

development in outlying parts of the world by such means as well-planned symposia in fields of special national interest. The prestige given to such meetings by the sponsorship of IUPAC plus the subsidized attendance of a few well-chosen eminent specialists from Europe, Japan, the United States and Canada would give assurance of substantial benefits to the countries in which the meetings were held. Such activities by the Union, on a scale

commensurate with the needs, would require resources far greater than the Union can command even if the contemplated increased rate of income is realized. There is evidence, however, that the Union is beginning to think in terms of a world-wide mission for the promotion of the science of chemistry, with all its attendant benefits to human welfare, rather than to limit itself to the interests of its constituent member countries.

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## SCANDOC—A Scandinavian Cooperation in Science-Tech Communication.

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The Scandinavian Documentation Center, SCANDOC, was established in Washington, D. C., in May of 1960. The purpose of SCANDOC is to assist the Scandinavian scientific and technical research councils and academies, as well as information services established by these organizations in the Scandinavian countries, in the fields of scientific and technical documentation and information activities. The activities of SCANDOC thus include the following: to locate and procure documents in science and technology upon request; to carry out or subcontract literature searches on request; and to follow developments in documentation and scientific information activities in the United States and Canada. These services are also open to Americans or Canadians who are interested in Scandinavian research. The activities of SCANDOC are limited to the fields of applied research and bordering fundamental research, exclusive of life sciences and medical research, and by the important consideration that SCANDOC shall not be used when the information or document can easily be obtained through conventional channels, such as the regular scientific press, bookstores, libraries, etc.

In general one may say that SCANDOC constitutes an unconventional channel for scientific communication between the Scandinavian countries and U. S. and Canada, with the prime objective of facilitating the exchange of scientific literature not easily obtainable through conventional channels.

It is hardly necessary to elaborate on the needs for an office of this kind: the mounting volume of Government Research reports, progress reports, conference papers, institute and foundation reports, thesis papers, pamphlets, brochures, exhibit material, etc. This activity of scientific documentation has in fact become the major activity of many scientific attachés, and the four Scandinavian countries Denmark, Finland, Norway and Sweden agreed that it was desirable to relieve the attachés of this work, and to economize and rationalize by centralizing this activity in one office.

The proposal for this venture in international scientific communication originated with the Scandinavian Council for Applied Research (SCAR). This organization is a common working secretariat for the research councils and academies for science and technology in Scandinavia, and has been instrumental in furthering Scandinavian cooper-

ation in these fields. The plans for SCANDOC were worked out by the technical and scientific attachés and representatives of the four Scandinavian embassies in Washington on a request by the Scandinavian Council for Applied Research in 1958.

International cooperation in science and technology has long traditions in Scandinavia. The universal nature of science and the importance of direct communication between scientists was recognized quite early. The first organized Scandinavian Congress of Natural Sciences was held in Copenhagen in 1839. Since then across-the-border cooperation has been growing steadily both in magnitude and in scope. This development has, of course, two good reasons: (1) The problem of being small, which creates a need for cooperation, and (2) the closeness and similarities of the four countries, which make cooperation natural and easy.

All four countries are small in population: Sweden 7.5 million, Denmark 4.6, Finland 4.5, Norway 3.6 and Iceland 0.176 million inhabitants. Standard of living is high in all countries. A high standard of living is entirely dependent upon a well-developed and integrated economic and industrial system and an advanced and progressing technology. The problem of maintaining a technology in small nations averaging fewer than 5 million people, which must keep pace with the technology in the United States in the 1960's may seem an impossible task. The solution to the smallness problem is extensive cooperation. Together these five nations count more than 20 million people, that is about 2 million more than Canada. The countries cover an area about the size of Central Europe, that is, a little more than the six European Common Market countries (West Germany, France, Belgium, Netherlands, Luxemburg, and Italy) together.

It is interesting to note that this group of 20 million people, 0.7% of the world's population, attracts 5.3% of the world's trade, produces one half of the chemical pulp entering world trade, controls 13% of the world's shipping and has the next highest income per capita in the world, surpassed only by the U. S. (1957-figures).

Professional manpower in science and technology is drawn from about 30 universities, institutes, and colleges granting professional degrees, all of recognized high standard, though inadequate in number and capacities.

Total enrollment at these institutions in 1959-1960 was about 77,000, of which about 35,000 was in natural sciences (including medical sciences) and technology. This has proved to be grossly inadequate, and professional manpower is at present one of our most serious problems. This has been recognized and present plans call for approximately doubling the number of enrolled students before 1970 in Norway, and an increase of from 30-80% over present figures in the other countries.

Now, strength is not a matter of summing figures and facts. This only serves the purpose of showing the potentials. The benefits from pooling resources become real only when this is done through a system of efficient cooperation and coordination. The Scandinavians are in the enviable position that they speak the same language—Danish, Norwegian, and Swedish are basically the same language and no language barrier exists between these countries. Finnish is a language all by itself, but Swedish is a second language in Finland and is spoken by all academic people. Thus, the most acute difficulty in international communication is already removed. It should be noted, also, that English is taught in all primary schools and followed up in the secondary and higher schools, with German and French as second and third foreign languages. Of courses, in other respects, too, the Scandinavians are strongly united—by origin, race, history, culture, as well as by modern socio-economic structure. Thus, the countries are exceptionally well suited for cooperation.

There are, of course, quite pronounced differences between the countries and in many important fields have we failed in attempts to cooperate. International cooperation is always hampered by a number of obstacles such as: nationalism, protectionism, competition, differences in national temperament and ideologies. We have not been able to eliminate these differences in Scandinavia and I hope we never shall, but on the whole we have come a long way toward a more efficient use of our pooled resources.

One of the many organizations which have been formed to strengthen the cooperative efforts of the four countries, is the aforementioned Scandinavian Council for Applied Research, SCAR. One of the first and very noteworthy accomplishments of SCAR was to compile a two-volume directory of Scandinavian research, called the Scandinavian Research Guide, which gives detailed information on more than 1,500 research institutions in Denmark, Finland, Norway, and Sweden, in all fields of the natural sciences and technology, exclusive of the life sciences.

Since the problems of scientific information and communication by its very nature is international, SCAR took early interest in this field and continued to coordinate the technical information activities in the four countries. SCAR has sponsored three Scandinavian symposia on documentation and has organized 2 two-week courses in technical information services for information officers. It was therefore quite natural that when problems arose as to how to handle the fast-growing volume of non-conventional science-tech literature in the U. S., SCAR took the initiative and suggested a Scandinavian Documentation Center in Washington, D. C.

Now, how is this four- or five-headed creature called SCANDOC administered? It would seem quite difficult to operate an office of this kind for four different countries

without a fairly simplified system of administration. I have prepared a graphic illustration of the relative position of SCANDOC to the organizations for scientific research administration and information activities:

Under each country you see listed the national organizations which are members of SCAR. The broken lines are administrative lines; the full lines symbolize operational routes. You will notice that SCANDOC does not as a rule have direct contact with the industries and research organizations in the four countries, but all activities are channeled through a central organization for information services in each country. These four organizations, which we call SCANDOC's "bridgeheads" in the home-countries serve two important purposes: they relieve SCANDOC of the burden of correspondence with the information-requestors in each country and the paper-work involved in billing and collecting expenses, and secondly they serve as filters and screen out the requests which are not within the frame of SCANDOC's activities. Time does not permit me to discuss this administrative pattern any further, which would involve a discussion of the research administration in the four countries. I would, however, like to point out that SCAR and SCANDOC, being outgrowths of the national research councils and academies of the countries, are semigovernmental in nature. These councils and academies are governed by council members partly from government and partly from universities and private industry. This enables the research administrators to have considerable freedom in their decisions and actions while at the same time maintaining close contacts with the governments and government policies.

The duties of SCANDOC already have been outlined in the introduction. They are expressed in the statutes for SCANDOC, of which I will read the first paragraphs:

#### Paragraph 1

The aim of the Scandinavian Documentation Center (hereafter called SCANDOC) in the USA established by the Scandinavian Council for Applied Research (SCAR) is to assist the scientific and technical research councils and academies of engineering sciences as well as information services established by these in the Scandinavian countries in documentation and information activities.

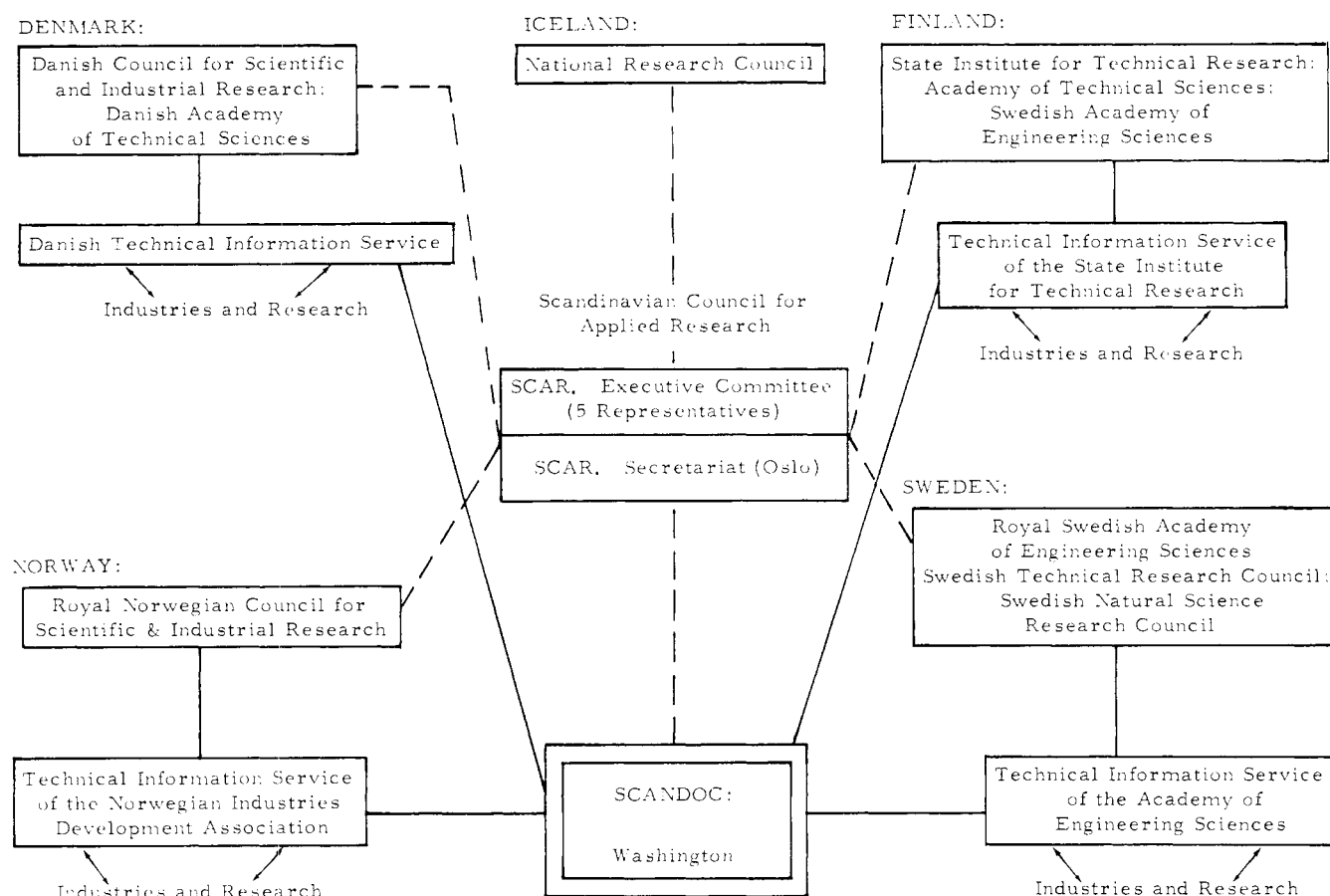
#### Paragraph 2

SCANDOC will: (a) follow the development in documentation and scientific information activities in the USA and Canada and report back to the Scandinavian countries on the appearance of relevant materials, (b) procure documents from sources in the USA and Canada upon request, (c) carry out or sub-contract literature searches on request, (d) furnish interested persons in the USA and Canada with information of Scandinavian documentation and procure documents, (e) receive grantees specializing in information work for studies in Washington, (f) take other suitable measures in accordance with the aim of the activities of SCANDOC.

#### Paragraph 3

SCANDOC has a Scandinavian Advisory Committee (hereafter called the Scandinavian Committee) consisting of members of the SCAR committee on Technical Information Service. In addition

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SCANDOC has an Advisory Committee in the USA (hereafter called the Local Committee). The members of the latter are appointed by SCAR.

I may add that SCANDOC is financed by SCAR through allotments from the SCAR member organizations, the expenses being divided between the countries in the proportions 1:1:1:2, with Sweden paying twice as much as the other countries. In all administrative and financial matters, SCANDOC reports to SCAR. SCANDOC is a non-profit organization and there is no charge for the services except to cover costs in certain cases.

Our main task has been to procure documents on request. We have now since the start received more than 3,900 requests, and have shipped home more than 3,100 documents. The number includes research reports available from the Office of Technical Services of the Department of Commerce, from the Government Printing Office, Bureau of Mines, Department of Agriculture, Senate Committees and other offices of the U. S. Government, as well as conference papers not yet printed, progress reports, university theses, Russian translations, photocopies from the Library of Congress, Special Libraries Association, unpublished reports and papers from industries, universities and research institutions all over the U. S. I believe that a majority of these publications would have been available for the users at home even without the aid

of SCANDOC, but not without a good deal of trouble and, above all, a waste of time. One of the most important motivations for the existence of SCANDOC is the saving in time. We have frequently sent home requested documents so that the publication is on the table of the user within one week from the day he mailed the request. We have now on the average of 200 to 400 requests per month, which is sometimes a little more than our present staff can handle.

Apart from these requests for specific documents, we also have a number of requests for literature within specified fields, for example: legal aspects of air-pollution control, means of depollution of oil-polluted groundwater, medical electronics. I am also requested to follow information and documentation activities, take part in meetings, etc., in this field and make reports on these activities. The so-called "information-explosion" is followed with great interest in Scandinavia and SCANDOC tries to keep in touch with the developments in this field in the U. S. We regularly send home programs and other material from conferences and meetings in the U. S. and Canada and, through cooperation with the other Scandinavian scientific attachés can sometimes cover special meetings with first-hand reports and reprints.

Most of the work is done by telephone and correspondence and I rely heavily on the cooperation of information centers and persons in the Washington area, on

associations, societies and other institutions throughout the U. S. and Canada. It has been a most gratifying experience for me to have been met with a spirit of cooperation and friendliness everywhere.

I may add that SCANDOC is still an experiment. By the summer of 1963, the experiences so far will be summarized and it should be possible to make an evaluation and more clearly define SCANDOC's future activities.

One of the most important aspects of SCANDOC is its centralized nature. Through SCANDOC and SCAR and the national bridgeheads for SCANDOC, we have established an inter-Scandinavian network of communication by which all activities in the field of technical documentation and information can be coordinated. The national research councils and academies, by being actively engaged in the information problem, and by their participation in SCAR and SCANDOC have it in their power to direct and coordinate future activities in this fast moving and difficult field. We think this is important

and makes it possible for the right people to take the right steps at the right time.

Finally, I would point out that these aspects of Scandinavian cooperation I have talked about, once again demonstrate the impact that science has on society in general, its power to change the social structure of nations, their way of thinking. We have, in fact, especially after the last war, plunged into what may be called the political stage of the scientific revolution. More strongly than ever before has the international nature of science become evident and has become a major force influencing the decisions made on all levels of national government. Let us hope that this forceful push toward internationalization imposed upon us by science may become as exponential in its rate of growth as science itself. Let us hope that peaceful co-existence not merely be co-existence but becomes peaceful international cooperation in all fields of human endeavor. Perhaps this impact of science upon politics may be the most important single factor preserving world peace.

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## Science Officers and International Communication\*

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The subject of my talk is the Scientific Attache program of the Department of State. This program was established 1951, when scientific attaches were placed in several of our embassies abroad. Although this initial venture was drastically curtailed two years later, it established the pattern for a new beginning in 1959. Today we have science officers in nine of our embassies (London, Paris, Bonn, Stockholm, Rome, New Delhi, Tokyo, Rio de Janeiro and Buenos Aires). Additional positions recently have been authorized in Switzerland and Israel, and it is planned that several further posts will be staffed within the next year. The incumbents of these positions are drawn from the scientific community, on leaves of absence from academic, industrial or governmental positions. They have been eminent working scientists, almost always with previous experience in their countries of assignment, and this coupling of professional recognition with personal knowledge provides a ready-made entry to the foreign scientific community.

Since the quality of our program depends ultimately on the caliber of the men involved, I might briefly note two of the officers whose background is in chemistry. Dr. Ludwig F. Audrieth, in Bonn, is the well-known inorganic chemist from Illinois. He is author of over 150 research papers, founder of "*Inorganic Syntheses*," and a former Priestly Lecturer. He speaks fluent German, and has studied and worked in Germany. Dr. Edgar L. Piret, in Paris, came to us as Professor of Chemical Engineering from Minnesota. He studied and taught in France, and has been especially active in the field of engineering education. He holds

several professional awards from both French and American societies.

The responsibilities of the science officers may be broadly grouped into three areas, *advising*, *reporting* and *representation*. In the first category they serve the ambassador and other officers of the embassy in supplying guidance and counsel on the implications which certain foreign policy moves may have on the advance of science and technology, both in this country and abroad, and they provide professional evaluation of the effects of scientific and technological advances on our relations with the host country.

It is in the next two areas that their activities are most directly applicable to the subject of this Symposium. The reporting function is, unfortunately, often misunderstood. According to popular conception, the job of the scientific attache is to ferret out detailed information on scientific research in other countries, preferably prior to normal publication, and to report them to Washington so that they may be available to interested scientists and technologists in the United States.

The volume of the exchange of scientific information between major countries would in itself bar such a function. Moreover, such a fact-gathering role would constitute duplication by the State Department of an activity in which numerous other private and governmental agencies already are engaged. Finally, periodic visits to the requisite number of active research centers to achieve the necessary coverage would be simply a physical impossibility for our small corps. Rather, the reporting activity consists of evaluating the influence which various developments involving science abroad may have on U. S.

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