such as having a title page in English.
   5. Selection and presentation to ISI by each country of the list of journals published in that country that are of international quality.

III. Steps Requiring Further Organization But Minimal Resources
   6. Development of a peer review system for journal editors and agency officials in developing countries who wish to avail themselves of such opportunities

IV. Steps of Small and Catalytic Costs
   7. An initiative to provide seed money for encouraging manufacturers in some developing countries to produce microfilm readers, as microform journals, books and reports are less expensive to produce and to ship airmail than hard copy.

V. Steps with Broadly Distributed Costs
   8. The expansion of the International Development Research Information System and extension of access to as wide an audience as possible.
   9. Encouraging each developing country to acquire and maintain complete bibliographic control over, and complete availability of, its own publications.
   10. Monographs need to be prepared in specific disciplines which are of special interest to developing countries but which are not adequately covered in the usual databases, because, for example, much of the literature is in the form of reports.
   11. Expanding the SCI to include the roughly 25 to 50 thousand articles per year of quality research. Projected additional annual cost to ISI of $250,000 would be obtained from outside sources for the first three years and absorbed in the regular ISI budget thereafter. The Rockefeller Foundation has pledged an annual; amount of 15 to 30 thousand dollars as part of this effort. Identification of new journals to be included should be done by countries through special blue ribbon scientific commissions such as the academies or other scientific societies in conjunction with ISI.

What You Can Do. Some of these recommendations can be initiated directly by readers of this report and their colleagues. If you are interested in participating in one or more of the international initiatives, please contact the coordinator of the conference, Dr. Michael Moravcsik, at the address on the report cover.

I. Background

1. The birth of the project

Scientometric indicators, using bibliographic databases, have been used widely and for some time to assess scientific work and to acquire information in science. For example, see e.g. *Science Indicators*, National Science Board, 1983; T. Braun, W. Ganzel, A. Schubert, *Scientometric Indicators*, World Scientific, Singapore-Philadelphia, 1985; A. van Heeringen, C. Mombers, R. van Venetie, *Science and Technology Indicators 1983. A comparison of the Netherlands with other countries on the basis of quantitative data*. RAWB report, The Hague, June 1984. For a recent bibliography of scientometric analyses in physics (publication, citations, and mobility studies), see Jan Vlachy, Czechoslovak Journal of Physics *B35*, 1389 (1985). It contains a list of some 50 previous bibliographies of this subject area, plus a list of some 8-900 references to such scientometric analyses. There has also been some dissatisfaction especially on the part of scientists from the developing countries, with the existing databases and with their utilization for purposes other than information retrieval. It has been claimed that these databases underrepresent and misrepresent the scientific output of the Third World. For example, recently a paper on a scientometric subject submitted to the Latin American journal *Interciencia* was refused publication because the referee deemed the database used in that article so biased against developing countries that the conclusions of the article would be significantly distorted.

In view of this latent and festering controversy about the appropriateness of the existing databases for Third World science, and because of the great significance bibliometric indicators play in scientific communication and in the management of science, it appeared advisable to try to resolve these issues through intensive discussion by a small and appropriately selected group of interested and knowledgeable people. Help to organize such an effort came readily. Eugene Garfield, president of the Institute for Scientific Information (ISI), had expressed his interest from the start and offered the premises of ISI, free of charge, for the meeting. Financial support was obtained from the Division of International Programs of the National Science Foundation and from the Rockefeller Foundation. This first phase of the effort, described below, stretched over the period from July 1984 to October 1985. This report deals with the first phase, and is being distributed widely to elicit comments, criticism, and offers of further cooperation. Responses should be addressed to Michael J. Moravcsik (who was the initiator, organizer, and coordinator of the project) at the address given on the cover.

2. An unorthodox format

The effort was carried out along somewhat unconventional lines. Both written and oral forms of communication have their own special strength and weaknesses; hence, they should be utilized primarily in the mode in which they are strong. Extensive exposition of positions and arguments and the transmittal of factual information are best done through written communication. Oral communication has the advantage of instant feedback and is well suited for debate, for the establishment of consensus, and for question-and-answer exchanges. The format used was also based in the belief that the participants at most meetings do not spend sufficient time prior to the meeting formulating their own views and suggestions. Precious time at the meeting is wasted "warming up."

The format used, therefore, was a combination of written correspondence and of a meeting. The written correspondence began about a year prior to the meeting, as soon as the participants had been identified and had pledged their time and effort for the task. Relatively few of those making this pledge backed out of the effort later, and some of these had genuine emergencies intervening. Once the list of participants was set, these participants were asked to submit written position papers, articles, data sets, or any other material thought relevant to the subject. Periodically, about every 2-3 months, these items, submitted to the project coordinator, were duplicated and distributed to all participants. Participants were also asked to submit suggestions for the meeting agenda. Altogether a large amount of material was circulated. By the time of the meeting participants had access to the materials, had an opportunity to argue with other points of view, and, most importantly, had prepared their own thinking for the meeting.

The meeting itself took place on July 10-12, 1985, at ISI in Philadelphia. Since material had

circulated prior to the meeting, at the meeting itself there were no formal talks, but only informal, round-table discussion, within the framework of a general list of topics. The agenda appears in the appendix to this report. The actual discussion strayed considerably away from the outline, particularly in the order in which topics were addressed.

It was the intention right from the start that results should not only be conceptual clarifications and general statements. Specific, realistic, and practical proposals that could be implemented by a task force of participants were sought. The discussion focussed in that direction. We found a number of steps that can be taken without mounting huge new programs and without involving gigantic organizations. This will be discussed in Part IV. Some of these steps depend on recognizing the problems and on slight alterations in the daily practices of many individuals and organizations around the world that could rectify them. This is one reason why this report is being so widely circulated.

3. The participants

The list below contains all the participants at the Philadelphia meeting, as well as those who participated in the postal correspondance until the very end but could not attend the meeting itself. (These latter people are marked by an *.) The brief identifications after the names were prepared by the individuals themselves. All of those provided transportation and subsistence by the project's grants were invited as individuals and not as representatives of an organization. A few people, marked on the list by #, were invited as auxiliary participants and were supported by their own organizations. At the meeting no distinction was made between these two categories of individuals.

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In addition, several other members of the staff of ISI also attended some of the discussion and contributed very valuable information to it. These included Robert Day, Director of ISI Press, Henry Small, Director of Research, Stephani Ardito Quinzer and Helen Atkins of the journal evaluation group, and Calvin Lee.

II. THE ANALYSIS OF THE PROBLEM

4. The aims of a database

To analyze whether bibliographic databases set up in industrial countries are suitable for use in the developing countries, we must establish the purposes for which such databases were established. Bibliographic databases for science have three general types of uses:

1. Information on research already performed to support ongoing research.

This is the use the research scientist has in mind. A researcher in a developing country wants to be aware of previous work related to his current research problem even if this problem is quite specifically related to the locale of the developing country, for example, a problem in tropical fisheries. Such information is needed by the research scientist both when entering a new field

of research, and when pursuing an ongoing research effort.

2. Information on the scientific community for the management of science.

This includes assessment of individuals, research groups, institutions, countries, regions, or the world; it includes the past outcome and research, the allocation of financial support for research, the establishment of new facilities, etc. This is the use the science manager has in mind.

3. Information on the evolution of scientific knowledge and on the pursuit of science as a human activity.

This is the use bibliometricians, information scientists, historians of science, philosophers of science, sociologists of science, psychologists of scientists have in mind.

The three objectives may dictate different needs for databases and in fact these needs may differ among regions and subject matters. For example, for the purposes of the scientist in tropical fisheries an informal and limited database, involving all the (relatively few) groups active in the field, and providing authors and article titles but no citation data, but also including the report literature, may suffice. The same database may be of little help to scholars in the science of science. A database perfectly satisfying the needs for all three uses may be impossible (or too expensive and unwieldy) to create.

5. Existing databases

There are a variety of databases for science. Some are computerized, others still manually operated. Some are discipline-specific, others are broadly inclusive. Some are limited to certain countries or regions, others are worldwide. Most contain information only on authors and titles, but some include citation information also. Some include abstracts, others do not. Some include the "gray" literature of reports and other non-journal sources, others are restricted to journals. There may be variation in terms of the handling of multiple-authored papers, of review articles, books, monographs, or even textbooks. For most purposes computer-manipulability and geographical comprehensiveness are very desirable qualities, since the first allows easy use and statistical analysis, while the second is an outgrowth of the universality of science and increases the regional utility of the database.

The workshop spent a relatively large amount of time discussing the SCI database created by ISI, since it is probably one of the most comprehensive and widely used one around the world, and hence its coverage is regarded as a crucial element in the dissemination of research performed by scientists in the Third World as well as an indicator of the output and characteristics of science pursued in the developing countries. In particular, the database underlying the Science Citation Index (SCI) and, to a lesser extent, the database underlying Current Contents (CC) were discussed.

As a very brief overview, one can say that out of the 50,000 to 70,000 serials in the natural sciences in existence around the world, the encyclopedic databases like those of ISI or CNRS Pascal M include only about 4000. These 4000 journals, however, cover a very large percentage of those scientific articles published which are most likely to be cited. When it comes to the practical question of extending the coverage of a database, the extension needs to be specified in terms of the number of additional journals to be surveyed. The impact on the information service is best guaged in terms of number of articles, not number of journals, and it is anticipated that extending coverage of Third World journals could be quite feasible because of their smaller size.

The criteria used to include or exclude a journal with respect to the ISI database are somewhat arbitrary, flexible, and multidimensional, that is, a whole set of criteria are considered together. An important one, however, is the extent to which the journal is cited in the scientific literature, that is, the total or average number of citations received by articles published in that journal (impact). This point is a source of controversy, since some claim that the citation frequency and being included in the ISI database represent circular criteria that discriminate against efforts on the part of scientific communities in the developing countries to achieve international visibility. This claim appears plausible and credible, but systematic evidence for the existence of this vicious circle is not available, only case histories. An example is the English language Journal of the Korean Physical Society which was not included in the database of ISI and the contributions by competent Korean physicists in USA to the journal are impeded due to the lack of citation credit. However, ISI staff gave examples of journals which are indexed by ISI even though they are not the highest impact journals but they satisfied other criteria necessary to insure representative geographic coverage in *Current Contents* or the *Science Citation Index*.

In any case, this is an area in which data could be readily developed.

6. Problems of inclusion

There are a number of mundane problems connected with the inclusion of a journal in a database like SCI. Language is a problem, especially if a non-Roman alphabet is used. The SCI staff can handle major European languages which use the Latin alphabet, such as English, French, Spanish or German. They can also handle the Cyrillic alphabet. However, less common languages even in the Latin alphabet (e.g. Hungarian) present difficulties, and so do other scripts like Chinese, Korean, Thai, Hebrew, Arabic, etc.

Database managers are averse to handling journals which do not appear regularly, or which appear very much later than the date printed on their cover. This problem may be one of appearance rather than of substance, but it is nevertheless important.

Access to the issues of a journal can also be a problem. Regular and reliable supply of the copies of the journal is essential for inclusion into a current database.

All databases, whether publicly subsidized or commercially supported, cater for specific users, and hence decisions about coverage have to consider frequency of use. At present, the useage of the ISI databases in the developing countries is, comparatively, low, in spite of the discount price such countries receive on purchases of SCI and other ISI material.

According to the SCI about 4-5% of the world's production of scientific articles comes from the developing countries. The workshop spent a considerable amount of its time estimating how much of the Third World's scientific production is left out by the ISI database. One has some approximate data for some large countries (e.g. Brasil), and for some regions (such as the Arab countries). Very roughly, it appears that only about 2-8% of Third World journals are included in SCI. If, however, some selection is made on the basis of the quality of the journals also, one concludes that perhaps half of the scientific output of the Third World which meets the international standards of excellence is included in SCI. Although these fractions are very approximate, they are important in estimating the magnitude of the task if the ISI coverage of the literature of the developing countries is to be improved.

As mentioned before, the ISI databases do not include the "gray" literature of reports and other informal non-journal modes of communication. Dealing with that literature is something the workshop considered only tangentially although it was recognized that this mode of publication is often prominent in Third World science.

7. Information problems

Although a general discussion of problems of scientific communication by scientists in the Third World was not the specific aim of the meeting or of the preparatory activities, some of these questions inevitably arose in our discussions because they are connected to the problems of bibliographic coverage and measures. In particular, questions arise of where scientists from the Third World publish, whether they are discriminated against by referees and editors of the international journals, whether they are significantly handicapped because English is the language of the international journals, whether local journals in the developing countries are desirable or not and for what purposes, whether publication in local journals often involved "double-publication" of articles also published in the international journals, etc. One generally shared impression is that the internationality of science is more evident for strictly "basic" research than for "applied" research with local relevance, and it is also more evident for the physical sciences than for the biological sciences which tend to be more geography-specific. A reflection of some of these deliverations will appear in the conclusions and initiations of action.

III. POSSIBLE IMPROVEMENTS

A. Strengthening Other Methods

8. Tools of communication

If the normal tools of scientific communication worked satisfactorily for scientists in the developing countries, some aspects of the databases would not be so critical. In this connection the meeting discussed briefly the problems of journal distribution in developing ocuntries, and the possible encouragement of microfiche versions of journals which can be produced very much less expensively than hard copy. The extensive use of microform in developing ocuntries requires, however, the widespread availability of inexpensive and hence locally produced microfiche readers. The reader is a very simple gadget and high quality readers are now available in the more advanced countries for $100-$150. The same quality reader could be manufactured in developing countries for a fifth of that, and then sold in return for local rather than hard currency. Because of the initial uncertainties, the establishment of such a local industry may need some outside seed

money at least in the form of a guaranteed "safety net." More about this in the list of recommendations.

In some respects the use of microform is not as convenient and flexible as having the hard copy. For example, making a hard copy from microfiche is expensive and requires additional machinery. So the access to journal literature should not rely entirely on the use of microform. On the other hand, the microform option should certainly be available to scientists in the Third World and can in fact be made available with relatively little effort, while the more elaborate modern techniques (e.g. a computer network) as well as the traditional hard copy option are not easily within the reach of those scientists. The best strategy appears to be the multipronged approach in which all realistic possibilities are probed and developed as the opportunities arise.

9. Peer review

An important method of assessment, an alternative to bibliometric methods and in many ways complementary to it, is the peer review. In a developing country, where the scientific community in a given area of science may be very small, peer reviewing on a purely domestic level is not feasible. To resort to international peer review, however, encounters some logistic difficulties (among others). In some instances local acquaintance with the worldwide scientific community may not be large enough to be able to pinpoint the appropriate referees. Reluctance may also be caused by not knowing whether the potential referee is willing to perform the task, and by fears that the potential referee may not be sufficiently familiar with the difficulties of doing research in developing countries to be able to assess the situation realistically. To circumvent some of these difficulties, some action is proposed in Part IV.

B. Improving the Bibliographic Tools

10. Regional or national databases

There are already a variety of national databases, for example in India, Brazil, Mexico, Columbia, Morocco, Tunisia, Egypt, Senegal, etc. By having direct control of what they include and how they are structured, such databases can readily serve local needs. The creation of a good database is also of educational value in science policy matters. At the same time, such databases can seldom be used for international comparisons, and they may be difficult to access for scientists or others outside the country. Access even within the country may not be easy. Hence, while the meeting recognized the existence and probable further development of such databases, it did not consider such databases an immediate answer to the basic problem it considered, namely the comparative assessment of scientific activity. However, the meeting considered that in the long term, national bibliographic databases which would be comprehensive, compatible, and internationally available, are a most needed tool for the development of scientific activities and their management.

Regional databases would be more widely useful, perhaps also financially more efficient, while still having limitations of access and intercomparison. In fact, there are very few regional databases in existence which are also multidisciplinary. The meeting did discuss the question of whether perhaps the establishment of such regional multidisciplinary databases would satisfy the needs of the developing countries better than the expansion of the present international databases. The discussants felt, however, that this question was best treated in regional fora in which the feasibility of regional efforts could be realistically assessed. Therefore, the meeting chose to concentrate on exploring the expansion of international databases.

11. Expanding the existing databases

The discussion at the meeting focused specifically on the feasibility of expanding the SCI to include all the work performed in the developing countries which is deemed of sufficiently high quality by commonly agreed standards and which is published in scientific journals. As mentioned earlier, the "missing" amount is perhaps as much as the amount now included from the Third World. A rough estimate was that 25,000-50,000 more articles per year would have to be included. This could include journals from other countries which publish many articles from or about Third World science. Certain Eastern European journals publish heavily in areas of interest to fisheries and oceanography. India and the USSR are strong in electrochemistry and cite each other's literature. The same could be said about the Chinese and Japanese journals. In terms of ISI total volume, even 50,000 articles is not a large amount. The yearly cost of this expanded coverage would be about $250,000 which would have to be obtained from an outside source for the first three years. Thereafter the extra cost could be absorbed in the regular ISI budget.

The 25,000-50,000 articles would represent a large number of journals, because most of the newly included journals would be relatively small and infrequently published. Therefore, the task

of identifying the new journals would be significant. This could be done by countries, through a special blue-ribbon scientific commission (e.g. through the academies or other scientific societies), proposing a list of journals to be included, and supplying ISI with sample copies for comparison and evaluation on the basis of international criteria.

The meeting concluded that this would be feasible, and would represent a major step in the resolution of the problem. It may not suffice for all purposes, but further steps should await the establishment and testing of this expanded coverage. Details of this initiative are given in Part IV.

The meeting briefly considered alternative tools for measuring scientific activity, such as databases on current research projects, participation in national and international scientific meetings, membership in scientific societies, scientific awards, etc. Because of their specific nature, they do not lend themselves easily to international comparisons and are also difficult to access. Although bibliometric data more often than not need to be combined with other types of indicators, they are felt to constitute the most basic and universal tool for the assessment of scientific activity.

IV. SPECIFIC INITIATIVES

12. Comments on the type of approach

In recommending action, one can aim in several directions. Some actions in science development involve massive organization and huge sums of money, encased into formal structures and extensive bureaucracies. A quite different type of action is based on the belief that there are, within the worldwide scientific community and its environment, many latent possibilities which are *almost* ready to meet needs of science in the developing countries, except for a small gap between opportunities and needs which can be bridged by a small, very carefully chose, catalytic program.

Most of the action proposed in this part of the report will be of this latter type. The initiatives outlined here are grouped into five categories. The first contains studies, or the acquisition of information on aspects of our problem area which would greatly facilitate solving them. Although one of the oldest "tricks" for procrastinating or for killing a project is to recommend "further studies," we believe that our list of studies is sufficiently specific to run parallel with (and not as a prerequisite for) other action.

The second category includes steps that are practically free (i.e. cost a negligible amount) but involve being aware of certain factors and willingness to introduce slight modifications in present practices. Creating such an awareness and the will to act accordingly, although not primarily a question of finances, is often not easy.

The third category includes action that is also practically free but involves a certain amount of organizational effort.

The fourth category contains small and catalytic initiatives which are relatively inexpensive.

Finally, the fifth category features situations where the cost of the initiative, although not massive, is not small either, but where the cost can be shared among many participants so that the cost per participant is not excessive.

13. Studies

A. An analysis is needed of the nature and usage of the science and technology literature from developing countries (4,500 journals) that is acquired by the British Library Lending Division. (25% of the use of the collection comes from foreign countries). Such information would be important for (a) assessing the characteristics of the literature, (b) assessing the relative use made of the literature by developing and developed countries, (c) constructing scientometric indicators which include such literature. (d) creating better and enhanced dissemination and use of such literature. Such a study can be carried out in the British Library, at a cost in the order of $12,500. Steps are being taken for executing such a study.

B. A study is needed to explore, in depth, the barriers to scientific research in the developing countries due to deficiencies in access to databases, secondary sources, and other information sources. The study should pick a specific scientific field and document the findings in detail. A subgroup chosen from among the participants of the meeting is in the process of preparing a detailed proposal for this.

C. A study is needed on the editorial practices in international scientific journals vis-a-vis articles submitted to such journals by authors from the developing countries. Is there any evidence for discrimination in the refereeing of such articles? The study may follow the general outlines of the Merton-Zuckerman study of biases in Physical Review (*Minerva 9*, 66 (1971)). The study could be carried out by taking two highly cited and refereed journals, and select a batch of articles submitted to them by authors from developing countries, with a second batch of other papers serving as a control group. Such a study should

be designed to avoid methodological problems found in previous work on peer review (See John Bailar, *NEJM* 312(10):654 (1985).). These papers could then be refereed again by a peer review group. The study, a fairly standard one except for its particular subject matter, would require the usual budget for such projects, perhaps between $50,000 and $100,000.

Alternatively, it would be quite feasible to choose world-class journals in the major scientific disciplines, identify submissions from DC's and trace those papers through the editorial reviewing system. Such a study could furnish preliminary data on biases against DC authors, and perhaps more significantly, generate information that would enable DC authors to compete better for space in journals, and generate guidelines for journal editors that would insure fairer treatment of DC authors. This also would cost about $50,000-$100,000, and would follow the methodology of the Merton-Zuckerman work referred to above.

14. Steps needing awareness but minimal resources.

A. To facilitate inclusion into international databases, journals in the developing countries should provide the following features using the ISO transliteration system:

i) At the journal level:
   a) An English title page
   b) An English table of contents

ii) At the article level:
   c) a postal address for the authors in Latin characters
   d) a transliteration into Latin characters of the references, if these are written in another script.
   e) if possible, an English abstract

These features are almost always a prerequisite for including a journal in databases, and hence would greatly improve the chances of journals' inclusion.

B. To facilitate the consideration of journals published in the developing countries for inclusion into databases, each country should select, with the help of a specially constituted committee consisting of working scientists, a modest list of journals published in that country that are of international quality. This list should then be submitted to ISI and to the managers of other international databases, with a sample copy of each of the journals included on the list. ISI will then study these lists in some detail and make decisions on inclusion.

15. Steps needing organization but minimal resources for operation

We need an initiative to define the best ways for the international scientific community to provide a peer review system for those journal editors and funding agency officials in the developing countries who wish to avail themselves of such opportunities. It is assumed that the operation of such a peer review system would be no more expensive than the system now used in the scientifically advanced countries. The initial formulation and organization of the system, perhaps first on a pilot-project basis in some particular scientific discipline, would require a grant of about $50,000.

16. Steps of small and catalytic cost

Microform journals, books, reports, etc. are less expensive to produce and to ship air mail than hard copy. The use of micro products in the developing countries is inhibited by the unavailability of good quality but inexpensive microform readers which could be purchased without expending hard currency. Microform readers are simple gadgets which, even in the industrial countries, are available for $150 or so, and could be manufactured in developing countries for a fraction of that cost. That they are not is due to the initial reluctance of manufacturers to enter a new product area, as well as to the uncertainty about the size of the market. An initiative is needed to provide seed money (perhaps merely in the form of guarantees) for encouraging some manufacturers in some appropriately selected developing countries to produce such microform readers. An initial sum (perhaps $10,000) would support an exploratory project to identify possible locales and individuals to be involved in the pilot project.

17. Steps with broadly distributed cost

A. In cooperation with four other reseach funding organizations, the U.S. National Research Council has prepared a database of research projects funded by these organizations. The International Development Research Information System (IDRIS) was designed as a private, joint database to enhance cooperation among the founding agencies. The database describes research underway in developing countries, including the recipient organization and address, researcher name, geographical area under study, key words, abstract, and level and source of funding.

Currently IDRIS is limited to the information entered by one of the founding institutions and is accessible only through one of these organiza-

tions. The originating institutions are: The Canadian International Development Research Center, the Swedish Agency for Research Cooperation with Developing Countries, the International Foundation for Science, the German Appropriate Technology Exchange, and the Board on Science and Technology for International Development of the U.S. National research Council.

In order to make IDRIS more useful, additional donor agency projects need to be included. Access to the database also needs to be extended to Third World researchers. It is recommended that the founding institutions vigorously pursue the expansion of IDRIS and provide access to as wide an audience as possible. It is recognized by the workshop that the expansion of IDRIS may require additional work and financial resources from large donor agencies which are, however likely to be balanced by the benefits derived from the use of the system.

B. Each country should ensure complete bibliographic control and complete availability of its own publications, Specifically, this means the progressive establishment of appropriately structured national information systems, which would include a comprehensive national collection of all publications produced in the country, which can then be used for consultation or remote supply (by loan or photocopy). The system should also include a bibliographic database, compatible with international standards, and suitable provisions for easy access by local and other users. Such a goal requires a firm and standing commitment on behalf of the local authorities for the regular funding and support of such systems, as well as joint efforts on behalf of donor agencies in providing the assistance eventually needed for the development of such endeavors. There are already two international programs (in addition to many national ones) with such an objective, both originating with the International Federation of Library Associations and Institutions: Universal Availability of Publications (supported in part by UNESCO), and Universal Bibliographic Control.

As an example, steps toward such a goal in Thailand may include the following measures:

1) A Union List of Periodicals prepared by the Thai National Documentation Center should be regularly updated;

2) The publication of *Thai Abstracts* by the Thai National Documentation Center should be strengthened;

3) The Thailand Information Center of Science and Technology (TICST) should form a network of information centers and libraries within the country and should work on bibliographic control as a major task.

C. There is need for monographic coverage of certain scientific fields which are of special interest to developing countries but which are not adequately covered in the regular databases for a variety of reasons, for example, because their literature is predominantly "gray," that is, in the form of reports. Tropical fisheries is an example. Such monographs would also provide bibliographic coverage, explore the pattens of the research community, promote communication within such community, and promote the utilization of available resources. It would also contribute to a publication and citation database which is independent of the existing ones. Each field needs to organize its own effort.

D. This last initiative is the most specific and intensive of those considered by the meeting, and addresses directly the expanded coverage of databases to include more of the scientific literature produced in the developing countries. As explained in the text, the aim is to add another 25,000-50,000 or so articles from the developing countries to the ISI database for SCI. This would involve covering 500-1000 more journals. The additional cost would be $250,000 per year, and this amount would have to be acquired from sources outside ISI for three years, after which it could be absorbed into the regular ISI budget. The first step would be that described in 14-B above, namely the "nomination" of journals for inclusion. Eventual selection for SCI will be based upon acceptable standards, and coverage in the SCI would not necessarily guarantee coverage in *Current Contents*. The $250,000 needed would be acquired, for the first three years, through additional purchases of copies of SCI by the developing countries, at the special discount rate of $3,000 per year granted by ISI to developing countries. Approximately 100 such new subscriptions are needed, which would be pledged by developing countries according to their size and resources. For example, a large country like India would purchase 20 additional copies, medium level countries 5, etc. To cover some of the smallest and least affluent countries, the Rockefeller Foundation is pledging an annual amount of $15-30,000 as part of this effort. The outcome of this initiative would be a substantial improvement of the representation of science by the developing countries in the ISI database as well as an enhanced access of scientists and policy makers in the developing countries to SCI. After a few years, further determinations could be made as to the adequacy of coverage of Third World science under these new circumstances.

This initiative requires the organization of 14-B as well as the organization of pledges from developing ocuntries for the additional purchases of the SCI. This task will be undertaken by the participants of the meeting personally and also through the wide distribution of this report. The initiative is an example of a concrete step to resolve a concrete problem, using a decentralized, unbureaucratic structure and widely dispersed cost distribution which needs to be carried by Third World countries only over a limited amount of time. The initiative involves the cooperation of individuals and organizations in both the advanced and developing countries, divides the cost among them, and includes in cooperation governmental agencies, private organizations, individuals from the scientific community, and others. If the effort is successful, it may serve as a precedent for solving other problems in science development. It is important, however, to ascertain that this initiative does not draw away resources from the regular aspects of scientific information services such as subscriptions to primary journals or to abstracting services.

Respondents who wish to place new orders for SCI and therby participate in this initiative should deal directly with Dr. Eugene Garfield, ISI, 3501 Market Street, Philadelphia, Pa. 19104 USA. The coordinator of this report (whose address appears on the cover) should be kept informed so that progress is achieving goals can be monitored and future efforts targeted on areas of greatest need.

V. CONCLUDING REMARKS

The effort of the task force as well as this report is directed toward a very specific and important area of science development, namely the representation of science done in the developing countries in the methods of assessment of science, and specifically, in the bibliometric indicators. The task force includes a specially selected group of experienced, knowledgeable, and interested people well versed in problems of science and information in the Third World, who were chosen for the most part for their individual qualities, not their organizational affiliations. The task force used a somewhat novel method of interacting through a combination of extensive written communication followed by an intense, three-day, discussion meeting. The outcome of this meeting is a set of specific intitiatives which are based not on the expectation of massive new programs, huge additional resources, and large, formal organizational involvement, but instead on small and easily implementable projects, requiring modest resources. They are catalytic in that they form a bridge between latent resources available and latent needs in evidence. But even for such modest and highly efficient initiatives, we need the cooperation of many individuals and groups. One of the main objectives of this report is to attract such cooperation. Expressions of interest should be communicated to the coordinator at the address indicated on the cover.

APPENDIX I. The planned outline of the discussions at the meeting

OUTLINE OF THE INDICATORS MEETING, July 10-12, 1985, Philadelphia I. W. 7/10. 8:45-12:00 DATA BASES—WHAT AND WHAT FOR?

ISI, British, India, Brazil, INIS, etc. Other secondary services.
Coverage: criteria of inclusion, basic-vs.-applied, language, first author?
What aspects of science are measured? Activity, productivity, progress.
What developing countries (DC) included?
Uses of databases, generally and in the context of DC
Information for researchers—material of science-of-science studies—basis for science policy decisions

II. W. 7/10. 14:14-17:30 DC RESEARCH AND ITS PROBLEMS

Aims of DC scientific research. Where do DC scientists publish and why?
Regional differences. The language problem. Subclasses among DC countries.
DC papers not cited? If so. why? Problems of peer review.
Access to world literature by DC scientists.

III. Th. 7/11. 8:45-12:00 DC SCIENTIFIC LITERATURE AND ITS COVERAGE

DC scientific literature: Audience, originality, significance, quality.
Reports and gray literature. Differences in different disciplines.
How much of this is now left out of databases?
Effect of this omission. Does it matter at all?

IV. Th. 7/11. 14:15-17:30 INDICATORS FOR DC SCIENCE

Past experience with indicator building. What is actually done?
What "quality" measures exist?
Non-bibliometric indicators
Options for indicator building

V. F. 7/12. 8:45-12:00 OPTIONS FOR SPECIFIC ACTION

What needs to be done. Local, regional, and international. Old and new ways of filling the need.

VI. F. 7/12. 14:15-17:30 RECOMMENDATIONS AND FOLLOW-UP

Specific recommendations for action:
What needs to be done? Who should do it? Why?
How should it be done? When should it bne done?
How much should be done? How much will it cost?
Where will the resources be coming from?

The logistics of follow-up action:
Dispersal of information-mailing lists
Inducing action and implementation
Forming a small implementation group from among ourselves
Resources needed for continued follow-up?

A *summarizer* is a person who gives a 15 minute summary of the main points made in the discussion of each session. This is delivered at the end of the particular session.
The summarizers were:
I. Braun II. Cori III. Eisemon IV. Drew V. Yuthavong VI. Moravcsik