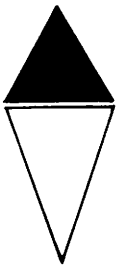
COMMISSION OF THE EUROPEAN COMMUNITIES

Proceedings of the
International Conference on

PROSPECTS FOR COOPERATIVE INDUSTRIAL RESEARCH IN THE EUROPEAN ECONOMIC COMMUNITY

Rotterdam 25, 26 and 27 April 1973

Organized by :



Committee of Directors of Research Associations

29-30, St. James's Street, London, S.W. 1

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Edited by:
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CONTENTS

INTRODUCTION

The entry of the United Kingdom into the European Economic Community has provided the Research Associations in Britain with both the opportunity and the obligation to meet their opposite numbers in the other countries of the Community. In some cases this was nothing new as many old friendships already existed but others were not so well placed.

Having the unique experience over more than half a century of working cooperatively with industry, Governments and amongst themselves, the Research Associations felt that they should take the lead in suggesting a Conference, the objects of which were to be

1. To exchange information on both national and EEC structures under which cooperative industrial research institutes operate at present and will operate during the next few years.
2. To define appropriate areas of activity as may be foreseen in the immediate and the long term future.
3. To explore the possibilities for cooperation between institutes which may serve different sectors of industry in various countries.
4. To explore the possibility of establishing an EEC Association to serve cooperative industrial research institutes.

The suggestion of an Association to serve the interests of industrial Research Institutes in the Community was made in the light of the experience of the value to the Research Associations since 1947 of having had a central body to act as a forum for discussion, as well as speak for and take action on behalf of all the members collectively. Similar benefits might be derived from an Association for the Community and it might well be valuable to the Commission as an independent body from whom a corporate viewpoint or advice could be sought.

The Committee of Directors of Research Associations is grateful to all those delegates and speakers who attended and made the Conference a success and most especially our friends at TNO, The Netherlands Organization for Applied Scientific Research, at whose invitation the Conference was held in Rotterdam and who were joint hosts.

The Earl of Shannon
Director
The Committee of Directors of Research Associations

OPENING SESSION

25 April 1973 - Afternoon

PRESENT NATIONAL STRUCTURES AND SYSTEMS OF FUNDING

Session Chairman:

Dr B.E. KING
Chairman, Committee of Directors of Research Associations

The Opening Session of the Conference was devoted to papers presented by delegates from each country in the Community in which were described the structure and systems of funding at present operating in each country.

Funding and Organization of Industrial Research in Belgium

Mr J. VAN KEYMEULEN
Director, Institut pour l'Encouragement de la Recherche Scientifique dans l'Industrie et l'Agriculture

Budget of Science-Policy for 1972 (*)

		Million BF
Mass I:	Direct Financing of Establishments of Higher Education	10 240
Mass II:	Indirect Financing of non-orientated Research	1 036
Mass III:	Credits intended to industrial and agricultural Research	3 646
Mass IV:	Financing of Scientific Activities of Public Services	2 841
Mass V:	Contributions to International Organizations	915
Mass VI:	Financial Transfers	572
		19 250

Budget of Industrial Research

	Million BF	% of Science Budget
Direct Financing of Industrial Projects	1 332	7
Indirect Financing of Industrial Research	1 092	6
Indirect Financing of Industrial Research through International Organizations	822	3.5

(*) Work document of the 'Service de Programmation et de Politique Scientifique'.

The direct financing of Industrial R & D projects is realized in two ways:

IRSIA ⟶ Research projects
Minister of Economic Affairs ⟶ Development.

INSTITUTE OF THE PROMOTION OF SCIENTIFIC RESEARCH IN INDUSTRY AND AGRICULTURE 'IRSIA'

The Institute is an autonomous public establishment with annual donations from the Ministeries of Economic Affairs and of Agriculture.

Evolution of the subsidies to Industrial Research

	million BF
1946	13
1950	32
1955	94
1960	184
1965	259
1970	486
1971	711
1972	712

At the beginning, the most urgent task was to bring Industry to a normal degree of research activity, to develop a better understanding of the importance of research as an investment for the future. At present, the task of the Institute is essentially: to promote and help research leading to an amelioration of existing products (amelioration of quality or process economy), to the elaboration of new products or new applications of existing products, as well as to explore new fields leading to totally new productions. In all cases, special emphasis is given to research leading to productions of high technicity and to industrialization in the future.

The research projects are financed on a 50/50 basis.

The basic principles of action of IRSIA are to be expressed as follows:

— IRSIA gives grants only to help finance research programmes
— IRSIA does not have its own laboratories, but uses all available facilities existing in industry and universities; it incites research organizations to establish their own laboratories or research centres
— IRSIA is essentially active in promoting and helping cooperative research

— IRSIA plays the role of a liaison agency for establishing contacts between research groups or with university specialists for helping firms define their problems and find adequate facilities to solve them

— IRSIA initiates research in new fields of importance for future developments and tries to induce potential users of the results to take an interest in those programmes.

The relative importance of grants for research to the various branches of industrial activity, averages as follows:

	1971-1972
— Siderurgy and non ferrous metallurgy:	20.0
— Chemistry (including photography and pharmaceutical chemistry):	35.6
— Machine tools and metal constructions:	11.6
— Electronics and electrotechnics:	13.6
— Buildings and road building:	6.7
— Textile:	1.7
— Glass and silicate:	5.3
— Research in cooperation between various branches of industry:	0.3
— Other branches of industry:	0.5
— Production and distribution of electricity:	3.6
— Agricultural industries:	1.1
	100%

Organization of Industrial Research

Cooperative Research:

— Collective Centre grouping all the firms of one sector of industry

— Free research association with permanent structure

— Research association for solving problems of common interest to firms belonging to various sectors.

Private Research:

— Individual projects executed by the firms and in their own facilities

— Collaboration of two or more firms to a common project.

MINISTRY OF ECONOMIC AFFAIRS

The law about the economic expansion foresees the possibility of according loans without interest to development projects and covering 50% of the costs. The projects have to be related to prototypes, new products or new processes.

Budget for Development projects since 1965

	million BF
1965	108
1966	270
1967	298
1968	285
1969	500
1970	670
1971	745
1972	500

ATV and the ATV Institutes

Dr N.E. HOLMBLAD
Past President
Danish Academy of Technical Sciences

1—THE DANISH ACADEMY OF TECHNICAL SCIENCES

The three letters, ATV, represent the many and varied technical scientific activities which, throughout 35 years, have grown up by fruitful cooperation between science and industry, with the purpose of promoting technical and scientific research and application of its results to the benefit of the Danish community and its trade and industry.

Activities in the ATV take place partly in 25 independent institutions, partly in the ATV Central Activities. The 25 institutions may be divided into two groups: first, 19 research institutes proper, engaged in research and development activities; second, 6 scientific societies, not directly involved in experimental work. Throughout the years these activities have grown up, centering around the Danish Academy of Technical Sciences.

The Danish Academy of Technical Sciences is an independent organization established in 1937 by a group of leading personalities from science and industry. The number of members today is well above 500, out of which about one half represents science, and the other half industry and agriculture.

In 1966 the Financial Council of the Academy was established; today it numbers 95 members. The aim of the council is to promote contact between the Academy on the one hand and trade and industry on the other, and to give financial support to the functioning of the Academy according to its object. The members are representatives from business enterprises and industrial organizations. Each member of the council pays an annual minimum fee of about £500. These fees, together with interest on the ATV basic fund and various other contributions, form the economic basis of the ATV Central Activities. It should be noted that the ATV Central Activities are not supported by government funds.

Initiative and coordination are carried out through the ATV Central Activities headed by the Academy Council. Thus, the Academy Council initiates technical and scientific work in committees, is in charge of Academy participation in international technical and scientific cooperation, and appoints representatives in external technical and scientific commissions, committees, institutions etc. Moreover, the Academy Council deals with questions of organization of institutes and societies affiliated to the Academy. Meetings take place both in the Academy Council and in the individual Academy groups, committees and commissions, partly to provide information, partly to promote new initiatives. The implementation of research or dealing with concrete problems take place on the initiative of the Academy Council within the Central Activities, the secretariat of which has at present a staff of about 20. During the 35 years of the Academy's existence, work has been carried out by about 150 committees.

	Establishment year	Number of employees 1971	Turn-over in £ million 1971
The Acoustical Laboratory	1938	10	0.05
The Danish Welding Institute	1940	151	0.93
The Danish Geotechnical Institute	1943	140	1.15
The Laboratory for Technical Optics	1956	6	0.05
The Danish Isotope Centre	1957	26	0.15
The Research Institute of Commercial and Industrial Plants	1959	51	0.17
The Danish Institute for Biotechnical Research and Development	1961	30	0.18
The Asphalt Industries' Laboratory for Road Construction	1962	6	0.05
The Danish Hydraulic Institute	1964	25	0.19
The Illuminating Engineering Laboratory	1964	16	0.08
The Danish Corrosion Centre	1965	27	0.12
The Danish Institute of Protein Chemistry	1965	13	0.10
The Danish Research Centre for Applied Electronics	1966	60	0.42
The Danish Packaging Research Institute	1966	8	0.06
The Danish Institute of Forest Technology	1967	7	0.04
The Scandinavian Paint and Printing Ink Research Institute	1969	25	0.11
The Danish Structural Research and Development Centre	1971	8	0.05
The Water Quality Research Institute	1972	36	0.12 [1]
The Danish Ship Research Laboratory	1972	—	—
Total		645	4.02

[1] The Water Quality Research Institute became an institute proper in 1972. Before that, work was carried out under the direction of a research committee appointed by the Academy.

Very often the work of the committees has shown the need of specialized technical and scientific research or development institutions. In the course of 25 years, well above 30 research and development institutions have been established, some have later changed status, some have ceased activities or merged, so that today there is a total of 25 independent institutions, 19 of which, the so-called ATV institutes, work with technical scientific research, development and service problems.

The 19 ATV institutes dispose of a total of about 650 employees, of which about 225 are university graduates.

In 1971 turnover amounted to about £4 million, of which about £3 million represented income from contract work, while about £1 million represented grants from government funds, especially from the Danish Council for Scientific and Industrial Research.

The table on page 16 lists the 19 institutes in order of establishment year.

The aim of an ATV institute is, through research and development activities in a special field, to extend technical know-how, and by consultation and information to promote the application of advanced technology in Danish trade and industry and in public enterprises.

All the institutes are independent non-profit service organizations to the Danish community, and their statutes secure the application of working profit and capital only to the benefit of non-profit research and development activities.

2—THE ESTABLISHMENT AND ACTIVITIES OF ATV RESEARCH INSTITUTES

2.1—Launching

As will appear from the list of institutes given above, the establishment of new institutes has been required from time to time.

Generally, the launching of an institute takes place in one of the following ways:

— by initiative from a branch organization or group of people with common interests;

— by initiative from the Academy to continue research activities carried out for instance by a committee;

— by initiative from a single person.

No matter the point of starting, the launching of an ATV institute has always been characterized by cooperation between a number of experts and parties interested. About technical, scientific and practical problems, and about personnel, equipment and premises, for instance with the Technical University of Denmark, the Royal Veterinary and Agricultural College, and the Danish College of Engineering. About problems of organization and finance, with the Danish Council of Technical and Scientific Research, branch organizations, groups of enterprises or other experts.

The launching of an institute will always imply a large number of specific problems, especially when new research problems are involved. In this connection the independent institution has proved to be a very suitable framework for cooperation, financing and organization.

2.2—Research and Development Activities

The fact that the institutes are formed as independent non-profit organizations has made it possible for each of the ATV institutes to develop both quantitatively and qualitatively with due regard to technical and scientific development and the need for the institute.

In spite of differences between the various institutes, their common objective is to give technical and scientific advice to any client—private or public. Therefore, the research and development activities of the ATV institutes are described as a whole, although the relation between research and development work and other kinds of activities vary with the institute.

A precondition to qualified research and development aid being given by an institute to private and public clients is that the institute is informed about recent scientific development in its specific field of interest. Such overall information is only obtained where the institute carries out research at an international level. This will enable the institute to estimate information given in new literature, and to get in touch with appropriate international relations. Research of this kind may for instance consist in the solution of advanced Danish or international problems or in work with research problems formulated by the institute and carried out by means of government grants or own capital.

According to increased international division of labour and increased division of labour between specialized research institutes, the institutes affiliated to the ATV have found it natural to cooperate, thereby to be able to offer assistance to trade and industry and to the public on a very broad basis.

For instance, the Danish Hydraulic Institute, the Water Quality Research Institute and the Danish Isotope Centre have formed a close cooperation to coordinate and strengthen scientific and practical efforts to combat water pollution.

A second example is that the Danish Corrosion Centre has decided to move into premises owned by the Danish Welding Institute. This sharing of geographical location promotes cooperation about administrative functions and coordinated efforts, to the benefit of common clients.

A third example is that three ATV institutes, the Microwave Research Laboratory, the Radiotechnical Research Laboratory and the Institute of Electronic Equipment merged in 1966 to form the Danish Research Centre for Applied Electronics.

To serve a client in the best possible way, cooperation with the client's own technicians will very often be of great value: For instance a client may for some time have one or several technicians stationed in an institute, or experimental work may be carried out partly in the client's laboratory, partly in one or several institutes.

Cooperation with laboratories of higher institutes of education is very important to the technical and scientific quality of activities carried out by the institutes. As an example it may be mentioned that quite extensive cooperation of this kind takes place between the Danish Technical University and the Danish Geotechnical Institute: The Laboratory of Foundation at the Danish Technical University and the Danish Geotechnical Institute cooperate very closely about research and education in order to obtain maximum exploitation of personnel and equipment.

The multitude and complexity of tasks carried out by ATV institutes for clients or on own initiative will appear from the following examples of products, processes and methods developed by ATV institutes. In a number of cases it has proved appropriate—either for the ATV institutes or for their clients—to take out patents for the results obtained:

Optical system for all-sky survey of auroral light.

Optical system for luminaire for landing- and starting-grounds in airports.

Portable, pneumatic working instrument for the quantitative determination of the adhesion of coatings.

Automatic ventilation system for storage rooms for vegetable raw materials.

New felling and transport methods (full lengths).

Methods of technical and chemical cleaning in deciduous stands.

Management planning and calculation methods in forestry.

Optical lens system for traffic signals.

X-ray equipment for industrial radiography.

New type of fork-lift.

Electronic measuring systems for slaughterhouses.

Projection systems for cine-projector viewers.

Electronic plainmeter.

Ultrasonic equipment for medical diagnostics.

System for dynamic registration of bend or torsion of large structures, e.g. ships, bridges or houses. Accuracy better than 1/10 of a mm and with a time resolution better than 1/10 of a second.

Spectral filters with two or more transmission bands for spectrophotometry.

Optical components for flow analysis with lasers.

Moisture gauge for industry, agriculture and hydraulogy.

A new fluorescent microscope for routine diagnosis.

Improved methods for determination of protein, lysine, water, carotine, xanthophyll etc. in feeds.

Method for production of particle boards from straw.

Method of calculating visual conditions on unlighted roads.

Chemical treatment of straw in a pellet press for cattle fodder.

Measuring apparatus for reflection properties of road surfaces.

Electronic flowmeter.

Improved methods for determining the settlement of foundations.

Photometric measuring apparatus for luminaires.

Method for counting of leucosytes.

Equipment for optical reading used by the retail trade, library service, sorting etc.

Methods of projecting road lighting, tunnel lighting, and indoor lighting by means of EDB.

Construction of groundwater lowering plants.

Method for identification of chromosomes.

Holographic methods for deformation and stress analysis.

Planning and development of microwave radio links.

Test methods for determination of sensitivity of electronic equipment to polluted atmosphere.

Equipment for storage of cereal grain under controlled climatic conditions.

Methods and equipment for measuring radiated electromagnetic noise.

Design and manufacture of humidity test equipment.

Development and planning of radar equipment.

Development and manufacture of climatic and mechanical environment test equipment.

Full automatic system for solid phase peptide synthesis.

Photoelectric detector for sensing liquids in transparent tubing.

Rapid method for testing spectral properties of colour film material.

Optical components for opto-electronic check of motorcar steering systems.

Low noise receivers for satellite communication transponders.

Development of PCM (pulse code modulation) equipment.

Code of practice for foundation engineering.

Development of cleaning methods for equipment exposed to gases from PVC-fires.

Microbial method for evaluation of protein quality.

Determination of earth pressure.

Development of thick film technology for electronic equipment.

Equipment for screening of antibiotic contamination of food.

Spectral filter systems for tracing of immuno reactions for microscopy within pathology and for tracing of specific proteins within food industry.

Spectral methods for eye diagnosis and for colour photography of retina.

Photometer for measurement of serological reactions by check of veneral diseases.

Decorative coatings on windows in a public swimming bath to obtain specific colour shifts by change of the angle of view.

Determination of the distribution of sewage concentration in the sea from planned sewage outfall by means of radioactive tracers.

Extended bearing capacity formulas (which have lead to allowable bearing pressures on soil of up to four times those previously assumed).

Computational hydraulic models for investigation of problems in relation to pollution and hydraulic engineering.

Development of a method for the hydraulic filling of long impervious sacks (flexible plastic tubes).

As will appear from the above, the ATV institutes represent a large number of examples of concrete results of research and development activities throughout the years carried out by the institutes.

However, these concrete results give only the direct measure of the value of the work: Research and development activities also represent a very considerable indirect value in the form of education and advisory service given by the institutes to the clients in connection with the solution of concrete problems.

2.3—Advisory Service and Education Activities

Through their advisory service and education activities, the ATV institutes play an important role in spreading to a large number of people know-how currently acquired in their special fields of interest.

This spreading of knowledge mainly takes place on the initiative of the institutes themselves and in many forms, for instance:

— advisory service in connection with research and development contracts;

— reply to telephoned questions;

— distribution to specific groups of reports on special problems;

— publishing of results in periodicals and scientific magazines;

— participation in specialized education, for instance at the Technical University of Denmark;

— participation in courses and supplementary training arranged by other organizations;

— arrangement of symposiums and seminars;

— lectures and demonstrations in the institutes.

2.4—Practical Work

Almost all ATV institutes attach great importance to practical work, service, control etc., in this connection meaning contract work not in the form of research and development proper. As a whole, practical work represents about 30 per cent of total turnover. Practical work may be the carrying out of special analyses and measurements, and testing by means of specialized equipment. It may also consist in examinations of a special nature to the client, but a matter of routine to the institute.

There are several reasons why the ATV institutes, in addition to their technical, scientific and informative activities also have an objective to engage in practical work. Four of these are given below.

In order to be able to solve as effectively as possible research and development problems presented by the clients, and in order as quickly and correctly as possible to be able to make decisions about the carrying out of research and development activities on own initiative, the ATV institutes work in close contact with private and public needs. In the opinion of the institutes, this contact can only be obtained if the institutes are engaged in practical work and thereby thoroughly informed about methods, processes and products which represent current practice used by private and public clients.

A second reason for carrying out practical work is that very often the institutes will dispose of the one existing special apparatus or special experimental set-up developed by the institutes themselves.

In a number of cases, this apparatus may be looked upon as a prototype which by thorough testing and further development may be made fit for production and form the basis of new Danish industry. Of this several examples may be given, cf. the above survey (pp. 19-22). By using such apparatus in practical work for clients, the institutes make thorough realistic tests of the prototypes and gain a more profound knowledge of its possibilities in practice.

A third reason why the purpose of the ATV institutes implies the carrying out of practical work is that investment made by the institute in personnel and equipment is used to the benefit of the community to a far greater extent when research and development activities are combined with practical work. At the same time, income from practical work may be used for further investment within the institutes.

The final reason is that when carrying out practical research work, problems will very often arise which require close theoretical examination. In this way serious research projects may be formulated.

These are not the least important reasons why the ATV institutes are able to obtain a large annual turnover with comparatively small public support, and thus get a very high return on government funds placed at their disposal (cf. chapter 2.7—Finances).

2.5—General Activities

The ATV institutes spend a total of about 10 per cent of turnover on general activities, which are necessary for the institute in order to meet the demand of service, for instance maintenance of know-how, standardization, promotion and national and international cooperation.

Thus, all the ATV institutes are in regular contact with experts from higher institutes of education and universities about the development of specific disciplines, about the utilization of specialized equipment, or about solution of special research problems. This kind of regular cooperation is important to the institute and its clients, but in a wider perspective it is important to the community as a whole.

Moreover, the ATV institutes are in close contact with technological institutes and other service institutes. Examples of this cooperation are given in the division of labour established between the Danish Welding Institute and the welding division of the Technological Institute, Copenhagen, and between the Danish Structural and Development Centre and the Danish Building Research Institute.

In the technical and scientific and technological field—as in almost any other field—the degree of internationalization increases. This is demonstrated for instance in the exchange of know-how and in contracts of cooperation. Furthermore, it is demonstrated in membership in international organizations.

All the ATV institutes are in close and very useful contact with corresponding expert institutes abroad. In this way the ATV institutes may exploit know-how many times the size of know-how held by themselves, and in this way add to the Danish community a constant stream of knowledge which would be very difficult to acquire by other means. This exchange of knowledge is mutual and extended year by year. In a large number of cases the result is a regular division of labour.

Examples of institutes cooperating with the ATV institutes:

The Welding Institute, England.

Eurotest (Group of testing institutes from 8 European countries).

South West Research Laboratories, USA.

National Institute of Oceanography, England.

Institut för Vatten- och Luftvårdsforskning, Sweden.

National Research Council of Canada, Canada.

Comité Européen de Coordination des Normes Electroniques—CENEL.

Norsk Institutt for Vannforskning, Norway.

Delft Hydraulic Laboratory, The Netherlands.

Chalmers Tekniska Högskola, Sweden.

International Exchange of Authenticated Electronic Component Performance Test Data—EXACT.

Union Radio Scientifique International—URSI.

Svenska Institutet för Konserveringsforskning, Sweden.

National Bureau of Standards, USA.

Cement and Concrete Association, England.

Institut für Meereskunde, Germany.

International Union of Forestry Research Organization—IUFRO.

Coastal Engineering Research Center, USA.

Comité International Spécial des Perturbations Radioélectriques—CISPR.

European Space Research Organization, ESRO.

Franzius-Institut, Germany.

Japan Electron Optics Laboratory, Japan.

International Atomic Energy Agency.

World Health Organization.

Sveriges Meteorologiske og Hydrologiske Institut, Sweden.

European Southern Observatory.

Institut de Chimie des Substances Naturelles, France.

International Electrotechnical Committee—IEC.

Vassdrags- og Havnelaboratoriet, Norway.

Conférence Européenne de Telecommunication par Satellites—CETS.

Institute of Optics, USA.

Verband Deutscher Elektrotechniker—VDE.

Drug Research & Control Centre, Egypt.

Deutsches Wollforschungsinstitut, Germany.

Electronic Components Quality Assurance Committee—ECQAC.

Nordiske Skovarbejdsstudiers Råd.

The Hydraulic Research Station, England.

Statens Väg- och Trafiksäkerhetsinstitut, Sweden.

Shemyakin Instituttet, USSR.

Commission Internationale de l'Eclairage—CIE.

Europæiske Astronomiske Union.

Paint Research Association, England.

Max-Planck-Institut, Germany.

Statesn Vägverk, Sweden.

Institute of Optics, Sweden.

Laboratoire de la Profession, Industrie de Peintures et Vernis, France.

International Association of Research Institutes for the Graphic Art Industries, England.

Institutet för Verkstadsteknisk Forskning, Sweden.

Institute of Organic Chemistry, Eötvös University, Hungary.

Independent Testing Laboratories, USA.

Laboratoire de Chimie Biologique, Université de Paris, France.

Forschungsinstitut für Pigmente und Lacke, Germany.

British Standards Institution, England.

Biokemiska Institutionen, Sweden.

Comité Européen des Associations des Fabricants de Peintures, d'Encres d'Imprimerie et des Couleurs d'Arts, France.

Verfinstituut TNO, The Netherlands.

The cooperation of the ATV institutes with colleagues abroad is an indispensable part of their research, development and service activities. As mentioned above, the institutes and their clients get a share, at less costs, in the international potential of specialized know-how and capabilities. At the same time, cooperation is a precondition for Danish institutes to find their relevant position in today's international system for specialization and division of labour.

2.6—Organization

Throughout the years, the Academy council has attached great importance to securing for the ATV institutes an organizational structure enabling them to work with the highest degree of efficiency and flexibility. This is the reason why the institutes have been organized as independent institutions affiliated to the Academy.

This affiliation has the following implications:

— the institute statutes must in all essential points comply with fixed standard statutes;
— the composition of the institute board of directors must be approved by the Academy council;
— the institute annual report and accounts must be submitted to the Academy for publication.

From the statutes of each of the institutes shall appear:

— the object of the institute;
— the field within which the institute works;
— the organizations, institutions, societies etc. nominating members of the institute board, and persons responsible for the ultimate election;
— persons appointing the chairman of the board and his term of office;
— the fact that the institute is only liable to the extent of its capital from time to time;
— the fact that the founders of the institute and the contributors have no part in or claim on the institute capital, and they cannot be held responsible for the liabilities of the institute;
— that working profit, if any, should primarily be utilized to promote the objectives of the institute, and secondarily for other non-profit purposes;
— that in case of cessation and liquidation, capital, if any, should be used for non-profit purposes only.

The composition of the board of directors is laid down in the statutes in the most appropriate way for the individual institute. Generally, the board consists of persons from many different organizations, for instance from research, from trade and industry and from public authorities. The members of the board are elected for a limited period of time, usually 3 years.

The main tasks of the board are:

— to secure obedience to the institute statutes;
— to lay down general guidelines for the activities of the institute, internally and externally;
— to appoint the day-to-day director;
— to approve the budget and adopt the accounts.

As regards reports and other publications, the institute has a free hand, the institute director in this, like in other questions, being responsible to the board.

The ATV institute directors employ staff according to requirements and financial possibilities. Salary and working conditions of the personnel generally correspond closely to conditions in the professional and industrial field served by the institute.

In 1971 the ATV institutes formalized their cooperation, which had so far been quite informal, by establishing the Council of ATV institutes. The statutes of this council are approved by the Academy Council. The Council of ATV institutes consists of a member of the board from each of the institutes and the institute directors. The Council elects its own chairman and lays down rules of procedure. The objects of the Council are to deal with matters of common interest to the institutes externally, for instance questions of financial principles and relations to the authorities empowered to make grants. The Council may also handle questions of importance to the individual institute in so far as desired by the institute. The Council is, however, not authorized to make decisions binding for the individual institute in fields clearly belonging under the institute board, without acceptance from the board.

2.7—Finances

As will appear from the above, the board together with the director are responsible for the finances of the institute.

Generally, the starting of an ATV institute takes place on a very modest scale, for instance with a few employees located in rented premises. The growth of the institute is dependent upon the demand for its services, on the quality of its work and on the skill of the staff.

Therefore, some institutes will remain rather small, while others experience a rapid growth. The turnover of an ATV institute today ranges from just below £60 000 to more than £1 million. The 1971 turnover of the total of the ATV institutes amounted to £4 million, of which approximately £3 million represents income from contract work carried out for private and public clients. About £1 million is made up by public grants—mainly from the Danish Council for Scientific and Industrial Research.

Thus, to the ATV institutes, private and public clients play a very important role, and this of course furthers the creation of a realistic relationship between the institute and its clients, in such a way that the clients get the service they want. Furthermore, this implies that the institutes fix the rates on an equally realistic basis, in such a way that all direct and indirect expenses are included in the price, for instance wages, pension, insurance, holiday pay, rent, interest on capital and other overheads.

In the table below is given a survey of the total 1951-1971 annual turnover of the ATV institutes and of public grants to the institutes in 1960-1971.

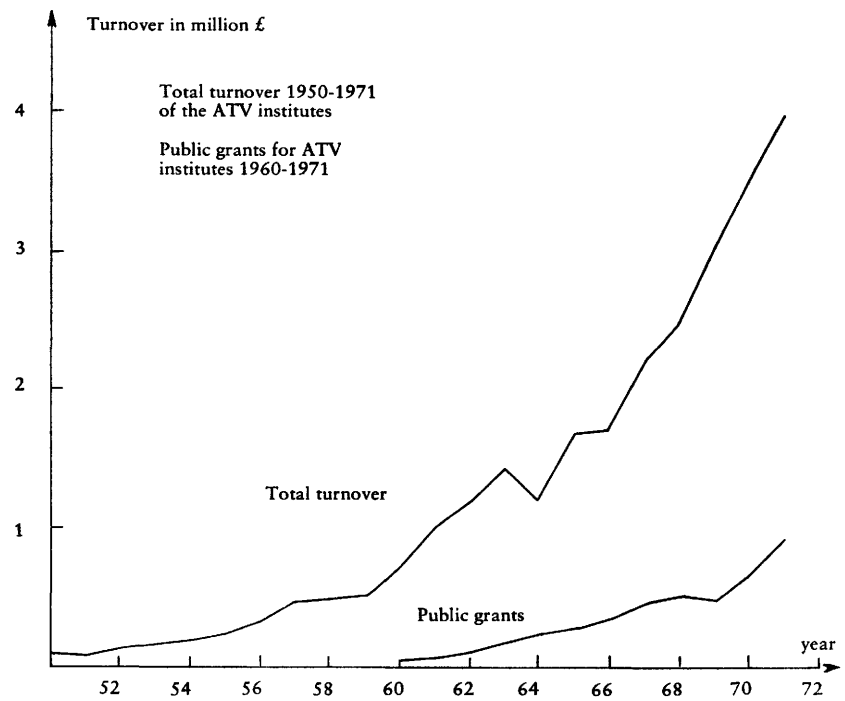
In the 1950's, the grants received by the institutes from the Danish Council for Scientific Research were, compared with the total annual turnover at that time, very modest.

From the beginning of the 1960's, grants from the Danish Council for Scientific and Industrial Research to the ATV institutes have increased considerably.

Public support to the ATV institutes has been utilized in a very effective way. To illustrate the effect of public support on the total turnover of the ATV institutes may be indicated the relationship in the last decade between the size of public grants and total annual turnover of the ATV institutes:

For each £0.1 million increase of public grants to the ATV institutes, the institutes have been able to increase annual turnover by £0.5 million.

This relationship, which may be seen from the graph below, gives better than many words an illustration of the stimulating effect of public grants on the activities of the ATV institutes to the benefit of the Danish community and its industry and trade.



The curve of the annual turnover has a break in 1964. The decrease in turnover, however, does not express a real decrease, but is a result of restructuralization: The Danish Institute of Computing Machinery, which had so far been an ATV institute, changed status and became a limited company, so that from 1964 the turnover of this institute is no longer included in the turnover figures.

In a number of cases the institutes have—very often in severe competition with institutes abroad—been able to secure for themselves contract work for private or public clients abroad. For instance the Danish Research Centre for Applied Electronics carries out important projects for ESRO, and the Danish Hydraulic Institute carries out a large number of examinations for foreign enterprises and public authorities.

To the Academy it is very important that the ATV institutes should be able to secure such foreign orders, not only because of the favourable influence on the foreign exchange balance, but also because the institutes get an opportunity to test their standard and efficiency on the international market.

However, to the ATV institutes public grants play a very important role, too. Without support granted by the Danish Council for Scientific and Industrial Research the institutes would not be able to carry out non-profit projects or projects which are 'ahead of their time'. This last type of project is very important, because it enables an institute to carry out, very often for several years, preparatory research into a new technical and scientific field, in such a way that the institute is very well prepared to tackle non-profit or contract work at the time when such projects have gained sufficient importance to trade and industry or to the community.

Grants from the Danish Council for Scientific and Industrial Research are not given to the institutes as a whole, but to each individual institute, and the Danish Council for Scientific and Industrial Research reserves the right to decide, from time to time, which professional fields should be supported by public means.

The ATV institutes have cooperated very closely with the Danish Council for Scientific and Industrial Research, and the cooperation has been very fruitful. It has, however, proved inconvenient that the Council has only been able to give one-year grants, because this does not meet the demand for long-term planning of institute activities.

The finances of an ATV institute will be scrutinized carefully when the institute wants to expand very quickly or to acquire its own domicile. In such cases it has been necessary to utilize a third possibility to raise money, i.e. on the ordinary loan market. Thus, mortgage deeds, bank loans and cash credits are part of the finances of the ATV institutes.

Thus, it is characteristic of the ATV institutes that their financial conditions are with all their advantages and disadvantages quite different from the financial conditions of branch institutes proper and of government institutes. On the one hand, these conditions imply an obligation for the ATV institutes to maintain their non-profit aim and professional standard, and, on the other hand, the necessity for activities to be performed on a commercial basis, without utilizing public grants to gain unfair competitive advantages over private research development and service institutions.

However, the financial conditions of the ATV institutes stimulate management and employees in their efforts to convert scientific results obtained in Denmark or abroad into technical know-how, which may be sold to their private and public clients.

3—ADDRESSES AND TELEPHONE NUMBERS

How to call an ATV institute from a European country:

1. Dial 009 45 / wait for dialtone
2. dial area number of the institute (the one-figured number in brackets at the beginning of each telephone number — most institutes haves area number 1)

3a. *fully-automatic telephone exchange:*
dial the institute number (the six-figured number after brackets, e.g. 88 44 44)

3b. *semi-automatic telephone exchange:*
dial the institute exchange number (the two-figured number after brackets but before comma, e.g. 27) / wait for exchange answer / ask for the institute number (the two-figured or four-figured number after comma, e.g. 22).

The Danish Academy of Technical Sciences
(Akademiet for de tekniske Videnskaber)
266, Lundtoftevej, DK-2800, Lyngby (1) 88 13 11

Acoustical Laboratory
(Lydteknisk Laboratorium)
Building 352
100, Lundtoftevej, DK-2800, Lyngby (1) 88 16 22

Danish Asphalt Industries' Laboratory for Road Construction
(Asfaltindustriens Vejforskningslaboratorium)
91, Stamholmen, DK-2650, Hvidovre (1) 78 06 26

The Danish Institute for Biotechnical Research and Development
(Biocentralen)
Forskningscentret
Venlighedsvej, DK-2970, Hørsholm (1) 86 76 11

The Danish Corrosion Centre
(Korrosionscentralen)
83, Sølvgade, DK-1307, Copenhagen K. (1) 15 82 17

Danish Research Centre for Applied Electronics
(Elektronikcentralen)
4, Venlighedsvej, DK-2970, Hørsholm (1) 86 77 22

Danish Institute of Forest Technology
(Skovteknisk Institut)
86, Vester Voldgade, DK-1552, Copenhagen V. (1) 12 21 66

Danish Geotechnical Institute (DGI)
(Geoteknisk Institut)
1, Maglebjergvej, DK-2800, Lyngby (1) 88 44 44

Danish Hydraulic Institute
(Dansk Hydraulisk Institut)
10, Øster Voldgade, DK-1350, Copenhagen K. (1) 15 90 30

The Illuminating Engineering Laboratory
(Lysteknisk Laboratorium)
Building 325,
100, Lundtoftevej, DK-2800, Lyngby (1) 87 39 11

The Danish Isotope Centre
(Isotopcentralen)
2, Skelbækgade, DK-1717, Copenhagen V. (1) 21 41 31

Laboratory for Technical Optics
(Optisk Laboratorium)
Building 307,
100, Lundtoftevej, DK-2800, Lyngby (1) 88 38 48

Danish Packaging Research Institute
(Emballageinstituttet)
1, Jemtelandsgade, DK-2300, Copenhagen S. (1) 27, 22

Scandinavian Paint and Printing Ink Research Institute
(Nordisk Forskningsinstitut for Maling og Trykfarver)
14, Odensegade, DK-2100, Copenhagen Ø. (1) 76, 5305

The Research Institute of Commercial and Industrial Plants
(Forskningsinstituttet for Handels- og Industriplanter)
10, Holbergsvej, DK-6000, Kolding, Jutland (5) 52 04 33

The Danish Institute of Protein Chemistry
(Proteinkemisk Institut)
33, Finsensvej, DK-2000, Copenhagen F. (1) 32, 1057

The Danish Ship Research Laboratory
(Skibsteknisk Laboratorium)
99, Hjortekærsvej, DK-2800, Lyngby (1) 87 99 33

Danish Structural Research and Development Centre
(BKF-centralen)
Building 371,
100, Lundtoftevej, DK-2800, Lyngby (1) 88 66 22

Water Quality Research Institute
(Vandkvalitetsinstituttet)
10-12, Poppelgårdsvej, DK-2860, Søborg (1) 67 16 66

The Danish Welding Institute
(Svejsecentralen)
345, Park Alle, DK-2600, Glostrup (1) 96 88 00

Les centres de recherche professionnels français

M. R. HAMELIN
au nom de M. M. DOUMENC, Président de l'A.N.R.T.

Les organismes professionnels français effectuant des travaux de recherche et des études techniques d'intérêt collectif, sur des problèmes de caractère non concurrentiel, au profit de l'ensemble des entreprises d'une branche industrielle, sont *nombreux* : une récente enquête de la D.G.R.S.T. (*) en a recensé 61. Les informations présentées dans cette communication sont relatives aux 25 plus importants d'entre eux, couramment dénommés « centres techniques professionnels ».

Le premier (l'Institut français de Soudure) fut créé en 1907, le plus récent (Centre Technique de l'Industrie du Décolletage à Cluses) a été créé en 1971.

— Effectifs totaux : environ 5 000 personnes dont plus de 1 800 cadres.

— Dépenses totales (en 1972) environ 500 MF.

Ces centres ont des tailles très variables (voir annexe)

• Le plus important est l'*Institut Français du Pétrole* (budget = 185 MF/an — 1 650 personnes).

• *8 centres* emploient de 185 à 500 personnes (budget entre 10 et 70 MF).

• *6 centres* emploient de 70 à 100 personnes (budget de 6 à 8 MF).

• *10 centres* emploient de 10 à 70 personnes (budget inférieur à 5 MF).

Ces centres ont des statuts différents

• *15 centres* sont placés sous le régime de la *loi de 1948* qui donne à l'État un droit de regard direct sur leur administration et leur gestion

(*) D.G.R.S.T. = Délégation Générale à la Recherche Scientifique et Technique.

Exemples :

- Centre Technique du Bois (CTB)
- Institut des Corps Gras (ITERG)
- Centre Technique du Cuir
- Centre Technique des Industries Mécaniques (CETIM)
- Institut Textile de France (ITF)
- etc.

• *4 centres* sont régis par la *loi de 1943* : leur directeur et les membres du Conseil d'administration sont nommés par les organismes professionnels dont ils relèvent (*). Un Commissaire de gouvernement représente le Ministère de tutelle.

Exemples :

- Institut Français du Pétrole (IFP)
- Institut de Recherches de la Sidérurgie (IRSID)
- etc.

• *5 centres* sont régis par la *loi de 1901* : ce sont des associations regroupant des adhérents ayant un intérêt commun.

Exemples :

- Institut Français du Caoutchouc (IFC)
- Société Française de Céramique (SFC)
- etc.

• L'*Institut de la Soudure* est un syndicat professionnel.

• *Quelques centres* ont des activités qui les apparentent aux Centres techniques professionnels, bien que par leur statut ils n'appartiennent pas au secteur privé.

Exemples :

- Centre d'Etudes et de Recherches des Charbonnages de France (CERCHAR)
- Laboratoire Central des Industries Électriques (LCIE), qui effectue des travaux pour le compte des industries électriques et de l'E.D.F.

(*) Sauf en ce qui concerne l'Institut Français du Pétrole, pour lequel les nominations sont maintenant assurées par le Gouvernement.

Activités des centres

Elles sont *très variables* (1).

(En % du budget)	IFP	7 grands centres (1) (moyenne)	15 petits centres (moyenne)
Recherche	76,5	41	54
Assistance technique	8,5	32	16
Normes et labels de qualité		7,5	10,5
Documentation et information de la profession	3	10,5	8
Enseignement, formation, recyclage	12	6	7,5
Autres		3	4

(1) L'IRSID ne figure pas dans ce tableau car ce centre n'effectue pratiquement que de la recherche, les autres activités étant prises en charge par d'autres organismes.

L'IFP et l'IRSID mis à part, on remarque que la recherche ne représente que la moitié environ des dépenses des centres.

Ressources financières des centres

Elles proviennent essentiellement :

a) du produit d'une *taxe parafiscale* dont le montant est proposé par les organisations et soumis à l'accord des Pouvoirs publics (cas des centres — loi de 1948 ainsi que l'IFP qui est financé par une taxe sur l'essence);

b) ou de *cotisations volontaires.*

Par ailleurs, en proportion variable selon les centres, certains *services* (documentation, essais, analyses, etc.) sont rendus à titre onéreux.

Des recherches peuvent être effectuées *sous contrat* pour une entreprise qui en supporte les frais en totalité ou en partie.

(1) Tableau extrait d'une enquête faite par l'Association Nationale de la Recherche Technique (A.N.R.T.) en 1972.

La participation financière de l'*État* est voisine de 10 % du budget total. Elle prend les formes suivantes :

- subventions pour nouveaux investissements (bâtiments ou équipements lourds);
- contrats de recherche (le plus souvent fondamentale) avec le M.D.I.S. (*), la D.G.R.S.T. et la D.R.M.E. (**);
- aide au prédéveloppement;
- aide au développement (exceptionnellement).

Répartition globale (IFP non compris).

- Taxes parafiscales 142 MF
- Cotisations volontaires 90-100 MF
- Contrats, services divers env. 40 MF (dont 30 MF de l'État).

Centres techniques professionnels et organismes assimilés sous tutelle du Ministère du développement industriel et scientifique

Statistiques 1971-72

Centre	Statut	Secteur industriel	Budget (MF)	Effectifs
I.F.P.	1943	Pétrole	185	1 649
C.E.T.I.M.	1948	Mécanique	68	500
I.R.S.I.D.	1943	Sidérurgie	62	600
I d S	Syndicat professionnel	Soudure	25	325
I.T.F.	1948	Textile	24	400
C.T.I.F.	1948	Fonderie	18,5	285
C.T.B.	1948	Bois	14,7	186
C.T.P.	1948	Papier	13,1	190
C.T.C.	1948	Cuir	11,7	185

(*) M.D.I.S. = Ministère du Développement Industriel et Scientifique.
(**) D.R.M.E. = Direction des Recherches et Moyens d'Essais du Ministère des Armées.

Centres techniques professionnels et organismes assimilés sous tutelle du Ministère du développement industriel et scientifique (suite)

Statistiques 1971-72

Centre	Statut	Secteur industriel	Budget (MF)	Effectifs
C.T.I.C.M.	1948	Construction métallique	8,3	59
I.F.C.	1901	Caoutchouc	8	103
C.E.T.I.H.	1948	Habillement	7	90
C.E.T.I.A.T.	1948	Aéraulique et Thermique	6,9	82
C.E.R.I.L.H.	1948	Liants hydrauliques	6,5	82
C.E.R.I.B.	1948	Béton manufacturé	5,8	67
S.F.C.	1901	Céramique	4,6	85
C.N.E.C.	1901	Emballage	3,5	51
C.E.M.P.	1943	Matières plastiques	3,2	40
C.T.T.B.	1948	Tuiles et briques	3,3	72
C.E.R.M.O.	1901	Machine Outil	2,6	21
I.T.E.R.G.	1948	Corps Gras	2,5	35
C.E.T.E.H.O.R.	1948	Horlogerie	2,5	42
C.T.T.N.	1948	Teinture Nettoyage	2,2	25
L.R.C.C.	1943	Trans-formation caoutchouc	2,2	40
I.P.R.E.I.G.	1901	Imprimerie	0,7	10

LISTE DES CENTRES TECHNIQUES PROFESSIONNELS A CARACTÈRE INDUSTRIEL

Centres Techniques Industriels (Loi du 22 juillet 1948)

— Centre Technique des Industries Aérauliques et Thermiques (CETIAT)
38, rue Copernic — 75116 Paris — tél. 553 97 09

Laboratoires :

— Laboratoire de Mécanique expérimentale des fluides — Bât. 511 — 91 Orsay

— Costic : Domaine de Saint-Paul — 78 Saint-Rémy-lès-Chevreuse
15, boulevard du 11 novembre 1918 — 69 Villeurbanne

— Centre d'Études et de Recherches de l'Industrie du Béton manufacturé (CERIB)
Rue des Longs Péages — B.P. n° 42 — 28230 Épernon — tél. 483 46 51

— Centre Technique du Bois (CTB)
10, avenue de Saint-Mandé — 75012 Paris — tél. 344 06 20

— Centre Technique des Conserves de Produits Agricoles (CTCA)
71, avenue du Général Leclerc — 75014 Paris — tél. 707 93 00

— Centre Technique de la Construction Métallique (CTICM)
20, rue Jean-Jaurès — 92807 Puteaux — tél. 772 05 33

Station expérimentale d'essais au feu : Domaine de l'IRSID
57210 Maizières-lès-Metz — tél. (87) 60 21 54

— Institut des Corps Gras (ITERG)
5, boulevard de la Tour Maubourg — 75007 Paris — tél. 555 07 73
Laboratoire annexe à Marseille

— Centre Technique du Cuir
181, avenue Jean-Jaurès — 69007 Lyon — B.P. n° 1 — 69342 Lyon Cedex 2 — tél. (78) 72 55 61

— Centre Technique de l'Industrie du Décolletage
Zone industrielle des Grands Prés — B.P. n° 65 — 74301 Cluses tél. (50) 98 20 44

— Centre Technique des Industries de la Fonderie (CTIF)
12, avenue Raphaël — 75016 Paris — tél. 504 72 50

— Laboratoire central : 44, avenue de la Division Leclerc —92310 Sèvres — tél. 027 27 54

— Réseau de 9 laboratoires régionaux de contrôle

— Centre Technique de l'Industrie Horlogère (CETEHOR)
39, avenue de l'Observatoire — B.P. n° 1145 — 25003 Besançon — tél. (81) 80 39 91

— Centre d'Études Techniques des Industries de l'Habillement (CETIH)
14, rue des Reculettes — 75013 Paris — tél. 587 36 87

— Centre d'Études et Recherches de l'Industrie des Liants Hydrauliques (CERILH)
23, rue de Cronstadt — 75015 Paris — tél. 532 58 40

— Centre Technique des Industries Mécaniques (CETIM)
Direction générale et laboratoire : B.P. n° 67
2, avenue Félix Louat — 60304 Senlis — tél. 453 12 60
  — Laboratoire : Route de la Jonnelière — 44000 Nantes — tél. (40) 74 30 36
  — Laboratoire : 10, rue Barroin — 42000 Saint-Étienne — tél. (77) 33 25 34

— Centre Technique de l'Industrie des Papiers, Cartons et Celluloses (CTP)
Domaine universitaire — Cedex n° 75 — 38042 Grenoble-Gare — tél. (76) 87 03 11
Siège : 154, boulevard Haussmann — 75008 Paris — tél. 227 70 55

— Centre Technique de la Teinture et du Nettoyage (CTTN)
avenue Gambetta — B.P. n° 48 — 69250 Neuville-sur-Saône — tél. (78) 47 85 55

— Institut Textile de France (ITF)
35, rue des Abondances — 92100 Boulogne — Billancourt — tél. 825 18 90

Centres affiliés

— Centre Textile de Contrôle et de Recherche Scientifique (CTCRS)
2, boulevard Beaurepaire — 59100 Roubaix — tél. (20) 73 13 25
  — Centre de Recherches de la Soierie et des Industries Textiles (CRSIT)
  7, rue Saint-Polycarpe — 69000 Lyon — tél. (78) 28 13 61
  — Centre de Recherches Textiles de Mulhouse (CRTM)
  185, rue de l'Illberg — 68200 Mulhouse — tél. (89) 42 74 08
  — Centre de Recherches de la Bonneterie (CRB)
  270, rue du Frg Croncels — 10000 Troyes — tél. (25) 43 50 29
  — Centre de Recherches des Industries Textiles de Rouen (CRITER)
  20, rue Méridienne — 76000 Rouen — tél. (35) 72 55 35
  — Centre de Recherches Textiles (CRT)
  3, rue de Comines — 59280 Armentières — tél. (20) 77 22 30

— Laboratoire d'essais, contrôles, analyses et de recherche industrielle (LECARIM)
1, rue de Bradfort — 81200 Mazamet — tél. (53) 61 11 24

— Centre Technique des Tuiles et Briques (CTTB)
2, avenue Hoche — 75008 Paris — 227 34 15

— Laboratoires à Clamart

Établissements Professionnels (Loi du 17 novembre 1943)

— Laboratoire de Recherche et de Contrôle du Caoutchouc (LRCC)
12, rue Carvès — 92120 Montrouge — tél. 655 71 11

— Centre d'Études des Matières Plastiques (CEMP)
21, rue Pinel — 75013 Paris — tél. 707 65 59

— Institut Français du Pétrole, des Carburants et Lubrifiants (IFP)
1 et 4, avenue de Bois Préau — B.P. n° 18 — 92502 Rueil-Malmaison — tél. 967 11 10
Centre d'essais à Solaize 69360

— Institut de Recherches de la Sidérurgie (IRSID)
185, rue du Président Roosevelt — 78104 Saint-Germain-en-Laye — tél. 963 24 01
Station d'essais 57210 Maizières-lès-Metz — tél. 60 21 54

Associations régies par la loi du 1er juillet 1901

— Union Technique Interfédérale du Bâtiment et des Travaux Publics (UTI)
9, rue Lapérouse — 75784 Paris, Cedex 16 — tél. 720 10 20

— Centre expérimental de recherches et d'études du Bâtiment et des Travaux publics (CEBTP)
12, rue Brancion — 75015 Paris — tél. 828 95 49

— Centres et stations d'essais à 78470 Saint-Rémy-lès-Chevreuse
Domaine de Saint-Paul — tél. 952 01 02

— Institut Français du Caoutchouc (IFC)
42, rue Scheffer — 75016 Paris — tél. 553 93 96
Laboratoires au Siège et au Mans

— Société Française de Céramique (SFC)
23, rue de Cronstad — 75015 Paris — tél. 532 58 40

— Centre National de l'Emballage et du Conditionnement (CNEC)
avenue Georges Politzer — 78190 Trappes — tél. 462 90 00

— Institut Professionnel de Recherches et d'Études des Industries Graphiques (IPREIG)
17, rue des Reculettes — 75013 Paris — tél. 535 17 75

— Centre d'Études et de Recherches de la Machine Outil
21, rue Pinel — 75013 Paris — tél. 587 13 30

Divers

— Union Technique de l'Automobile, du Motocycle et du Cycle (UTAC)
157-159, rue Lecourbe — 75015 Paris — tél. 842 53 90

— Institut de Soudure
32, boulevard de la Chapelle — 75880 Paris, Cedex 18 — tél. 607 36 32

— Centre d'Études et de Recherches des Charbonnages de France (CERCHAR)
Siège : 33, rue de la Baume — 75360 Paris, Cedex 08 — tél. 225 95 00 et 256 20 98
Laboratoires de Verneuil-en-Halatte : B.P. n° 27 — 60103 Creil — tél. 455 35 00

Cooperative Industrial Research in the Netherlands

Professor Dr Ir. A.A.Th.M. VAN TRIER
Chairman, Central Organization TNO

Mr Chairman,

Before I make a few introductory observations on cooperative research in the Netherlands, I should like to take over on the general remarks.

First of all, as a representative of the Dutch Organization for Applied Scientific Research, allow me to say how pleased we are that you have chosen this country for your international conference, which in a way may be seen as a symbolic entry into the common market.

Secondly I should like to express my admiration for the thought provoking report of the Committee of Enquiry into the Research Associations. Although it refers to the RA's, it is evident that so many topics are dealt with that are relevant to cooperative research in general, that the report will be of great value to all those responsible for governmental sponsored or un-sponsored industrial research.

Turning then to the situation in the Netherlands, it can be said that there are several types of industrial cooperative research.

In today's context the most interesting type is cooperative industrial research co-financed by the Dutch Government through TNO's intermediary.

This type of cooperative industrial research can be compared with the role of the grant-aided RA's in the United Kingdom, with the 'Centres Techniques' in France and with the 'Industrielle Forschungsvereinigungen' in Germany.

In our country, however, the promotion of cooperative industrial research and the actual performance of such research are the responsibilities of different bodies. The promotion of cooperative research and the collection of financial contribution for it are the responsibility of either a specific 'speurwerkvereniging' (association for cooperative research) or of the organization of the industrial companies in the branch concerned.

The actual research is done in one or more TNO-institutes.

A special government grant has been available sinc 1954 to stimulate the increase of financial contribution by industry to TNO for cooperative research purposes. If industry makes a certain contribution to a certain project or to a certain field of activity then the government adds the same amount of financial support to the project.

Another type of cooperative research may be mentioned here although it is less relevant to private industry than to semi-governmental organizations of public utilities. I refer to those cases where cooperative research is performed in institutes that are owned and primarily financed by members or shareholders. There are some minor branches of industry that have their own research centre, e.g. the centre for the production of sand-lime bricks. Of much greater importance are the research organizations of the various utilities: KEMA of the electricity producers, VEG-Gas Institute of the gas distribution and KIWA of the waterworks. These institutes do not do much work for industry directly but in particular their testing facilities are of great importance to industry.

Returning now to the cooperative industrial research carried out by TNO: I should like to give a very brief indication of how TNO is operating and what its 5,000 people do. The organization consists of the Central Organization and a number of 'Special organizations' for different fields, namely the special organizations for Industrial Research, for Nutritional and Food Research, for Health Research and finally for Defence Research. This shows that TNO serves the national interest not only through activities in the field of industrial research. A considerable part of its R & D capacity and its advisory work is devoted to these areas.

At present, depending on how one defines 'industrial research' 35-40% (its annual budget of 275 million guilders, 35 million pounds) is devoted to industrial R & D and to related technical services. Of the industrial part of about 90 million guilders approximately one half is financed by government subsidy, the other part is financed by revenues from contract work, by contribution from industry etc. In other fields of activity, in particular in defence and health research, the financial source is nearly completely government subsidy.

Industrial research is mainly concentrated in two of TNO's special organizations, that of Industrial Research—as the name indicates—but also that of Nutrition and Food Research. For some institutes belonging to or closely associated with these organizations the cooperative type of R & D programmes is predominant, e.g. in the Fibre Research Institute, which works for various sectors of the textile and garment industry and similarly the paper industry. For other institutes, such as the Metal Research Institute and the Plastics and Rubber

Research Institute cooperative research accounts for only a part of the service given to industry. For these institutes the general R & D programmes and the capacity devoted to sponsored work are much larger than the cooperative programmes.

Some TNO-institutes engaged in industrial research projects do not have a permanent responsibility for a cooperative programme at all, although the potential of these institutes may be used and in fact is often used for contributions to cooperation research programmes for which the TNO-institutes have the primary responsibility.

The relative importance of cooperative research for the various TNO-institutes is indicated in the annexed schedule where the letters a, b, c, d and e indicate the intensity of cooperative research.

As I mentioned before the TNO-institutes or divisions responsible for cooperative R & D programmes in general do not have industrial members themselves but act as partners for 'speurwerkverenigingen' or branch-wise organizations of industrial companies. One of the few exceptions is the Technical Centre for Metalworking of the Metal Research Institute, which does have its own membership.

In this country, a levy system or a 'taxe parafiscale' and source of funds for cooperative research is unknown.

Subscription to cooperative programmes, carried out by TNO, normally is on a voluntary basis.

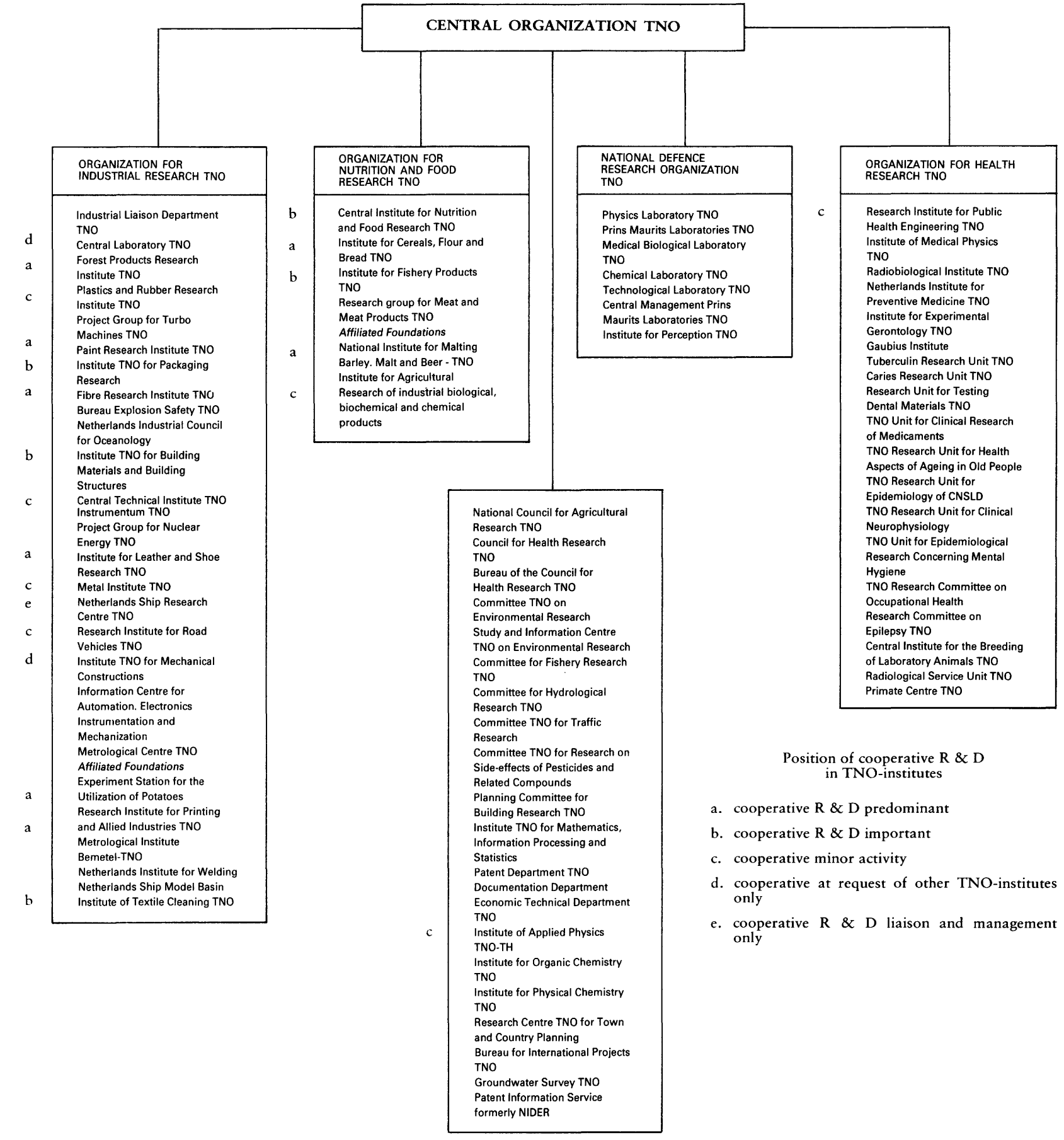
European perspective

In recent years the TNO-organization has tried to strenghten its position through increased coordination of the activities of its roughly forty institutes and we continue this effort. A number of TNO-institutes in which cooperation activities play a major role have been able to develop effective forms of collaboration with their European counterparts. This collaboration is realized in most cases on a bilateral basis. In this way exchange of research results or coordination of R & D activities have been achieved.

Addresses of TNO Institutes etc, engaged in industrial research.

TNO Head Office
148 Juliana van Stolberglaan, The Hague
P.O. Box 297, The Hague
Phone: 070 - 81 44 81

Industrial Liaison Department TNO
97 Schoenmakerstraat, Delft
P.O. Box 215, Delft
Phone: 015 - 56 93 30
(For information about TNO research facilities, contracts and similar subjects).


CENTRAL ORGANIZATION TNO
ORGANIZATION FOR INDUSTRIAL RESEARCH TNO
Industrial Liaison Department TNO
d Central Laboratory TNO
a Forest Products Research Institute TNO
c Plastics and Rubber Research Institute TNO
Project Group for Turbo Machines TNO
a Paint Research Institute TNO
b Institute TNO for Packaging Research
a Fibre Research Institute TNO
Bureau Explosion Safety TNO
Netherlands Industrial Council for Oceanology
b Institute TNO for Building Materials and Building Structures
c Central Technical Institute TNO Instrumentum TNO
Project Group for Nuclear Energy TNO
a Institute for Leather and Shoe Research TNO
c Metal Institute TNO
e Netherlands Ship Research Centre TNO
c Research Institute for Road Vehicles TNO
d Institute TNO for Mechanical Constructions
Information Centre for Automation. Electronics Instrumentation and Mechanization
Metrological Centre TNO
Affiliated Foundations
a Experiment Station for the Utilization of Potatoes
a Research Institute for Printing and Allied Industries TNO
Metrological Institute Bemetel-TNO
Netherlands Institute for Welding
Netherlands Ship Model Basin
b Institute of Textile Cleaning TNO
ORGANIZATION FOR NUTRITION AND FOOD RESEARCH TNO
b Central Institute for Nutrition and Food Research TNO
a Institute for Cereals, Flour and Bread TNO
b Institute for Fishery Products TNO
Research group for Meat and Meat Products TNO
Affiliated Foundations
a National Institute for Malting Barley. Malt and Beer - TNO
c Institute for Agricultural Research of industrial biological, biochemical and chemical products
NATIONAL DEFENCE RESEARCH ORGANIZATION TNO
Physics Laboratory TNO
Prins Maurits Laboratories TNO
Medical Biological Laboratory TNO
Chemical Laboratory TNO
Technological Laboratory TNO
Central Management Prins Maurits Laboratories TNO
Institute for Perception TNO
ORGANIZATION FOR HEALTH RESEARCH TNO
c Research Institute for Public Health Engineering TNO
Institute of Medical Physics TNO
Radiobiological Institute TNO
Netherlands Institute for Preventive Medicine TNO
Institute for Experimental Gerontology TNO
Gaubius Institute
Tuberculin Research Unit TNO
Caries Research Unit TNO
Research Unit for Testing Dental Materials TNO
TNO Unit for Clinical Research of Medicaments
TNO Research Unit for Health Aspects of Ageing in Old People
TNO Research Unit for Epidemiology of CNSLD
TNO Research Unit for Clinical Neurophysiology
TNO Unit for Epidemiological Research Concerning Mental Hygiene
TNO Research Committee on Occupational Health
Research Committee on Epilepsy TNO
Central Institute for the Breeding of Laboratory Animals TNO
Radiological Service Unit TNO
Primate Centre TNO
National Council for Agricultural Research TNO
Council for Health Research TNO
Bureau of the Council for Health Research TNO
Committee TNO on Environmental Research
Study and Information Centre TNO on Environmental Research
Committee for Fishery Research TNO
Committee for Hydrological Research TNO
Committee TNO for Traffic Research
Committee TNO for Research on Side-effects of Pesticides and Related Compounds
Planning Committee for Building Research TNO
Institute TNO for Mathematics, Information Processing and Statistics
Patent Department TNO
Documentation Department
Economic Technical Department TNO
c Institute of Applied Physics TNO-TH
Institute for Organic Chemistry TNO
Institute for Physical Chemistry TNO
Research Centre TNO for Town and Country Planning
Bureau for International Projects TNO
Groundwater Survey TNO
Patent Information Service formerly NIDER
Position of cooperative R & D in TNO-institutes
a. cooperative R & D predominant
b. cooperative R & D important
c. cooperative minor activity
d. cooperative at request of other TNO-institutes only
e. cooperative R & D liaison and management only

Study and Information Centre TNO on Environmental Research
TNO-Complex Zuidpolder
97 Schoenmakerstraat, Delft
P.O. Box 186, Delft
Phone: 015 - 56 93 30

Planning Committee for Building Research TNO
5 Lange Kleiweg, Rijswijk (ZH)
P.O. Box 49, Delft
Phone: 015 - 13 82 22

Bureau Explosion Safety TNO
117 Lange Kleiweg, Rijswijk (ZH)
P.O. Box 45, Rijswijk (ZH)
Phone: 015 - 12 03 30

Netherlands Industrial Council for Oceanology
97 Schoenmakerstraat, Delft
P.O. Box 215, Delft
Phone: 015 - 56 93 30

Project Group for Nuclear Energy TNO
129 - 135 Laan van Nieuw Oost-Indië, The Hague
P.O. Box 614, The Hague
Phone: 070 - 81 48 21

Project Group for Turbo Machines TNO
TNO-Complex Zuidpolder
97 Schoenmakerstraat, Delft
P.O. Box 406, Delft
Phone: 015 - 56 93 30

Institute of Applied Physics TNO-TH
1 Stieltjesweg, Delft
P.O. Box 155, Delft
Phone: 015 - 56 93 30

Institute TNO for Building Materials and Building Structures
5 Lange Kleiweg, Rijswijk (ZH)
P.O. Box 49, Delft
Phone: 015 - 13 82 22
Including:
Technical Centre for Fire Prevention

Central Technical Institute TNO
Albert Schweitzerlaan/Arnhemseweg,
Apeldoorn-Zuid
P.O. Box 342, Apeldoorn-Zuid
Phone: 05760 - 73 344
Including:
Physical and Chemical Technology
Physical Measuring Techniques
Ceramics
Reactor Technology
Fluid Flow Technology
Heat Engineering and Cryogenic Technology

Forest Products Research Institute TNO
TNO-Complex Zuidpolder
97 Schoenmakerstraat, Delft
P.O. Box 151, Delft
Phone: 015 - 56 93 30

Plastics and Rubber Research Institute TNO
TNO-Complex Zuidpolder
97 Schoenmakerstraat, Delft
P.O. Box 71, Delft
Phone: 015 - 56 93 30

Institute for Leather and Shoe Research TNO
55 Mr van Coothstraat, Waalwijk
Phone: 04160 - 33255

Metal Institute TNO
Albert Schweitzerlaan/Arnhemseweg,
Apeldoorn-Zuid
P.O. Box 541, Apeldoorn-Zuid
Phone: 05760 - 73 344

Including:
Technical Centre for Metalworking
Technical Foundry Centre
Welding Department
Surface treatment Department

Netherlands Ship Research Centre TNO
5 Leeghwaterstraat, Delft
P.O. Box 29, Delft
Phone: 015 - 56 92 18

Paint Research Institute TNO
TNO-Complex Zuidpolder
97 Schoenmakerstraat, Delft
P.O. Box 203, Delft
Phone: 015 - 56 93 30

Institute TNO for Packaging Research
TNO-Complex Zuidpolder
97 Schoenmakerstraat, Delft
P.O. Box 169, Delft
Phone: 015 - 56 93 30

Fibre Research Institute TNO
TNO-Complex Zuidpolder
97 Schoenmakerstraat, Delft
P.O. Box 110, Delft
Phone: 015 - 56 93 30
(Various fields of textile research including paper research department)

Institute of Textile Cleaning TNO
97 Schoenmakerstraat, Delft
P.O. Box 70, Delft
Phone: 015 - 56 93 30

Institute TNO for Mechanical Constructions
5 Leeghwaterstraat, Delft
P.O. Box 29, Delft
Phone: 015 - 56 92 18

Including:
Information Centre for Automation, Electronics, Instrumentation and Mechanization

Research Institute for Printing and Allied Industries TNO
1 Ter-Gouwstraat, Amsterdam-O.
P.O. Box 4150, Amsterdam
Phone: 020 - 94 95 25

Research Institute for Road Vehicles TNO
40 Ezelsveldlaan, Delft
Phone: 015 - 12 59 34 / 12 59 37

Central Institute for Nutrition and Food Research TNO
48 Utrechtseweg, Zeist
Phone: 03404 - 18 411 shortly: 03404 - 24 688

Including:
Netherlands Centre for Meat Technology

Institute for Cereals, Flour and Bread TNO
15 Lawickse Allee, Wageningen
P.O. Box 15, Wageningen
Phone: 08370 - 19 051

Institute for Fishery Products TNO
37 Dokweg, IJmuiden
Phone: 02550 - 19 022

Including:
Materials Division

National Institute for Malting Barley, Malt and Beer - TNO
46 Utrechtseweg, Zesit
Phone: 03404 - 18 411, shortly: 03404 - 24 688

Institute for Perception TNO
5 Kampweg, Soesterberg
P.O. Box 23, Soesterberg
Phone: 03463 - 14 44

Research Institute for Public Health Engineering TNO
97 Schoenmakerstraat, Delft
P.O. Box 214, Delft
Phone: 015 - 56 93 30

National Structures and Systems of Funding of Industrial Research — the Republic of Ireland

Martin J. CRANLEY,
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Institute for Industrial Research and Standards, Dublin (IIRS)

The Republic of Ireland—The Country and its Economy

The island of Ireland has an area of 84 200 sq km and a population of 4.5 million, of which 70 100 sq km and 3 million population are in the Republic of Ireland. Our principal natural resource is the combination of a temperate moderate climate and a fertile soil. Up to recently, it was thought that we had little or no mineral resources, but considerable deposits have now been found, particularly lead and zinc. We have little indigenous fuel apart from peat, from which 30% of our electricity is generated, another 15% is hydro-electric power, the remainder comes from oil.

Our economy has traditionally been predominantly agricultural. As a result of strenuous efforts at industrialization in recent decades, Agriculture, Forestry and Fisheries accounted for 18% of our Gross Domestic Product in 1971. Industry for 35%, and Services, the remainder. Most of this change has occurred in the last 15 years, e.g. the volume of output of Irish Industry in 1971 was 92% greater than in 1960. This has been mainly due to the provision of significant State incentives to attract foreign industries to Ireland and to develop native industry, much of the latter having previously been established to supply the needs of a home market protected by high tariff barriers. However, protectionism is now rapidly disappearing, firstly as a result of the Anglo-Irish Free Trade Agreement of 1966, and secondly because of our accession to the EEC.

Our Gross National Product (GNP) increased at an average rate of 4.5% per annum in the period 1959-1969, nearly 4 times the rate of the previous decade. The industrial sector grew by 6.75% per annum and the agricultural sector by 1.5% per annum. The hitherto persistent downward trends in population and employment were arrested. Unemployment and emigration declined—the latter quite remarkably.

However, despite all this recent progress, our Gross National Product per capita is still the least of all the EEC countries and is only about half of the average within the EEC.

Another noteworthy feature of the Irish economy is its openness to international trade—*Imports plus Exports* represent *80% of the GNP.* This is due to the small size of the Irish home market, the scarcity of native fuels and of industrial raw materials and the relative lack of a capital goods industrial sector. Our industrial exports in 1968, for the first time, accounted for over half of our exports. Over half of our imports are materials for further production, about one-quarter are goods for direct consumption, and about one-sixth are producers' capital goods. Another feature of our trade is that in 1971, 66% of our exports went to, and 50% of our imports came from, the United Kingdom.

Three features of Irish industry must be stressed.

1) We have no large firms by international standards.

2) The variety or diversity of industry in Ireland is nearly as great as in a highly industrialized country.

3) A very considerable proportion of our medium-sized industrial units are subsidiaries of overseas companies. Consequently, their policy-making, top management and R & D are located abroad.

Up to about 1960, most foreign investment in Ireland was British. While British investment has continued, there has in the last 12 years been a remarkable increase in investment by other countries, notably the USA and West European countries. Over the 12 years, 1960-1972, Government grants were given to 668 projects for new industries or for major expansions, involving a total investment of £221 million. More than two-thirds of these projects, involving three-quarters of the total investment, originated overseas.

Science and Technology in Ireland

The concept that science and technology had a role in Irish economic development is not new. There have been isolated expressions of this since 1840. But for various reasons, both political and economic, it was not until the late 1920s that national authorities for the production of electrical power, sugar, alcohol and peat were established by the new State. Apart from these, nearly all science and technology in Ireland up to the outbreak of the Second World War was conducted in our universities, which were poorly endowed by Western European standards and by a single private enterprise concern.

Our technical deficiencies were made obvious by the dislocation of our economy during the last war. The Emergency Scientific Research Bureau was established in 1943 to alleviate the situation and its success led the Government to establish my organization—Institute for Industrial Research and Standards—IIRS—in 1947. In 1958, the Agricultural Research Institute was established. It is indicative of our attitude both to Economic Development and to Industrial Science and Technology even as recently as the middle 1950s, that while £1.8 million of United States Counterpart funds were allocated to Agricultural Research, only £130 000 was given to IIRS (6.7%).

Other organizations were also established in the late fifties and early sixties; the most important of these in the research field were the Institute for Physical Planning and Construction Research (AFF) in 1964 and the Economic and Social Research Institute (ESRI) in 1966. These are the principal national organizations involved in Research and Development and, together with the Higher Education Sector and Business Enterprise, perform nearly all Research activity in Ireland.

R and D Expenditure in Ireland in 1971

Provisional Results of a Survey of R and D in Ireland in 1971 have just become available and these give an up-to-date and fairly accurate summary of the overall position in Ireland for that year.

Summary of Provisional Results of Survey by National Science Council for 1971 (issued March 1973)

N.B. It is emphasized that *these Results are Provisional* and are based on approx. 90% completion of the Survey.

Gross Expenditure on R and D (GERD) was *£14.27 million in 1971* as compared with *£9.95 million in 1969.*

GERD as a percentage of GNP (£1922 million in 1971) was about *0.74% in 1971* (*0.67% in 1969*).

Note: Ireland does not engage in Nuclear, Defence or Space Research.

Estimated Breakdown of Expenditure by Sectors

Sector	R & D Expt. 1971 - £m.	% G.E.R.D. - 1971	R & D Expt. 1969 - £m.	% G.E.R.D. - 1969	% Overall Increase 1969-1971	% Annual Increase, Compound
Government (1)	6.42	45.0	4.72	48.9	36	16.6
Business Enterprise	5.32	37.3	3.41	34.0	56	24.9
Higher Education	2.12	14.9	1.50	15.1	41.3	18.3
Private Non-Profit	0.41	2.9	0.32	2.0	28	13.2
All Sectors	£14.27 m	100%	£ 9.95 m	100%	43.4%	19.8%

(1) Including the major national research institutes.

In *Real Terms*, the annual increases (% Compound) are Government Sector 6.4%; Business Enterprise Sector 14.0%; Higher Education Sector 8.6%; Private Non-Profit Sector 3.7%; *all Sectors* 9.3%.

Approx. Distribution of Sources of R and D Funds

Sector	1971 (%)	1969 (%)
Government	49.1	51.6
Business Enterprise	40.0	36.3
Higher Education	8.4	8.9
Private Non-Profit	1.1	1.1
From Abroad	1.4	2.1

It should be noted that, for the first time, it appears that Government sources have fallen below 50% and the Business Enterprise sector has increased to 40%.

Of all economically-orientated research in Ireland, about 45% is in the Agricultural sector (mostly Government-funded) and 42% in the Industrial sector—business enterprise and IIRS. About two-thirds of all Government money for R and D goes to the Agricultural sector which accounts for one-third of the total national R and D.

It should also be noted that 4 companies account for 41%, and 20 companies account for 69%, of all Business Enterprise R and D expenditure.

In the financial year 1972-1973, the Government grant to—

IIRS was	£1.293 million	(£0.948 million in 1971-1972)
AFT was	£2.81 million	(£2.5 million in 1971-1972)
AFF was	£0.282 million	(£0.238 million in 1971-1972)
	£4.385 million	(£3.686 million in 1971-1972)

The grant for IIRS for the current year 1973-1974 is £2 million—of which 20% is to start a major and long overdue Building Programme.

Industrial R and D Grants Scheme of the Industrial Development Authority

The Industrial Development Authority (IDA) has overall responsibility for promoting the development of Irish industry, especially the provision of grants and/or loans for new industrial projects whether initiated by indigenous or foreign-based companies. The IDA has since 1970 operated a scheme whereby up to 50% of the cost of approved industrial R and D projects may be given to firms as non-repayable grants. Up to the end of 1972, 89 projects, with a total estimated expenditure of £568 000, had been approved for such grants.

The Institute for Industrial Research and Standards—IIRS

IIRS is, after Industry itself, the only significant organization in Ireland involved in industrial research and development.

In 1961, after 14 years of existence, IIRS was a very small and relatively ineffective organization. It was beset by many difficulties, financial, legal, policy-making and management. Under an Amending Act of 1961, a new Board was appointed to undertake the task of reorganization and development. In the eleven years from 1961 to 1972, the Institute has grown from a Budget and staff of £35 000 and 35 people respectively to £1.6 million and nearly 450 staff. The greater part of our income is by way of Government grant, but strenuous efforts have been made in recent years to increase earned income from industry Last year this amounted to just over £300 000 or 22% of our Gross Revenue Expenditure. We intend that this should increase to about 35% in the next 3-4 years.

The role of IIRS is simply stated as being to assist and to encourage the exploitation of Science and Technology in Irish industry and to provide the necessary technological support to maintain existing industry and to assist its growth.

Our principal functions as defined in our Act of Parliament are:

(a) to perform and encourage scientific research

  (i) to promote utilization of natural resources

  (ii) to improve technical processes and methods used in State

  (iii) to discover technical processes and methods to facilitate the expansion of existing or the development of new industries and to utilize waste products of industry

(b) to formulate Standard Specifications etc.

(c) to disseminate technical literature and information to industry

(d) to undertake or assist in the development and exploitation of inventions.

In practice, IIRS performs the following functions:

Applied Research

Technical Design and Development

Technical Consultancy

Techno-Economic Studies and Evaluation of Research and Technical Programmes

Problem-Solving and 'Trouble-Shooting'

Advisory, Liaison and Promotion Services

Measurement, Testing and Analysis

Standards: Specifications, Standard Marks, Quality Control

Technical Information: Acquisition, Storage and Dissemination

Using, principally, the following Sciences and Technologies:

Physics
Chemistry
Biochemistry
Microbiology
Mathematics and Computer Science
Civil Engineering
Mechanical Engineering
Production Engineering
Electronic Engineering
Electrical Engineering
Chemical and Process Engineering
Metallurgy
Metrology

Food Technology
Packaging Technology
Printing Technology
Textiles Technology
Timber Technology

Mainly for the following Industries:

Building and Construction
Engineering (particularly mechanical and electronic)
Textiles (particularly knitwear and clothing)
Food Processing
Fine Chemicals
Minerals and Inorganic Chemicals
Paints and Surface Coatings
Plastics
Timber and Wood-using Industries
Furniture
Packaging
Printing

IIRS also provides the following *Specialist Services* to *all industries:*

Fuel Efficiency
Industrial Engineering
Automatic Measurement and Control
Industrial Water and Air Pollution Abatement
Acoustics and Vibration

Benefits

Cost-Benefit studies show a Benefit/Cost ratio on R and D Expenditure of at least 15:1 and a Benefit/Cost ratio of at least 2:1 on expenditure on technical advisory and consultancy services in the years 1969-1971 and *accruing in the same two years.*

Much of what we do would in larger and more developed countries, be conducted by separate institutions, e.g. the national Standards activity, the national industrial technical information function, even the national function of promoting science and technology in industry, particularly for small industry. None of these activities are potentially

important sources of earned income and this is one reason why our ration of earned income to expenditure is not only low, but cannot be expected to increase to a very high percentage.

IIRS activities are approximately 30% R and D and 70% Technical Services. Using a strict interpretation of the word 'Research', our R and D is best described with a small 'r' and a Capital 'D'—to indicate that our 'r' and 'D' is a small amount of Applied Research and a large amount of Design and Development. About half of our R and D is performed for individual client companies on a confidential basis—the other half is IIRS-initiated where we put State money at risk in areas not yet attractive to industrial companies.

Perhaps the responsibilities of IIRS may be more easily understood by analogy with the United Kingdom. Our task is to do in a country of 3 million people, with a relatively small but rapidly expanding industrial sector which is nearly as diverse as that of any developed country, what is done in the United Kingdom primarily by:

(i) the many Government Civil Research Establishments such as National Physical Laboratory, National Engineering Laboratory, Warren Springs, Building Research Station etc.;

(ii) the 40-plus British Research Associations;

(iii) the British Standards Institution and

(iv) the National Research and Development Corporation—NRDC.

This wide range of functions and responsibilities across a diverse pattern of industry means that our work is extremely varied and that we are really a multi-purpose industrial technical organization. However, such a concentration of functions and resources in one organization is probably necessary for a small country such as Ireland.

IIRS—The Future

We completed the preparation of our 2nd Five-Year Plan in July 1971 and we consider it to be a milestone in the development and evolution of IIRS. In outlines the philosophy and role of the Institute and describes its strategies and objectives. The first strategy—the 'Defensive Strategy'—is to continue to support the efficient operation of industry by providing a large variety of Technical Advisory Services. The second—'Offensive Strategy'—is to stimulate industrial expansion by providing new viable Investment Opportunities in technology to firms committed to grow in Ireland and by offering technological support to industrial firms attempting to grow and/or to introduce radical change.

The Resources required to implement the Plan are an increase of 150% over 5 years in staff and annual cost and also a Capital Development Programme, mainly for Buildings, of more than £3 million.

We have been gratified by the reception given to the Plan. It appears to have stimulated new thinking in certain influential quarters in Ireland. More recently, it has received favourable comment from the Northern Ireland Department of Commerce, the British Ministry for Trade and Industry and OECD, particularly with reference to Mediterranean countries (IIRS staff are now acting as consultants to the Government of Portugal). We have also had requests for consultancy services from the governments of under-developed countries.

The National Science Council and recent OECD Reviews

The first attempt in modern times to examine Science and Technology in Ireland at national level was the publication in 1966 of a 2-volume Report 'Science and Irish Economic Development' by a joint Irish/OECD Survey Team. Its major recommendation was that a National Science Council be established to advise the Government on all matters relating to Science and Technology with particular reference to economic development. This Council—the NSC—was set up at the beginning of 1968 and its initial task was to report on the first Five-Year Plan of IIRS for 1968-1973. Last year, it reported very favourably on our second Five-Year Plan. About 18 months ago, the National Science Council, after much discussion and controversy, decided that to perform its functions adequately and to fulfil the national needs, as it saw them, of Resource Allocation and Programme Coordination in Science and Technology, it should be reconstituted as a statutory body with resource-allocating powers. Last summer, the Government approved in principle that there should be a statutory body, but deferred decisions on its functions, duties and powers pending the completion of the OECD Reviews then in progress.

These OECD Reviews of (a) Ireland's Science Policy and (b) Ireland's Scientific and Technical Information Policy have just been completed by the holding of the respective Confrontation Meetings in Dublin in March 1973. This was the first time that OECD conducted two such Reviews of one country in parallel. The official reports are expected to be published by OECD in summer 1973. We were fortunate to have as Chairman of both Teams of OECD Examiners Prof. Bottcher of the Netherlands, who was assisted by eminent experts from Norway, Denmark, Belgium, France and Canada. Such reviews are always an occasion for national self-criticism and for recommendations and suggestions by the foreign examiners. In the case of Ireland, which had no pretensions to have National Policies for either Science and Technology or for Scientific and Technical Information, the exercise was

indeed a difficult one. However, our Research Institutes emerged with considerable credit from the reviews and IIRS is pleased with their outcome.

The OECD Examiners gave special attention to future institutional arrangements in Ireland for Science and Technology. They endorsed the National Science Council's proposal and the Government's approval in principle that there be a statutory National Board for Science and Technology (NBST). However, they did not agree that the new Board should have Resource-Allocating powers, which they recommended should be exercised by a Cabinet Committee for Science and Technology, of which the Minister for Finance would be Chairman.

At present, each Research Institute argues its case with, and receives its Government grant from, its own Ministry (Industry and Commerce, Agriculture and Fisheries and Local Government in the case of the three major Research Institutes, IIRS, AFT and AFF). Each Ministry in turn makes its representations to the Minister for Finance who at present coordinates only to a limited extent national R and D Programmes and Expenditure.

The OECD Examiners recommended that the new Board—NBST—would be responsible to the Minister for Finance and would prepare for him, and for consideration by the Cabinet Committee, policies and proposals for Science and Technology and for public investment in them, including an overall Science Budget. A new Government has recently taken office in Ireland, so it will be some time before decisions are taken on this and related matters. My purely personal guess, however, is that there will be a National Board for Science and Technology generally along the lines of the OECD recommendations, but probably with the Minister for Finance acting alone instead of the proposed Cabinet Committee.

The OECD Examiners particularly noted:

1) the central role of the Irish Government as a source of funds for R and D, and of the national Research Institutes as performers of R and D. They considered these Institutes to be the backbone of the Irish Science System and believed that they gave Ireland a strong base for further development;

2) the unusually high proportion of R and D resources spent on Agriculture and concluded that there must be a change in the overall pattern of resource allocation and a shift of emphasis towards industrial R and D;

3) the imbalance between scientific and technical information activities in different sectors, with agriculture absorbing 76% of the resources for STI in the public sector. Since activities other than agriculture

are relatively lacking in information resources, they suggested that a disequilibrium of this apparent magnitude could be most serious.

The OECD Reviews were a complete endorsement of the work of IIRS and stressed the great need to increase its activities and resources. Consequently, we in IIRS will have to re-examine as a matter of urgency our Five-Year Plan, as it seems that we have underestimated the need and have been too modest in making claims on national resources.

*

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IIRS

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An Foras Forbartha (AFF) - Institute for Physical Planning and Construction Research

Economic and Social Research Institute (ESRI)

IIRS:

Five-Year Plan 1971-'76 (July 1971)

Articles in Technology Ireland (IIRS Monthly Journal)

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(b) (Cost-Benefit Analysis of) R and D Activity at IIRS (April 1972)

(c) The Future Role of IIRS (June 1972)

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ditto. for 1971 in preparation

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Progress Report 1969-'71

Report on IIRS Five-Year Plan 1971-'76 (1972)

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(Basis Information and Statistics for OECD Reviews)

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OECD:

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An Outline of Funding and Organization of Industrial Research in Italy

Professor Costantino A. FASSÒ
Member of the Board
Consiglio Nazionale delle Ricerche

In Italy the industrial research is financed by many Ministries and public agencies as well as by private companies. The research activity of Ministries and public agencies is carried on through their own Laboratories and Experimental Stations, as well as through contracts with Universities and private industries. Since most of the Ministries and public agencies finance both basic and industrial research, it is not always easy to evaluate the part of funding to be attributed to industrial research. An approximate estimate of such a part is given in the following table, based on the budget for 1972.

	Total expenditure for R & D million u.a.	Expenditure for industrial R & D million u.a.
1) PUBLIC FUNDING		
Min. of Education	162.0	
Min. of Health	7.3	0.5
Min. of Defence	22.8	17.8
Other Ministries	66.8	17.3
CNR	109.3	18.4
CNEN	82.0	19.5
ENEL	23.4	23.4
Total 1)	473.5	96.9
2) PRIVATE FUNDING		
Industries with State financial Participation	160.0	160.0
Private Industries	420.0	420.0
Total 2)	580.0	580.0
Total 1) + 2)	1 053.4	676.9

Note: CNR is the National Research Council.
CNEN is the National Committee for Nuclear Energy.
ENEL is the National Agency for Electric Power.

From these figures it appears that the expenditure for industrial research is about 65% of the total. According to the adopted classification, only 14% of this expenditure seems to be supported by public funding. But as a matter of fact the true percentage is much higher, for two reasons: first, the industries with State financial participation are largely financed by the Government and so are the researches they carry on, and second the IMI (Istituto Mobiliare Italiano) Applied Research Fund is included in item 2), of which it represents about 24%.

Most of the industrial research activity sponsored by public funding is done on a cooperative basis, as well as a part of that of the industries with States financial participation. The same is true for a part of the activity of the private industries financed through the IMI Applied Research Fund.

The total expenditure devoted in Italy to research purposes is rather low, as it represents only about 1% of the Gross National Product. Therefore the expenditure for industrial research, though being a material percentage of the total, is still inadequate to the needs of the country and it is expected that it be increased in the next years.

Since Italy is highly interested in international cooperation in the field of industrial research, the proposals that will come out from this Convention will deserve careful consideration by our authorities.

Financing of Applied Research Projects in Italy, a role of IMI Istituto Mobiliare Italiano

Dr P. ALDERISIO
Director
Technical Office for Applied Research
Istituto Mobiliare Italiano

We have already heard, thanks to Professor Fassò's presentation, about the Italian research structure, which is so to speak made of two large sub-structures. The first one is made of public research institutions such as CNR—National Research Council, CNEN—National Nuclear Energy Commission, the Experimental Stations of the Ministry of Industry and the University Research Laboratories. The second sub-structure is made of Research Laboratories operating within industrial concerns, either public or private, but generally private. Contrary to the public research institutions, traditionally supported by public funding, industrial research laboratories were almost exclusively self-supported, in Italy, up to a few years ago. This very segment of the national research structure is going to be the subject of my presentation, that is public funding or financing of research activity within industry, as carried into effect for the first time at the end of 1968, with the establishment of the so called Applied Research Fund.

Purpose of the Fund is that of contributing to the development, technological updating and rationalization of the Italian industry, by promoting applied research with adequate funding or financing.

Note that applied research activity is here considered as a means for industrial development rather than the final objective of the Fund. Full account of this important aspect is taken due care of as one of the conditions to be satisfied in order to qualify the applied research projects for financial help.

The Applied Research Fund amounts to 150 billion lire, approximately $250 million; as brought about with the Italian law No 1089 in October 1968, and following amendment of 1971. Fund administration is entrusted by this law to IMI—Istituto Mobiliare Italiano, which is a large Italian public-law financial institution with autonomous management. IMI is in effect the largest Italian medium-long term credit institution, having the statutory purpose of contributing to the

development and strengthening of the Italian economy by carrying out credit, and financial transactions in general, for the industry. The Applied Research Fund is just one of several public funds entrusted to IMI although the main activity of the institution consists of autonomous financial transactions including capital borrowing through the issue of interest bearing bonds.

Specifically, Applied Research Fund administration involves both advisory and executory functions in observance of priorities and directives established according to the law by CIPE, the Italian Interministerial Economic Planning Committee; in particular IMI performs the examination of applications issued by firms proposing development of new research projects. The applicant firm is first to be evaluated with regard to its own assets and with particular reference to type of business and volume, company size, balance sheet situation profit-loss situation and with due consideration of company policy and future plans, research organization and qualification.

The actual research project is then evaluated with particular reference to technical objectives, development programme, cost and duration estimate, ability of the research organization to develop the project and probability of meeting the technical objectives. Particular attention is then devoted to the industrial and commercial exploitation of the research results, that is ability of the company to transfer said results in production, further to what kind of business volume can be expected, what kind of adjustments will be required in marketing and production company structure, how much additional investment will be required and eventually which is the likely return on the overall investment. Since the Applied Research Fund will only finance the research project, eventually including no more than a small pilot line, the applicant company must arrange a sound financial plan to cover with other means further production investments.

Screening of the applications involves, in addition, the matter of funding duplication, inasmuch the Applied Research Fund cannot duplicate financing of projects already been or likely to be financed by the Italian government in other forms.

One important additional condition to be met is that the technical and financial risk of the project must be sufficiently high that the company would not be able to afford it without the help of the Fund.

Priorities within CIPE directives consider as particularly worthy:

— Research projects included in the framework of multinational initiatives, according to the Italian economic policy and international Italian government commitments.

— Research projects able to introduce advanced technology in public interest services.

— Research projects able to diversify the Italian industrial structure with the introduction of advanced technology.

— Research projects able to improve the international competitivity of the Italian industry.

— Research projects lending to further diffusion and fall-out, thus yielding further industrial development.

Additionally, in order to assist small and medium size firms, and firms operating in economically depressed areas, 15% of the Applied Research Fund is reserved to small and medium size firms, and 40% is reserved to firms operating in southern Italy, according to the Italian policy of promoting industrialization in this part of the country.

At the conclusion of the application proceeding IMI transfers its conclusions and proposal to CIPE which in turn, taking into consideration IMI recommendations within the framework of the Italian economic development plans, issues the final decision about qualification and terms of financing.

Let us now see which forms of funding and financing are allowed by the law. There are three possible forms:

Form a) is related to the constitution of research associations between two or more industrial firms. In this case funding requires the acquisition by the Applied Research Fund of partnership equity in the newly formed research company.

Form b) is related to low interest rate loans, that is at 3% interest rate, covering up to 70% of the actual research project cost.

Form c) is a particular form of funding, it being related to the actual results of the research project: should the project objective be not met at the end of the research programme, funding is an actual grant for up to 70% of the project cost. Should the objective be met otherwise, funding is converted into a 3% rate loan, according to form b). Form c) is applicable to research projects having a relatively high risk content, otherwise form b) directly applies. Since form c) in practice allows to cover up to 70% of the financial risk, the applicant firm can in this case afford particularly difficult research tasks with the assurance that the invested money will not have to be returned to the Fund unless the expected objectives are met. If objectives are not met, the company is entitled to retain the funding and in this case the price to be paid is that all findings, process data, patents and all significant results in general, are acquired by IMI on behalf of the Applied Research Fund. IMI will eventually dispose of this technical material by selling or publicizing any useful data.

According to either form b) or c) IMI refunds up to 70% of actual research costs every six months. To this extent the firm has to supply full evidence of cost statement, as proven by technical reports, bills, and cost registration in company official books. Usually IMI performs technical and administrative inspections at the company's premises in order to assess whether the actual research activity is in line with the originally proposed programme and whether cost statements are true, correct and actually incurred for the research programme.

At the end of the research programme the company will have acquired, in case b), a debt to be redeemed with constant instalments covering capital and interest in a time period ranging from 3 to 10 years. As per form c) the same applies if the case research has a successful ending, otherwise the company will retain funding under the already mentioned conditions.

Further comment is now required about form a). As already mentioned this form applies to the constitution of new research associations between two or more industrial concerns willing to develop a common research programme. This kind of association is particularly useful in the case of projects requiring diversified technical competence, and a number of such projects spanning over several years. The Applied Research Fund normally acquires a relative majority partnership equity in the research company. Once the company is constituted, research programmes developed by the company are financed according to form b) or form c), as in the general case.

The partners' equity of a research company is to cover the general costs of the company, project costs being covered up to 70% by the Fund and by the industrial partners for the difference. Company income is represented by fees or royalties being paid to the company by partners or external customers acquiring the research results.

You might be interested in a few statistics, as of the end of 1972. IMI had at that time received in four years, since the institution of the Fund, about 500 applications for as many applied research projects, 300 of which qualified for financing.

Out of these 300 research projects, about 20 were successfully concluded, 210 running, and about 70 new applications were being processed by IMI. Total funding allotted to the approved projects, that is to cover estimated costs of the 210 running projects plus the actual costs of the 20 concluded projects, amounted to about 2/3 of the Fund that is about $170 million. Form a) amounted to about 13% of total allotment, form b) to about 65% and form c) to about 22%.

Considering the industrial sectors:

— Electronics were ahead with	27% of total allotted followed by
— Chemical Industry with	20%
— Mechanical Industry with	14%
— Pharmaceutical Industry with	10%
— Aeronautical Industry with	7%
— Iron Metallurgical Industry with	6%
— Miscellanea (*)	16%
	100%

The mere 7% for Aeronautical Industry does not reflect the actual applications in this sector. In fact several aeronautical projects have so far been set aside while expecting a new amendment of the law which will raise the Fund from $250 million to about $420 million, to include aeronautical projects.

As per form a), up to now 4 research associations have been formed:

— *Tecnomare*—Is a research company formed by IMI (30%), ENI (25%), FIAT (10%), Finsider (10%), Pirelli (5%), Micoperi (10%), E. Breda (5%), Selenia (5%), for the development of new techniques and hardware for the exploitation of deep sea resources, namely oil.

— *Sago*—Is a research company formed by IMI (29.9%), Pignone Sud (14%), Olivetti (14%), Selenia (14%), Montedel (14%), Sorin (14%), Ist. Negri (0.1%) for the implementation of electronic medical data processing in hospital services.

— *Tecnocasa*—Is a research company formed by IMI (30%), Nuovo Pignone/ANIC (ENI) (14%), SIR (14%), M. Edison (14%), Italstat/Italsider (IRI) (14%), MCS (EFIM) (14%) for advanced house and industrial building techniques and materials.

— *Tecnotessile*—Is a research company formed by IMI (46%), Unione Industriale Pratese (18%), Cassa di Risparmi e Depositi di Prato (18%) for the development of textile research programmes.

The Italian law 1089 which instituted the Applied Research Fund is going to be amended in the near future with a few but important improvements:

— Financing will be raised from 70 up to 100% of project cost

— Form d), concerning up to 20% grants, in addition to form b) or c) financing, will also be introduced.

(*) Food, textiles, instrumentation, Electromechanics, housebuilding, ceramic, rubber, wood.

As already mentioned, the Fund will be raised from $250 million to about $420 million.

Over four years since the institution of the Applied Research Fund the balance of achievements and results is with no doubt quite positive.

Apart from the promotion of new industrial initiatives, with a real contribution towards the strengthening of the national research structure within the Italian industry, Fund administration has also made a significant contribution towards the implementation of research planning and programming. Fund requirements have in fact compelled several firms to get acquainted with the latest research planning techniques, thus yielding a valuable service to firms' management.

The undoubted success of the Applied Research Fund procedures in Italy can probably suggest some valid ideas for similar initiatives in other countries, or even for multinational research programmes. It in fact appears that the European Bank of Investment is going to run an EEC fund whose procedures will bear several similarities with the Applied Research Fund.

Present National Structures and Systems of Funding — United Kingdom

Mr B.W. OAKLEY
Under Secretary
Research and Development Requirements Division,
Department of Trade and Industry

1—HISTORY

It is generally stated that the first British Government financial support for Research and Development was the formation of the National Physical Laboratories at the turn of the century in 1900, but in fact support for R & D goes back long before that. For example the Government was supporting computer research in the 1830's when that irascible genius Charles Babbage applied for, and obtained, a grant for the development of the world's first digital computer. True to form he overran his budget, both in time and money, but the Treasury did stump up with the funds for some years. Going even further back Isaac Newton was funded as Director of the Royal Mint —at first sight the fact that he was largely working on alchemy research at the time suggests that Lord Rothschild would hardly have approved, until one realizes that his research grant applications might have stressed the cost benefits of generating gold coin from base metals. However, there is no real doubt that Government support for Industrial Research started, as so often seems to happen in the scientific field, under the stress of war in 1917. The Government, in an attempt to encourage industrial research, offered to provide what we would now call 'launching aid' for industrial cooperative Research Associations in the form of an annual grant for a few years equalling the subscriptions raised by the Associations from industry. There were already a few cooperative research bodies in being but true to form— industry jumped at the chance of getting their hands on taxpayers money, and by 1970 there were 20 IRA's in being (incidentally IRA's stands for Industrial Research Associations, but out of respect for our friends in the Irish Republic—with whom we have very close links in the Research Association field— we tend to drop the 'I' these days for fear of confusion with another organization with the initials IRA). As one who has had on several occasions to try to explain to Treasury why it is necessary to extend indefinitely what started as a purely

short term support scheme, I have a certain sympathy with those officials who had to go back to the Treasury at the end of the initial period to explain that it would be necessary to maintain the grants. Just to emphasize the point, the one RA that was considered to be suffciently viable to survive without government support, when the grant was withdrawn in 1920, promptly went into dissolution.

2—CURRENT STATE

Since then there has been a continuous period of growth, and change, but the RA's of today are still discernibly evolved and linked to those bodies established in the early 1920's. Today there are some 40 Research Associations in receipt of some form of Government Grants, 4 from Department of the Environment, 4 from Ministry of Food and Fisheries, and the rest from Department of Trade and Industry. There are a further 20 odd cooperative RA's that do not receive government financial aid.

3—STATISTICS OF R & D

In the United Kingdom we have a saying, 'There are lies, damned lies, and statistics'. I believe it was first coined by Benjamin Disraeli, no doubt in a comment on some Government White Paper, when in opposition. Well I often feel like that when I look at the official statistics on R & D. Today some £1 000 million is spent in the United Kingdom on R & D; of that about £17 million or 1½% is spent on the Research Associations. But this gives a totally false impression of the importance of the RA's in the industrial R & D scene. About ¼ of the total is for work carried out in the Government's own laboratories, largely for defence, about 60% is for work in industry—but again if one takes away the figures for defence, aircraft, nuclear and electronics—the high technology industries—the picture looks very different. Another 10% goes on basic research in Universities and Research Councils. In the medium and low technology industries the work on R & D by the RA's continues to be a major factor in the pattern of work. In some industries the RA does as much as 80% or more of the total R & D. (There are other reasons why the figures distort the true picture which I need not go into now). Incidentally Government provides over 50% of the total funds for R & D.

4—WHAT ARE THE RA'S ?

The RA's are, as the name suggests, associations of industrial firms banding together to perform cooperative R & D. It would not be true to say that their scope covers the whole industrial scene—because there

are conspicuous gaps in the industrial coverage, but nevertheless they have a considerable coverage ranging from the food industries through to the manufacturing. I will not list them—for those who are interested I would refer you to the report just published by Lord Bessborough's committee of enquiry, 'Industrial Research and Development'.

Some 20 000 firms are members of the RA—in fact because of large firms belonging to more than one RA the numbers of individual firms is somewhat lower than this figure. It was originally intended that the RA's should particularly serve small firms, especially in fragmented industries. I do not think this is a true picture today, partly because of the trend in the last twenty years for industry to form into larger groupings. But in some industries virtually every firm is a member of its RA, and it is often stated (without much evidence in my opinion) that the RA's operate best in those industries where there are a number of medium to small firms without any dominating giants.

The RA's tend to serve and draw their membership from the manufacturing firms rather than the consumer or user firms, though there are some notable exceptions to this pattern.

5—FINANCE OF RA'S

The Government grant forms a decreasing percentage, now rather less than, on average, 25% of the total turnover or income of the RA's—which are of course non-profit-making bodies. The rest comes from industrial subscriptions, from contract research (about 25%) and from sales of services and publications, etc. Some 10 RA's receive some part of their funds from trade associations, and 5 receive a statutory levy.

6—WHAT DO RA'S DO?

The one thing one learns about RA's is that no two RA's are alike. But most of them do carry out much the same functions and I feel a quote from the standard Departmental 'conditions attaching to annual grants' may be in order: 'The Department holds the view that there should be a well-balanced and carefully evaluated programme of work appropriate to the requirements of the industry or industries served and that the necessity to see research results applied should be borne prominently in mind. The Department also considers that activities such as industrial and management training, operational research, ergonomics, inter-firm comparisons, production economics and market research of a technico-economic nature are eminently suitable subjects of work for a research association'. And—leaving aside the inevitable civil service mumbo jumbo of the words—so it very largely is. It would be

a mistake to imagine that RA's are concerned wholly or even largely with research, perhaps efficiency if one wants one word. There is no doubt in my mind that some of the non R& D activities of the RA's are amongst the most popular with their members.

7—FUTURE GOVERNMENT POLICY

It has been obligatory in the last few years for anyone speaking on the subject of R & D in the United Kingdom to mention Lord Rothschild and his principle of the customer-contractor relationship. Lord Rothschild has certainly left his mark on the British Scientific scene—and one which, I for one, wholeheartedly endorse. He maintains that he who wants the research carried out should pay for it. And more particularly that the customer should understand just what it is that he requires of the research contractors, and should commission it and see he gets it. At the moment the Government's support for the RA's is largely in the form of grants related to their subscription income from industry. In future we are moving towards a system of support for specific R & D tasks commissioned under contract. Where the Government acts on behalf of industry or the community at large we have established Boards representative of those interests to decide on the Research Requirements and the allocation of funds. In the short run this is not expected to have any very significant effect on the funding of the RA's, but it is hoped that it will both help to concentrate attention on the Research that is needed by the country, and at the same time help to 'get Goverment off the backs' of the Associations.

8—EUROPE

Because this is the theme and purpose of the conference I will say little about the United Kingdom RA's in Europe, but I will just point out that some RA's have, for long, had members and associations with other countries in the EEC. Last year the Government relaxed controls so that, if the RA Council agrees, overseas members can now have full member rights and powers. The whole philosophy behind the RA's is cooperative benefit and as members of the EEC we welcome moves to cooperate with firms and similar organizations in Europe. It is, after all, very central to the reasons that led us to join the Community.

The National Structure and System of Funding of Industrial Research in West Germany

Dr Herbert STUSSIG
Past President
Arbeitsgemeinschaft Industrieller Forschungsvereinigungen E.V.

German research depends to a large part on public funds. It is in this respect similar to other industrial countries, and there are doubtless positive arguments for it. Agreeing that scientific research is a major factor in economic growth, it is the duty for a government, which influences to a large extent trade and industries, to support men and institutions working on it.

Germany does not claim to do more than other western countries for research, but in all it is certainly much more than it was foreseen not so many years ago. To an essential part it is closely knitted with education at the universities, so that exact figures are not just to be read in government reports, but have to be estimated.

This has not been made easier by the formation of two new Ministries, one for Education and Science and the other one for the so-called Big Sciences, like nuclear and space research, but including everything else which costs big money, like aircraft.

New for Germany, that means not older than about 20 years, is the cooperative research, as practised by the members of the AIF (Arbeitsgemeinschaft Industrieller Forschungsvereinigungen). These members are research associations, founded by the branches of the corresponding industry for the purpose of solving their technological problems. It is anticipated that the research-work done will support the small and middle sized establishments to stay abreast with their bigger competitors who do their own research-work.

The Ministry of Economics contributes about 40 million DM to this scheme, while the industries concerned put several times as much into it.

To a certain extent research on a similar base is carried on at a smaller scale in other institutions, like the Fraunhofer-Gesellschaft and the RKW (Productivity Council).

Other associations are organized on entirely different schemes, like the Deutsche Forschungsgemeinschaft and the Max Planck-Gesellschaft, and cannot be classified as doing cooperative research.

Anyway they are very important and should here at least be mentioned.

Discussion

Question by: Dr A. Rossi.

Will the recent 'customer-contractor' policy increase the proportion of 'classified' (or secret) research performed by the RA's? I understand that at present the main portion of the research activity is of common interest to member companies.

Answer by: B.W. Oakley.

It is not clear that there will by any particular change in the secrecy situation. It all depends upon the Requirement Boards who make the decisions on particular contracts. They may lay down conditions of secrecy or they may require wide disclosure as a condition of contract support. In my opinion it is likely to lead to some increase in secrecy.

Question by: Dr N.K. Bridge.

Could the speakers from the different countries say whether the spending by their governments on the support of industrial research in the 'bread and butter' industries is increasing, stable, or decreasing in real money terms.

Answer:

As it would be invidious for speakers from individual countries to give this information, for the record it was decided that this question would best be answered by a 'show of hands'.

The results of this were as follows: 7 going up, 3 stable, decreasing none.

Question by: Mr McBride.

What are the catalysts that start?

What are some examples of page 13—Cooperative Research associations which are formed for solving problems of common interest to firms belonging to various sectors?

Answer by: Mr J. Van Keymeulen.

The initiative can be taken either from the private firms or from IRSIA. To illustrate this I will give two examples. A typical example on the initiative of IRSIA is the 'Comité d'Étude de l'État solide'. This committee groups firms active in the field of electronics, semi-conductors, refractory metals, photography, special crystal production, dielectric layers, gas lasers, working in close collaboration with two very active university laboratories.

Another interesting example is the 'Chance' project for the study of optimalization of industrial processes and grouping in cooperation a specialist in hybrid computers, a producer of computing equipment and electric power plants. Research work is done at the university, in an industrial research laboratory and at the electric power plants.

Question by: Professor A.R. Payne.

With the diversity of different ways of supporting research of cooperative research, what communality will evolve if the directives of the EEC are to be brought into practice?

Answer by: Mr B.W. Oakley.

The methods really have much greater similarity than appears on the surface. Perhaps the biggest problem lies in the difference between support by statutory levy and by research grant or contract. It will be a slow process, perhaps taking a decade for any uniformity to emerge.

Question by: Professor A.W. Holmes.

Does any speaker agree with the United Kingdom approach of 'let those who want the research done pay' philosophy?

Answer by: Mr B.W. Oakley.

If research is to be commissioned by those who want it, is this not meaning that industry must pay for an increased percentage of R & D, leaving government to fund only that which it requires for its own purposes?

Mr Oakley intervened to point out that this was a misunderstanding of the customer-contractor principle. The government could, and would continue to be a customer for research on behalf of the community or a part of the community.

Answer by: Dr Herbert Stussig.

It is recognized today that the backbone of any economy is the small and medium sized industry. They also need research but are not strong enough to finance it themselves. The state fulfills a public duty to help them like it does in other fields. This may not fit into a very liberal opinion or state philosophy. But the states today are not liberal in the old sense of it. They are democratic, or socialistic or even welfare states. Even with a conservative government, the state decides today to a large extent about the fate or rentability of enterprises. Not only with taxes and tariffs but also with the labour policy and the foreign trade and its promotion of competition. Therefore the governments are responsible for promoting research and funding it.

Answer by: Dr R. Hamelin.

There are at least two reasons for a government to support research in a cooperative research institute:

— It is considered normal in all countries, to have the *fundamental* research paid by public funds. Why could such fundamental research not be carried out in a cooperative research institute?

— The government may consider as an important task (for social or economical reasons) to support the development of a certain industrial sector. Supporting the cooperation research institute pertaining to this sector might be a very good way of doing it.

Comment by: Mr R.E. De Barr.

Whilst we are discussing the funding of industrial research by governments and by industry I think that we should remember that most of the money available to governments for this purpose comes from industry by way of taxation. I do not suggest that our speakers should be asked to tell us the rate at which their governments tax industry but this question is one that cannot be dissociated from the main theme of our discussion. It would be useful to have available information on the rates at which industry is taxed in the various countries alongside that about the proportions of industrial research funded by industry and by government.

Question by: Ing. F. Grandi.

Can you give some details about the activities of the National Research and Development Corporation?

Answer by: B.W. Oakley.

The National Research Development Corporation (not the National Research and Development Corporation) was established about 20 years ago with the objectives of ensuring the exploitation of inventions originating from the National Research work, and to provide assistance in the exploitation of inventions in the private sector. It works by providing loans to firms to help achieve specific developments. These go largely to medium and small firms, but some large firms have, in recent years, had assistance from NRDC. It is financed by loans from the government, and has recently been making a small profit overall largely from a few per cent of the many projects that have been supported.

SESSION II

Thursday 26 April 1973 - Morning

PROBABLE CHANGES IN STRUCTURES AND FUNDING DURING THE NEXT FIVE YEARS BOTH IN THE EEC AND NATIONALLY

Session Chairman:

Dr Pietro CAPRIOGLIO
Director-General, Joint Research Centre

Towards a Common Research and Development Policy of the European Community

G. SCHUSTER
Director-General
Commission of the European Communities, Brussels

It was with great pleasure, that I accepted as representative of the EEC the kind invitation of Lord Shannon to outline to this distinguished forum our current thoughts for a common approach in the fields of scientific research and technical development. I don't think I need to explain in that context to you the important role that industrial research associations have played in the past and can play in the future in support of our main goal: to develop gradually a common policy in the areas of science and technology. This policy—as I hope it will become clear from my remarks—is a guarantee for a continuing improvement of the material and human living conditions of all members of that family, which we call Europe.

I—THE NEEDS FOR A COMMON APPROACH

The present situation

Before examining the needs and the orientations to be derived therefrom for a common approach in the fields of R & D, it is worth reviewing the present European situation in the world context. If we do that on the basis of human and material resources, we arrive at the result shown in table 1 overleaf, which indicates the strong polarization in favour of the US and USSR in the fields of R & D, which perform about 60-63 % of those activities in the world.

If we consider the public efforts only, shown in table 2 overleaf, the comparison seems to suggest that if we include now Great Britain, Denmark and Ireland, the differences between the US-efforts and those of the EEC in the fields of R & D are almost negligible. But this is only truly comparable if:

1. we can exclude indirect contributions of military research to the general development in the civil sectors and

2. we can assume a well-coordinated R & D programme of the EEC, orientated towards well-chosen common objectives or established national goals as in the US for example.

Table 1 (graph 1)

Total Material and Human Resources engaged in R & D - 1970

	Budget $\times 10^9$ $	Scientists $\times 10^6$
World	65	2.45
USA	26.6	0.53
USSR	13	0.93
Japan	3	0.38
EEC	8.7	0.22

(Unesco-Yearbook — 1971)

Table 2 (graph 2)

Comparison of US and EEC Research Expenditures - 1970

	EEC	USA	Ratio
Total public R & D expenditure	4.4×10^9 $	17.2×10^9 $	1 : 3.9
Military budgets	0.9×10^9 $	8.7×10^9 $	1 : 10
Public R & D exp. excluding Military	3.5×10^9 $	8.5×10^9 $	1 : 2.4
Public R & D exp. using special exchange rate acc. to Freeman/Young	5.8×10^9 $	8.5×10^9 $	1 : 1.5

(OECD — Freeman/Young)

To achieve the same efficiency as the US in the fields of Science and technology the EEC needs therefore a common policy.

Where do we stand today? The following figures give you an idea about European cooperation in the main fields of R & D:

Table 3 (graph 3)

Public R & D Contributions to Multilateral and Bilateral Programmes of the EEC Countries over Period 1967-1971

Objective	1967	1971
Nuclear Research	166	106 (MUA)
Space Research	89	130
Defence	74	111
Industrial Productivity	118	81
Total	447	428 (MUA)

(Stat. Office EEC — 1971)

If we look at these facts of European R & D, we will be disappointed to find that besides the almost negligible share of common European effort in R & D, international European cooperation over the last four years has shown an overall negative trend, which seems to indicate a decline of interest for European cooperation.

What does this mean to Europe, European economy and industry —now and in future? One may be sometimes misled by the current US economic, trade and monetary difficulties, to believe that the US-challenge for European industry in Europe or the world market has ceased to exist.

This is not so and it suffices to examine:

— the US-investments in Europe;

— the patents-licences and know-how balance Europe-US;

— the trade-balance Europe-US in the fields of the new technologies,

to realize the existing situation between Europe and the USA.

And it is clear, that at long-term the export chances for Europe are rather with the advanced technologies than in the fields of the more classical technologies for which it is to be expected that the developing countries will soon have acquired their own potential.

The European Cooperation in the Fields of R & D

The present situation in some big industrial sectors

We will investigate some sectors of European R & D cooperation next, but let me start in saying that so far the results in European R & D cooperation were disillusioning.

Up to now European integration has proceeded with more success in the traditional sectors, e.g. coal, steel, agriculture, etc., covered by the Treaties of Paris and Rome, than in the fields of advanced technologies, where multilateral solutions seem to have been favoured.

Let me briefly review next the experiences to be gained and the lessons which can be drawn so far from the European R & D cooperations.

Euratom

As you know, Euratom has been to some extent a failure although it was an early attempt of Europe to institutionalize cooperation in one, at the time advanced, field of technology.

What was the original task of Euratom? According to the Treaty it was twofold:

— to stimulate creative work in neglected areas of R & D and areas complementary to the national R & D activities;

— to coordinate big and long-term activities, which exceed the possibilities of a national approach.

The complementary R & D task led to the creation of the Joint Research Centres in Ispra, Karlsruhe, Geel and Petten.

This approach strongly stimulated by the I. Geneva Conference (1955) (Atoms for Peace) and conditioned by the Suez-crisis (1956) at the time (guarantee of future energy supplies) demanded a highly advanced concept of European integration, i.e.:

— institutional powers;

— common programmes;

— common budgets.

The main difficulties expected to arise therefrom, were the facts that (1) some countries already had a well advanced technology in the nuclear field when they were called upon to collaborate so that the envisaged common effort was going to face already established, divergent preferences for the reactor development programmes and no neglected areas or any real need for complementary R & D. Under these conditions those two tasks did really mean projects of second choice; (2) because of the late availability of the JRC, there existed a strong deconcentration of the R & D efforts in the nuclear field—in practice this led immediately to a constant rivalry between the Euratom programmes and the national R & D efforts and as a consequence the notion of the *juste retour* introduced by the member countries as a condition to agreeing to the programme and budget of Euratom; (3) insufficient consideration was given to the industrial viewpoint inappropriate to centralize the management in Brussels. This explains why the importance of Euratom never grew beyond 10% of the national budgets.

To understand better the success and failure of the various branches of Euratom and the reasons for it, please let me go a bit further in detail.

1. *Dissemination and Transfer of Knowledge*

   The difficulties in this sub-sector arose because of disparities between the countries with respect to available knowledge and know-how in the nuclear field. This led to the rather unsatisfactory solution of distributing amongst the member countries only the very rare pieces of commonly elaborated information.

2. *Supplies and Distribution of Fissile Materials*

   The balance which can be drawn from these activities is quite positive and it can be said that is has played an important economic role in establishing better negotiating conditions of the Six towards the supply countries, e.g. the USA.

3. *Control of fissile materials*

   In the field of safeguards, the Commission of the European Communities is invested by the Euratom Treaty with powers (1) to ensure that nuclear materials are not diverted from their intended uses, and (2) to enter into safeguarding commitments towards non-Member States and international organizations.

Two main features of this pioneer safeguards system must be particularly underlined. First, its high degree of technical effectiveness which, from the outset in 1958, has been continuously developed with a view to avoid hampering economic development and to reduce the use of inspection manpower, thus avoiding prohibitive cost levels. Secondly, the high degree of independence which it derives from the complex balance of responsibilities established by the Treaty among the various European institutions. Such features account for the wide credibility which the Euratom safeguards has acquired as it is demonstrated by the agreements concluded by the Community with the United States in 1958, Canada in 1959 and the International Atomic Energy Agency, just two weeks ago.

4. *Transfer of Know-How* (Association contracts on HTR, Euratom-USAEC on LWR, etc.)

A lot of useful information has been obtained in that way but little use was made, except in RFA, by European industry. Unfortunately therefore that action had little effect in integrating European industry, but helped rather to reinforce the national character of it.

5. *R & D Areas of Success*

We can note that in fields of no or little commercial interest, e.g. Thermonuclear Fusion, Biology and Health protection, Euratom has been rather successful in coordinating European efforts. The very existence of such success demonstrates that European cooperation can work in favour of certain issues, provided the objectives are sufficiently well defined and do start at a stage early enough.

6. *Failures*

Obviously not much success can be granted to Euratom in the fields of nuclear reactor developments and it is rather disappointing to admit that the most important European achievements in the nuclear field emerged from bilateral and multilateral cooperation rather than from Euratom, e.g. FBR-projects, HFR-projects, nuclear-fuel reprocessing, uranium enrichment, etc.

In conclusion therefore, we find that the basic objective to create a strong and competitive European nuclear industry was not achieved. Instead the national trends in programming, budgeting, buying policies remained dominant. It is true that the total European R & D effort in the nuclear fields has been comparable to the one in the US, but

the development towards big European enterprises, competitive under world market conditions, has been disappointing. One example :

— 87 US nuclear stations are being constructed by 4-5 US-firms,

— 16 European nuclear stations are being constructed by 12 firms.

The main reasons for Euratom difficulties are obvious:

— the aims and objectives were built upon problems expected at the time of the Suez-crisis: this economic crisis did not prevail;

— too little consideration of industrial structures, needs and wants;

— many aspects of the Treaty demanded political supranationality and the time was not ripe for that.

The more operational problems experienced with Euratom were:

— the different technical orientation of the member countries at the time regarding reactor types to be developed or adopted;

— the notion of *Juste retour* instead of balancing the actions according to the experiences of the nations;

— the sectoral approach which forced Euratom to starve.

Let me give you two further examples of European cooperation in the fields of space-research and aeronautics.

The European Space Cooperation

Here Europe appears rather well organized, but still the collaboration remains of intergovernmental character, which implies amongst other facts that decisions can only be taken unanimously.

The main organizations in the fields of space are ELDO, ESRO, and CETS.

The motivations of these institutions are quite different, for example:

ESRO — scientific space exploration;

ELDO — promotion of industries in the fields of launching vehicles and associated new technologies;

CETS — forum for development of common attitudes and uses of telecommunication satellites.

This leads straightaway to the following problems:

— national representations to these different space organizations, originate from different ministries, which implies that their interests and willingness in participation and financement are of varying degree;

— no form of cooperation is laid down amongst the three and possible other enterprises in the fields of advanced technologies associated with space research.

To coordinate the three, it was necessary to create the CSE, but only little agreement could be obtained between the suggested lines of action proposed by CSE on one hand and its member countries on the other, for the main reason that the UK saw possibilities to obtain satisfactory agreements with the USA (including the Intelsat problem), whereas France insisted upon the necessity for an independent European approach, if only to reinforce the negotiating position of Europe towards the USA.

In the meantime the US-programmes have evolved to such an extent (shuttle services, heavy duty rocket engines, etc. US-budget: 2×10^9 \$/a) that it looks doubtful if Europe could do anything else than accept participation and cooperation with the USA.

In conclusion one can say, that the rather late start of European cooperation in the fields of space research encouraged national nad bilateral cooperation within Europe and with the USA. The difficulties experienced with ELDO (to a lesser extent with ESRO) are basically the same as listed for Euratom:

— divergent objectives of the Member States;

— *juste retour* attitude;

— limited financial resources.

What seems missing is one single European Coordination Instrument like NASA, which after proper consideration of political ambitions, national R & D programmes, industrial abilities and specializations can elaborate a coordinated European approach. Provided with the necessary resources it can take all necessary technical decisions without referring every detail back to the political bodies of the member countries once agreement concerning the main objectives has been reached.

Let me finally give you another example in a field of interest for industry and also for large controversy, i.e. aeronautics:

The European Cooperation in the Fields of Aeronautics

The European cooperation in aeronautics is a typical example of bi- and trilateralism. The European activities were initiated by:

NATO: Atlantic, F 104

Industries: F 28, VFW, Sa 330/340, WG 13

Governments: Concorde, Airbus, MRCA.

The strong participation of public funds seems characteristic for the European activities in that field. Scientifically and technically Europe seems to have reached the same level as the USA, but the following drawbacks exist:

— the production capacities are too small;

— the production centres are too dispersed;

— the decision making set-ups through national bodies are rather slow;

— the delivery and sub-delivery policies are often not based on economic criteria;

— the duration of the international collaboration is time limited, so it has little permanent integrative effects upon the dispersed European production centres.

The situation is even less comfortable, if we place it into the context of the world as shown on the next graph:

Table 4 (graph 4)

Employment and Production Plants in EEC, UK and US - 1969

	Employment × 1 000	Production × 10^6 $
EEC	164	1 788
UK	234	1 610
Total	418	3 368
USA	1 168	23 288

As European production remains small compared to the US, the costs per unit are uneconomically high. Moreover one must not forget that we are dealing here with a well existing and organized world-market in which Europe's failure is clearly due to the coexistence of a unified approach. It is time for governments to establish the conditions necessary for private initiatives in that field: The public

support to that sector amounted in Europe 60 %, in the USA only 1 %, during the period of 1960-1967. To reduce that and to render European industry viable is a matter of proper industrial structuralization, taking into account specialization of industries, their interests etc. and the need for a European home-market. The views of the EEC concerning the European aircraft industry are expressed in their memorandum of 19 July 1972.

II—THE NEEDS FOR A COMMON APPROACH

The need for Europe to compete with the USA in Europe and on world markets demands similar industrial structures, a common adequate public support, harmonized buying policies, big and competitive multinational European companies, a large organized home-market. I know this is easy to say and difficult and only gradually to realize. For that it is necessary to improve the decision bodies and methods for executing that cooperation (the need for it is known). As the competition with the USA at home and in the rest of the world can't be avoided, European technical cooperation should not restrict itself to the development of new advanced technologies to a competitive level, but also try to improve its industrial competitivity by facilitating the formation of transnational consortia, facilitating R & D by industrial research and development contracts, elaborating buying policies, etc.

This requires a common view, a common approach and a common policy: Europe needs a common R & D policy and big industrial production units, otherwise European investments will remain less effective than those of the USA in sectors requiring intensive research and development. As said before a common strategy is beneficial not only for the home market but also for the external (USA, USSR, Japan, China, etc.) industrial R & D affairs, including such aspects like product-commercialization and the relations with third countries.

So far R & D activities undertaken in Europe were initiated:

— without a sufficiently deep analysis of the European situation of today;

— without sufficiently close collaboration and contacts between all concerned as a function of present and future opportunities and interests.

The entry of the 'newcomers' in particular of Great Britain, with its abilities in sectors such as nuclear energy, informatics, aeronautics, etc., might trigger off mergers to some big transnational production units.

But the difficulties of achieving such mergers are very great and it is likely to take some time before any effective association can be made, at any rate across the frontiers.

Therefore I feel that the need for some measure of integration, or at least coordination of the *basic research* and *development programmes* and *resources* should not wait for the integration of the companies as a whole.

Indeed it will be very difficult to achieve a significant level of research coordination in industry without putting at risk the commercial advantages which some companies feel they have because of the R & D work they have already done and because of their overall background and experience.

These risks will have to be faced if the European industry is to become really viable and competitive on the world market in the future.

To that end we have to develop suitable methods of dealing with industrial property rights taking into account the fact that some manufacturers already have significant patent portfolios.

III—TOWARDS A COMMON R & D APPROACH

The Concept

The communiqué of the nine Heads of State or Government at the Paris Summit meeting 1972 gives a clear mandate to the Community Institutions to 'define the objectives and assure the development of a common policy in the scientific and technological field. A programme of R & D actions including working plan and budget, should be elaborated and presented to the Council before January 1974'.

A common policy in the scientific and technological field is not an aim in itself, but should be in response to important and multiple needs of the Community, e.g. research for an optimum quality of life, to guarantee economical competitivity, to maintain or improve the present level of scientific activities. In many cases as we have seen this can only be satisfied within an efficient and appropriate common policy.

Such common policy should consist of:

— the common selection and adoption of objectives and R & D priorities as functions of recognized social and economic needs. Such commonly effected choices would maintain the desirable coherence and complementarity between national actions, actions to be developed at Community level, and international actions with participation of member countries;

— laying down common attitudes for the relations with third-countries and international organizations;

— defining the effort to be engaged;

— setting-up the administrative structures and techniques necessary to achieve the objectives.

The R & D objectives will be elaborated sectorally or on the basis of the already established 'sectoral policies' of the Community (e.g. transport, energy, agriculture, etc.).

When defining and realizing R & D actions within the Community, the latter will leave large margins exclusively to the free initiatives of national centres, universities and enterprises. A common approach and common actions should be attempted in cases of recognized necessity only.

In order to formulate options or actions presenting a communitary interest, the EC elaborated five basic criteria which would facilitate such selection process:

— all actions and projects which, because of the scale of their human and financial implications, cannot be performed on a purely national basis (radio telescopes, uranium enrichment);

— projects where development cost and sales would require a very large organized market (data processing, aeronautics, necessary electronic instruments);

— actions which are by nature international (meteorology, long-distance transport, telecommunications, etc.);

— projects designed to meet collective needs common to the member countries (establishment of the European scientific and technical information and documentation network, research on environment, urban and rural development and new means of transport);

— projects designed to contribute to the implementation or development of the policies adopted by the Community for individual sectors (agriculture, transport, technical standardization, policies for specific industries, etc.).

The Instruments

A common R & D policy implies the *coordination of national policies.* Beyond even the explicit will to define common objectives as well as to perform actions of a communitary interest, this is obviously of fundamental importance. The coordination of national R & D policies supposes that the Community's Institutions be informed systematically about potentials, plans, programmes, national budgets and all other important decisions in scientific and technological policy

of the Member States. In order to assume the fundamental and permanent task of coordinating national R & D policies, it is important that the Community be equipped with an adequate instrument.

A *Scientific and Technological Research Coordination Committee* is being proposed, which should consist of high-level national officials responsible for R & D policy in their respective countries, as well as of delegates of the Commission.

A common R & D policy implies the preparation of proposals for joint action by the Commission which are submitted to the Council of Ministers for decision. The Commission will require general advice on R & D matters and for that the *European Research and Development Committee (CERD)* has been created.

This Committee consists of personalities capable of enlightening and advising the Commission and would be responsible mainly for the continous analysis of the community technical, potential and socio-economic needs.

I am not going to bother you with further details about the instruments, which the EC will require to fulfil its complex tasks.

I think it is rather useful to give you now some ideas about the different modes of cooperation envisaged.

Modes of cooperation

At present we distinguish here between the following types of actions:

— Community actions: joint actions, which englobe actions elaborated jointly by all Member States but with a variable financial participation of the EC ranging from 100 down to 0% (concerted actions).

— Actions with variable participation of not all Member States. The financial participation of the EC again can vary from 100 to 0% following the type of action, type of work, information and interest expected therefrom.

It is obvious that these cooperation modalities imply the development of a common view of the Member States in their external relations as regards R & D in the areas in which a common policy has been decided on.

One important task of the Community is to create conditions favourable to innovation and facilitate cross-frontier cooperation when this appears necessary. There is in particular a manifest need in this field to assist companies in funding the initial stages of development of new projects, in response to proposals which they may put forward at Community level. It is therefore necessary to determine the type of instrument to be defined and established for this purpose.

Execution of Resources

The Community has two means for execution at its disposal:

— the R & D institutions owned by the Community (direct actions);

— the institutions existing in the member countries (indirect actions).

The Community-owned R & D institution existing up to date, the JRC, is evolving at the present time. Originally representing exclusively the nuclear type research centre, it is in the fact becoming more and more polyvalent and thus capable of satisfying the communitary needs in different fields as well.

As to instruments which can possibly be used, the following are suggested:

— scientific and technical research contracts;

— industrial development contracts;

— association contracts;

— the common enterprise.

Let me give you a few more details about the two main supporting pillars the EC has put forward for industrial development, i.e. industrial development contracts and the 'common enterprise'.

Industrial Development Contracts

The industrial development contracts of the Commission suggest a threefold objective:

— to encourage the Community's industries to develop new products or processes of interest to the social and economical development of the Community;

— to promote transnational technological and industrial cooperation;

— to contribute to the satisfaction of public needs not sufficiently covered to date.

It follows therefrom that proposals for such contracts should correspond to a number of criteria, e.g. be innovative, of general economic interest, have a fair probability of technical success and commercial prospects, be of foreseeable technological and financial risk. The financial contribution of the Community would generally not exceed 50% of the total costs except for projects of public interest belonging to sectors stipulated by the Council of Ministers.

The European Investment Bank (EIB) is supposed to advise on applications forwarded by enterprises and the management of concluded contracts, the final decision being made by the Commission on the basis of EIB's advice.

As concerns the ownership of knowledge it is suggested that in general, the new information emerging from such a contract will remain with the enterprise to which the contract was extended. Enterprises are obliged however, to exploit such knowledge under circumstances which meet the general interest; otherwise, they will have to grant licences to third parties under reasonable conditions.

As yet the Council of Ministers has not decided to allocate funds for these contracts; discussion is still going on.

The 'Common Enterprise'

The common enterprise, as described by article 45 of the Euratom Treaty, was conceived to perform research or advanced-technology operations of primary importance to the development of nuclear industry in the Community. The extension of the status of 'common enterprise' beyond the nuclear field appears now particularly desirable taking into account its essential characteristics, e.g.:

— a particularly smooth juridical basis facilitating cooperation between governments and public or private enterprises of the Community, with or without the contribution of third-country governments or persons, or international organizations;

— possibility for the Community to contribute financially to public services or industrial initiative. Such support may follow the pattern of capital participation or the pattern of starting or running subvention;

— after an unanimous decision of the Council, the possibility to grant a series of advantages and facilities for each individual case, e.g. on tax and customs duties, the free movement of persons, capital, equipment and deliveries.

Before coming to the end of my presentation, I would like to review briefly the main sectors in which we are likely to propose actions for our new multi-annual R & D programme.

IV—R & D ACTIONS OF COMMUNITARY INTEREST

Under the present circumstances the following tentative list of actions can be considered as a first approach for a multi-annual European R & D programme. These propositions are going to be elaborated with a view of maintaining a narrow relationship:

— between national policies and communitary programmes;

— between such R & D actions and other Community policies;

— between the proposed actions themselves.

Sectors and actions under study

1. *Increasing of knowledge*

   In the field of fundamental research and basic research the Community should try to examine the possible need to improve mobility of researchers, to organize high level complementary training, seminars, summer-schools, symposia, to rationalize big investments, to rationalize the utilization of costly equipment, creation of centres of excellence.

2. *Actions in support of policies*

   — Protection and promotion of human health: epidemiological research; medical biology; bio-medicine ...;

   — Promotion of agricultural productivity and technology: research on the quality of food products (vegetal and animal); increase of meat production through genetical, physiological, nutritive and pathological improvements ...;

   — Research on environment: research on harmful polluants for man; ecological effects of polluants; new detection methods ...;

   — Preservation of natural resources: water supply; desalination of brackish water by purification and recycling of polluted water.

3. *Promotion of Industrial Productivity and Technology*

   — Nuclear and non-nuclear energy; plutonium recycling; super conductors; storage of waste;

   — Materials; composite materials;

   — Informatics;

   — Telecommunications;

   — New means of transport;

   — Aeronautics.

4. *Scientific and technical information and documentation (STID)*

   Progressive installation of a European STID network, following the Resolution of the Council of Ministers of 24 June 1971; suggesting new systems for the fields of agriculture, medicine, patents.

5. *Concertation of the Programmes of Big Research Centres of the Community*

Most of the big national and international nuclear research centres created after World War II, were conceived to do R & D and technological work in the nuclear field, sometimes up to the construction of experimental reactors and prototype plants.

Due to the shifting of the responsibility for nuclear R & D more and more toward industry and due to the continuing financial difficulties since 1967, the procedure of diversifying the activities of practically all these centres, has been started.

Regarding the abovementioned big R & D centres, it might be possible to envisage a permanent committee of concertation of effort on a Community level. Their diversification efforts could thus be made more efficient and it would be possible to avoid unnecessary duplication.

V—OUTLOOK

Where do we stand—What needs to be done ?

From what has been said so far it is clear, that there is not much time for Europe to lose: The present situation suggests that in particular in the fields of the already estabished new technologies, Europe may find it difficult to catch up with the lead of the competitive big industrialized nations in the world, in particular the US, and to some extent the USSR. Europe should try therefore to develop the new technologies 'to come' rather than run behind those of the others. Though trying to benefit from the advances and experiences of the others, we should not copy the approach, the models or the objectives of the others, but rather concentrate on our own problems.

Moreover it appears that Europe could fulfil an important task in developing the social and general sciences, which are traditional fields for Europe, e.g. urban developments, civil engineering, telecommunications, transport systems, pollution, oceanography, technology transfer etc.

As it has also been shown to be successful, Europe needs to pool gradually its resources. In that context the role of public bodies, national and international, within the frame of the EC, becomes quite evident.

On the other hand, there is an important role for private industry to play: Industry is the customer of the newly developed technologies.

Therefore to be successful in Europe and on the world markets, industries must find together within the appropriate institutional frame. In this context the role of the US-firms in Europe must be considered.

Reference to CDRA-Meetings' Role

It is not exaggerated to say, that the industrial associations as represented here today do constitute a valuable first step in that direction. The EC can expect from such associations, valuable suggestions in regard to possible mergers into international and transnational compounds and would be only too glad to collaborate with them closely in view of elaborating common R & D policies and strategies to overcome the immediate difficulties.

The tasks before us are tremendous, but can be fulfilled if we join together. The powers to do all that exist in a dispersed way, they need to be organized.

Thank you.

Discussion

Question by: Mr McBride

It would appear that the EEC Commission is primarily concerned with Space, Atomics, Telecommunications, Big Companies and Mergers and not with the project-oriented, more mundane bread and butter, industrial, cooperative research which we are concerned with here today.

Can Dr Schuster honestly see any real role for the EEC Commission in fostering cooperative industrial research (the topic of this conference) on the scale in which we are interested?

Wouldn't we be better advised (and make more rapid progress) to continue the type of exchange and cooperation we have today, on an almost *ad hoc* basis, than to look to the EEC to take action?

Could the EEC Commission provide finance to support such *ad hoc* voluntary activities thus encouraging we 'amateurs' interested in producing projects for our industries rather than providing finance to the 'professionals' of the EEC Commission who appear to be more concerned with European prestige and 'big' problems?

Answer by: Dr Schuster

It would be misleading to say that the EEC Commission is primarily concerned with big technologies such as space, atomics or telecommunications.

In my lecture I have tried to develop which lessons the Commission should draw from the past, from earlier failures mainly in the field of big technologies, in order to be able to define a valuable common R & D policy. The two general aims of this policy can be described as follows:

— innovation satisfying social needs in fields like preservation of environment, health, education, urban developments, i.e. in general the improvement of the quality of life;

— innovation of industries to ensure and to increase their efficiency and to raise the general technological level.

With regard to efforts for cooperation in industrial research and between industrial research organizations on a Community level I should like to state that the EEC Commission welcomes the initiative started with this Conference. The Commission should try to sponsor cooperation and especially exchange of information between the different organizations, as far as it takes place on a multinational and Community basis.

Question by: Dr Theisen

Comment concerning Dr Schuster's introductory statement of a decline of interest for European cooperation. The data given in his first figure concerning EEC Government appropriations seem to indicate a more differentiated aspect.

Whereas total R & D appropriations increased in the considered period 1967-71 by a yearly 10%, only the contribution to projects of international research organizations tend to stabilize or decrease slightly.

This decline of appropriations certainly results from the worldwide reorientation of the tasks of international or big national laboratories in the field of nuclear, aerospace, etc. research and the increasing part of industry take over. These governmental laboratories are certainly in a stage of transitory phase and an increase of financial donations could only be expected after a successful implantation of an adopted restructuration and diversification of objectives in the social and general sciences.

On the other hand the EEC Commission might have an important catalytic role in the elaboration of research needs and strategies for industrial research, specifically in determining market needs and monopolistic domination threats by the foremost industrial third country powers.

Answer by: Dr Schuster

I agree with the first part of Dr Theisen's comment. The well-known crisis of the Joint Research Centre (JRC) occurred simultaneously with a stagnation of growth in other domains of nuclear and space activities run by EEC countries. As a consequence, national laboratories were obliged to diversify and—in some cases—even to reduce their staff.

In such a period, tendency of increasing Community programmes is very limited and attempts are even made to reduce such programmes in order to avoid heavier reductions at national scale.

R & D policy should not be an aim for its own sake. It has to be oriented following real needs and it should contribute to satisfy those needs. It is at the level of definition or identification of such medium or long-term needs that the Commission has to play an important role.

Question by: S. S. Carlisle

I would like to ask Dr Schuster if he does not think that too much attention is being concentrated on procedures and instruments for coordinating the initiation and planning of R & D.

Might it not be better to attempt more cooperative action in the application and exploitation of the results of R & D. Cooperation in initiation and conduct of R & D is notoriously difficult and we all see this difficulty even in national planning especially since good R & D is dependent on personal initiative and imagination. On the other hand, it is in the application in industry of R & D that the costs increased are much greater and the real economic benefit results and where our achievement in Europe may be weakest. Surely, therefore, the EEC Commission could well apply itself to asserting the spread of information on R & D achievement and encouraging institutes in each country to assist each other in exploitation.

Answer by: Dr Schuster

At the Paris Summit conference in October 1972 the Heads of State or Government stipulated in their final communiqué, that the Commission should develop a common R & D policy. Coordination of national policies anad execution of 'actions of Community interest' make part of such a policy.

In this frame coordination of national policies is a very important task, which will serve the following objectives:

— Continuous identification of research and development objectives of the Community countries following their main socio-economic objectives and thus identification of gaps and lacks. Laying down of Community objectives to be fixed according to the analysis.

— Laying down of such original objectives and options from which the countries of the Community should benefit by taking them up in common, even if they did not correspond exactly to the sum of their national interests or to a compromise of such interests.

— Maintenance of an entity between the objectives and the options of the member countries and the objectives and options of the Community or modification of the objectives in common agreement.

— Examination of value and benefit of pursued options, particularly in view of their human and social relevance and possible implications.

As to actions of Community interest, it is there—and especially in the frame of industrial policy—that one has to locate the realization of cooperative actions in application and exploitation of results. In this field, the Directorate-General for Dissemination of Information is planning considerable efforts. The abovementioned cooperative actions also include promotion of exchange of information between Research Associations of the different EEC member countries.

Question by: Dr R. G. Allen

In many ways it is a pity that the EEC had first to take on the integration of areas of industrial activity which contain a high proportion of the major problems, competition and commercial self-interest, which make cooperation difficult to achieve.

Could I suggest to Dr Schuster that the EEC should seek to tackle the simpler problems first? I refer to matters of public health, pollution and the environment, where there is an identity of common interest and a freedom from competition and the profit motive.

Answer by: Dr Schuster

In all future proposals to be made by the Commission in the field of R & D, special attention will be given to those points that tend to improve quality of life and to satisfy public needs.

The Commission has submitted to the Council of Ministers a set of proposals for a Community environment policy. At the same time, the Commission has worked out proposals for actions of R & D to be taken in the frame of this policy. A first part of those actions which are to be executed within the Joint Research Centre have already been approved by the Council of Ministers. For the other part, which is to be done in cooperation with institutes of EEC member countries, a decision is still pending.

Comment by: Dr Caprioglio

It seems that in the field of profit-making industries, what is needed is information on which firms or rather fields are characterized by dynamic enterprising spirit. These are the firms deserving being helped and also those that will make best use of information provided to them.

Also, one would like to link the amount of money spent in research with the overall turnover of industry in a certain field.

From this kind of analysis it would clearly appear why so much public money has given so poor results is some fields.

The Report of the Committee of Enquiry into the Research Associations

The Rt. Hon. The Earl of Bessborough
Chairman,
The Committee of Enquiry into the Research Associations

EEC implications

We welcome Section 7 of the European Summit communiqué issued on 21 October 1972 concerning industrial, scientific and technological policy. We recognize that first priorities involve the elimination of technical, fiscal and legal barriers to trade within the Community. We agree with the need for the EEC to develop a common policy in the field of science and technology and that this policy will require the coordination within the institutions of the Community of national policies and joint implementation of projects of interest to the Community. We are glad to note that a programme of action together with a precise timetable and appropriate measures is to be drawn up by the Community's institutions before 1 January 1974.

RA attitudes to the EEC

British entry to the European Economic Community has important implications for the RAs. It will at its most basic inevitably accentuate the trend for British RAs to look beyond Britain for their customers and their competition. At the same time it will place their skills potentially at the service of far larger groups of industries and markets. The RAs' wide involvement in standardization will inevitably have to extend to the EEC level if their value to their industries in this sphere is to be maintained. For reasons such as these we believe that it is therefore necessary for our RAs to consider carefully and without delay how they can adjust to the new circumstances which they will meet.

We learned from some RAs that they do not regard the EEC as having a significant bearing upon their activities and that they saw no reason why they should pay any special heed to the Community at the policy level. We would suggest to all RAs that they should consider the question very carefully before adopting such a view. In contrast,

on a number of occasions associations told us that they were eagerly anticipating the advent of British entry to the EEC because of the opportunities which this would provide for them to extend their membership and influence.

Specific expansionist policies for the EEC will again highlight the trend towards internationalism and away from the original British-oriented protectionist role of RAs. This we consider highly desirable. Since British entry is a now a fact, it is in the RAs' own best interests as viable and resourceful institutions, and in the best interests of their own members, that full advantage should be taken of the greater scope offered by Community membership. Moreover, and equally importantly, for British RAs to make sure that their special skills and knowledge are as effectively promoted and as widely utilized as possible will in itself be in the best interests of the European Community as a whole.

We therefore suggest to any RA which has not already done so that it should develop an explicit policy towards the ECC. We hope that these policies will seek positive opportunities rather than simply grounds on which best to protect the position so far established within the UK alone.

In the context of general scientific relations with the EEC, we hope that the Parliamentary and Scientific Committee will consider the acceptance of membership from representatives of European organizations. The 'P and S' provides a valued forum for interchange of ideas and philosophies on science and technology matters and its membership within the enlarged EEC should cover as wide a canvas as possible.

RA links with European institutes

The Committee visited TNO[1] in Holland, ANRT[2] in Paris, and AIF[3] in Cologne. TNO is a collective technical research facility within which Dutch RAs (who do not normally have laboratories themselves) conduct technical programmes. TNO receives government grants at a generous level averaging 50% to support industrial work. ANRT and AIF are similar organizations in that they are responsible for the distribution of at least a proportion of the government money devoted to industrial RAs, while not themselves being government departments. They have in membership industrial RAs and other technical institutions and occupy a 'buffer' role between the government and research institutes.

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[1] Nederlandsche Organisatie voor Toegepast-Naturwetenschappelijk Onderzoek.
[2] Association Nationale de la Recherche Technique.
[3] Arbeitsgemeinschaft Industrieller Forschungsvereinigungen.

Our discussions with them confirmed the impression which was developing from conversation in the UK, that already a considerable degree of collaboration exists between RAs and European institutes of similar technical interests. This has achieved an advanced stage in, for example, the printing research institutes which through the mechanism of IARIGAI,[1] their international forum, exchange information and programme plans and arrange collaboration of many kinds on both multilateral and bilateral bases.

The development of this type of activity depends primarily upon the inclination of the RAs, and the abilities of the directors. There are often limits to the extent to which collaboration can be taken; for example, different approaches to documentation systems may inhibit information exchange on a full scale. But we can see nothing but good coming from the establishment of strong personal links between institutions in different European countries. This should at least involve an annual comparison of general programme work and progress at director level, and it can proceed well beyond this. We found in the case of the French and British textile institutes (The Shirley Institute) that staff exchange programmes had been undertaken with considerable success.

Another limit to such collaboration lies in the fact that in some cases RAs may be competing with each other in the European market for contract industrial research. This would not seem, however, to negate in principle the value of informal relations or even the establishment of organic links. Contract programmes need not be discussed—although we found an example in which this did occur.

EEC polices towards industrial technology

The strong impression which we received from our European discussions was that it would be counter-productive if the EEC Commission should attempt centrally to organize international relations between compatible research institutes. There should be scope for the Commission to provide financial incentive for international collaboration, and it may be possible for the Commission to encourage bilateral or multilateral contacts by providing information on institutions. But the preference expressed, which we endorse, was that the Commission should not attempt to establish a new central body to control, or even guide in any bureaucratic sense, the relations between European research institutes.

From our conversations with EEC Commissioners concerned with science and industrial policy, as well as with officials concerned in member countries, it seems to us likely that the industrial policy

[1] International Association of Research Institutes for the Graphic Arts Industry.

developed by the European Economic Commission, which includes policies for industrial technology and R & D, will adopt a polycentric principle for research institutes. It should be recognized that many and varied technological institutes can and should exist within the Community but that their various specializations should be available on a wide scale to interested Community parties. As already noted, many of the British RAs regard themselves as having a degree of expertise which can withstand comparison with that of any other European institution. We would, therefore, support the Commission's present attitude that existing institutions should be regarded as centres of excellence (in so far as they merit that regard) and that the institutions in turn should regard themselves as far as possible as 'European' rather than national. That is, they should be prepared to make their services available on an EEC basis in all cases when it appears that they are best suited to undertake particular tasks.

We did conclude, however, from our discussions on the Continent that at present the degree of understanding in individual EEC member countries of the various kinds of institutes and research support systems which exist in different countries leaves much to be desired. At a national level this may be understandable; but at the time of our enquiry the EEC Commission had apparently had little impact in informing national agencies of the RAs and institutes which exist in other countries. Indeed, the Commission itself did not have an inventory of European science and technology resources.

The compilation of such an index should, we believe, be regarded as of the highest priority. It is only on the basis of a comprehensive index to the various research institutes operating in similar or adjacent technical areas that sensible multinational collaboration can be encouraged. The EEC Commission is the correct location for such an initiative. Most national central organizations for RAs have comprehensive lists of research associations within their national boundaries, and government departments can normally supply lists of government agencies. There should be no practical problem in gathering a comprehensive inventory. Care would have to be exercised to ensure that the technical emphasis of different laboratories were correctly identified, but this is not a significant problem and we hope that the Commission will at an early date ensure the compilation of such a register.

Not only would this provide invaluable aid to RAs and institutes themselves in planning the development of their own international relations, but it would be an essential condition for any ambitions which the Commission might have to promote international collaboration or to make suggestions regarding the extension of cooperation between these establishments in fields of common interest. This may require a modest expansion in the office of the Commission which deals with science and technology matters.

Conclusions and recommendations

In this part of the Report we summarize the main conclusions which we have reached from our examination of the RAs in Britain, and the major recommendations which arise from our investigation.

1. The RAs spent about £17 million in 1970 in support of industrial technology, or about 2.5% of the amount spent within private industry on R & D: in only three or four industrial sectors did RA activity equate to more than 0.2% of industrial net output: the government contribution to RAs is £4 million per annum or 0.7% of total government R & D expenditure. But in spite of these relatively small sums we are convinced that RAs perform a role in the creation and application of industrial technology which is far out of proportion to their size, and that their effect on non-science based industries is of great importance. It is our judgement that, overall, the money devoted to RAs has produced handsome benefits for industry and the economy. (Part I, Section 1.)

2. We have no hesitation in accepting the continued validity of the principle of cooperative research, although we stress that RAs must always be sure that cooperative programmes do reflect current industrial needs. We recognize that great changes have occurred and will undoubtedly occur in the composition of RA programmes and the ways in which RAs are funded. (Part I, Section 3.)

3. In this connection, we accept and endorse the introduction of the new system of support for government R & D as outlined in the White Paper of July 1972, implementing the principles expounded in the Green Paper by Lord Rothschild. We approve the implication of this policy that RA general grants be replaced by money given for specified purposes. We do however clearly distinguish this from contract work for government. We believe that the government should continue to contribute moneys other than for contract work to RAs in order to help support specified programmes which are in the national or industrial interest. (Part I, Sections 1, 19.)

4. We consider that each RA should be the concern of the Minister responsible for the industry with which that RA most closely deals. This position has been partially achieved in recent years but requires further attention. (Part I, Section 18.)

5. We believe that there is a need for a greater central linking between all the RAs and recommend the establishment of a Board of Industrial Research and Development to serve representational and functional purposes. Such a body should coordinate the interest of technically or industrially connected RAs in the preparation and presentation to government of programme proposals for national support and in the negotiation with government or the Requirements

Boards in the matter of determining the correct allocation of public funds to industrial technology. Secondly, we have identified a number of functions which we believe should be organized as a central service for the RAs. Taken with Recommendation 4, the proposed Board would furthermore provide a central reference point for the larger number of Ministers which we would like to see assuming responsibility for RAs. (Part. I, Section 18.)

6. We believe that it is critical to full RA success that each association defines explicit objectives and plans its medium-term future in a detailed fashion. RAs individually should now undertake a fundamental review of their objectives. Some may need to review or restate their functions and redefine their markets. A clearer expression of their own objectives as institutions is essential to the effective framing of future policies, particularly towards submissions to government for financial support. It is also essential to ensure that RAs reflect changing industrial structures and demand. (Part I, Section 2.)

7. We urge industrial members of RAs to ensure that their representation on RA committees and Councils is of the highest possible level. Only in this way can industrial initiatives and needs be adequately expressed. (Part. 1, Section 3.)

8. We were not convinced in all cases that trade associations are as effectively involved with RAs as is desirable. We believe that both have an increasing joint role in the evolution and practice of legislation relating to safety, health, and pollution. We accordingly recommend that all RAs and their related trade associations examine their relative responsibilities. The proposed Board for Industrial Research and Development could undertake a coordinating and supervisory role in this matter. (Part I, Section 12.)

9. We are of the opinion that many RAs by their long and intimate contact with industry are better equipped to undertake work of industrial importance than most of the government research establishments (GREs). RAs have a better knowledge of industry, better personal contacts and surer insights into the possibilities of technical application. We accept that GREs should perform certain work for government, but we believe they are less well suited than RAs to technical work for industry. GREs should not normally do industrial work. We believe that where GREs have facilities in excess of those required for their basic objective then the management of such facilities should be transferred to the RA or to industry itself. (Part I, Sections 7, 8.)

10. Whether or not GREs continue to do industrial work we believe that the relations between RAs and national technical institutions, particularly GREs, should be made more effective. The exchange of information has often in the past been one-side in favour

of the GREs. We therefore recommend that reciprocal representation should be established at the level of highest governing bodies of parallel or contiguous RAs and GREs. (Part I, Section 7.)

11. In view of the impending changes in Defence establishments and in the allocation of defence research expenditure, we hope that the Ministry of Defence will consider making a greater use of the industrial RAs. (Part. I, Section 7.)

12. Industries should be left free from government stipulations or limitation as to the nature of support given to RAs. This relates to home and overseas members. Similarly, where the majority of an industry, by number of firms and by output, so desire it, RAs should have access to statutory levy finance. (Part I, Section 19.)

13. We believe that all RAs should now have developed, or be developing, a policy for overseas activities, especially with regard to the European Economic Community. Many RAs should now widen their overseas memberships and we welcome the government decision to remove discrimination against membership by foreign concerns. We hope that the government will now also remove the grant discrimination against overseas membership subscriptions, or, in the first place, those originating in Commonwealth and EEC countries. (Part I, Sections 16, 17.)

14. We do not regard size in itself as having any necessary relation to RA effectiveness, although we accept that the smaller an RA is the less it is competent to undertake full-scale laboratory activities. We conclude that the primary decision on the question of mergers between RAs should be made by the industries involved. We are not convinced that significant economies of scale could often be achieved by merger, but agree that in cases of membership overlap or technical compatability, communications and general effectiveness may be improved by merger. (Part I, Section 18.)

15. We have discovered that many RAs have already made significant progress in the conservation of industrial resources, control of industrial waste and recycling. In some cases collaboration in these spheres has taken place between RAs. Their closeness to industry makes them better suited to undertake this type of activity than the GREs with the exception of the Water Pollution Research Laboratory. (Part I, Section 9.)

16. We were impressed by the contribution made by many RAs to industrial standardization in all its forms, particularly the preparation of BSI and ISO standards and the increasing involvement in EEC standardization procedures. This reflects the institutional value of the RAs which it would be difficult to replace if they did not exist.

Work of this type should receive specific grant support. (Part I, Section 10.)

17. We believe that all RAs should keep themselves informed of management and marketing problems of their industries and should devote attention to analysis of the development of their industries' markets and to forecasting future economic and market conditions. Where not otherwise provided, RAs should feel free themselves to offer management, marketing, forecasting and planning services if there is a demand from their industries. (Part I, Section 12.)

18. We support the policy of low RA member subscriptions which simply provide access to routine services and right of access to all other services for which specific payment is made. Should RAs wish to preserve substantial subscription levels, we commend the system adopted by some of allowing members to nominate projects to which they wish subscriptions to be tied. (Part I, Section 19.)

19. We consider it to be the responsibility of each RA to protect by patent and to market by licence in the most effective way possible its own technology and know-how. This should not be left entirely to outside agencies. Some RAs already do this effectively: more should. (Part I, Section 6.)

20. We hope that RAs will continue to devote particular attention to the development of international relations with technical institutes operating in similar fields. Again, we stress the importance of this within the EEC. (Part I, Sections 16, 17.)

21. We consider that British scientific and commercial offices in Embassies abroad should be more familiar with the facilities and expertise offered by British RAs, and could assist RAs in developing their international activities. (Part I, Section 16.)

22. We support the present attitude of the European Economic Commission that existing technical institutions should be regarded, as merited, as centres of excellence and that each should make its services available on a EEC basis. We believe that the British RAs have a great potential in this framework. The Commission can assist this process by developing central information services on the availability of technical services for industry, the development of an index or inventory of science and technology resources for industry. (Part I, Section 17.)

In Part II of the Report a number of special recommendations are made in respect of individual RAs. Many of these derive directly from the general recommendations summarized above. Some of the more important of those which do not, or which, in our view, deserve a special emphasis here are as follows. Reference in brackets is to the relevant RA profile in Part II.

23. We do not recommend mergers between the main textile RAs but would like the Textile Research Conference to take an increasingly active role in coordinating their various activities. (Cotton, Silk and Man-made Fibres RA.)

24. We suggest that the industrial membership of the Steel Castings Research and Trade Association and of the British Cast Iron Research Association be asked to consider a merger between the two. (Steel Castings RA.)

25. We further recommend the establishment of a metals research conference to control the extent of overlap between the various metals-associated RAs and to increase collaboration between the organizations concerned. (Steel Castings RA.)

26. We recommend that a special independent enquiry should examine the relationship between the Machine Tool Industry RA, the Production Engineering RA, and the National Engineering Laboratory. (Machine Tool RA.)

27. We recommend that the Ship Tank facilities at Feltham of the National Physical Laboratory be transferred to the management of the British Ship Research Association. (Ship RA.)

28. We believe that the skills of Aslib in the design and/or operation for RAs of information services have not so far been properly utilized by the RAs as a whole. Aslib itself should devote special efforts to the promotion of new information systems to RAs. (Aslib.)

29. We believe that the Department of Trade and Industry should give attention to achieving a positive and effective policy for under-water engineering. (Construction RA.)

30. We would be reluctant to see the total loss of the skills and expertise of the Welwyn Hall Research Association. We suggest that the proposed Board for Industrial Research and Development should consider the reallocation of WHRA functions among other RAs. (Welwyn Hall RA.)

31. We recommend that the National Computing Centre be converted to an industrial RA, with particular emphasis on the provision of services to the software industry. The RA should be structured from the outset on a European basis, deliberately seeking its membership on an EEC scale. (Part I, Section 18.)

32. We believe that there is an urgent need for a specialist independent investigation of the organization and administration of food research in the United Kingdom. We believe that there exists overlap, duplication and in some cases friction between the institutes involved—RAs, government and ARC stations and universities. The question extends well beyond the industrial RAs which were our own remit. (Food Manufacturing Industries RA.)

Discussion

Question by: Mr Leicester

Lord Bessborough mentions the undercurrents in his report which may well necessitate serious consideration. I would welcome his comment on one such hidden sector 'The value of Government financial aid as a means of extending collaboration and cooperation between the 40 RAs'.

Whilst substantial aid was available, the Directors and Staffs could obtain help and information from their colleagues at no cost and with great benefit to their industrial members. As noted by the Committee of Enquiry and re-emphasized by Mr Oakley, that aid is steadily being withdrawn in favour of the customer/contractor principle.

In my view, this can have a disastrous effect on collaboration and the ability for free exchange of information. Why is this so? Quite simply because under the customer/contractor principle everybody is being forced to make a charge for services rendered.

The opportunity of feeding a member's problem into any one of the 40 RAs was of extreme value to industry, it was the admiration of similar research institutes throughout Europe and yet now that the United Kingdom is in the EEC, we are destroying this most valuable asset.

What would be your comment on this point Lord Bessborough?

Answer by: Lord Bessborough

Whilst I fully appreciate that the customer/contractor principle will limit the extensive free exchange of information between research associations on behalf of industry, nevertheless the members of my Committee did not consider that this would cease completely.

In the overriding need to balance research and technical effort with what industry requires and is prepared to pay for, it was considered that the overall concept was right. If one RA's request involved another RA in work, then the costs should be paid by the enquirer.

Answer by: Mr Oakley

If somebody asks for information then presumably they have a specific need and so why should they not pay to have that need satisfied?

The customer/contractor relationship does not necessarily imply that government support for the RAs will decline. Lord Bessborough's report does draw attention to an apparent imbalance between the turn-over of industries and the support they get from government. The government must give serious attention to this. But it does not necessarily follow that if it were decided that a greater proportion of the national R & D cake should be diverted to the medium and low technology industries, served by the RAs, that it would be right for that to lead to an increase in RA funding.

In passing may I comment that I have observed that in cases where a charging system for information has been introduced the demand has fallen off dramatically. I do not believe that that is due to the quite trifling charges involved, but rather suggest that many of the questions in a free service are so trivial that they are not worth the effort involved in answering them.

Comment by: A.W. Holmes

Collaboration between laboratories depends on the will of the scientists to collaborate more than direction. If this is satisfactory we must then face the question of money especially if:

(a) RAs are being preconized to follow the customer/contractor relationship;

(b) there is a great imbalance of activities.

Several international collaboration possibilities have failed because of budget problems. The availability of a central fund through EEC for this purpose would ease the problem and increase international collaboration.

Question by: Dr R.G. Allen

In the United Kingdom the Government is in the process of putting waterworks and sewage works together and thereby bringing the 'clean' and 'dirty' aspects of water into 10 large Regional Water Authorities for the whole country.

It is proposed at the same time to reorganize and merge the relevant research at present financed by Government (dirty water), and by the industry itself (clean water), bringing £ 2.5 m of research into a central body operating as a Research Association owned by a membership drawn from the water and effluent industry itself.

The Bessborough Report (page 162) notes and approves of this extension of the RA principle and no doubt Lord Bessborough is glad to see, as we are at the Water Research Association, the substantial scale of funding proposed and which involves the transfer of £2 m of research expenditure out of Government and into the industry which needs it.

Answer by: Lord Bessborough

Yes, the Committee noted with interest WRA's leading part in the establishment and development of cooperation between European countries in the field of water pollution research. Its main concern centered, however, on the part which it is planned that the Association should play under the reorganization of the water services which Dr Allen has mentioned . This central body for research will reduce the fragmentation of R & D in water matters which at present is spread primarily between four bodies. It is intended that the centre shall retain the principle of 'membership' and that industrial representation should be sustained. This seems, therefore, to be an extension of the RA principle which will lead to a more extensive and more rational provision of R & D services to the Water Supply Industry. The Committee is confident that this arrangement will achieve an effective end product for the United Kingdom and of benefit to Europe as well.

Comment by: Mr J.G. Butlin

Customer/contractor principle forces RAs to have a commercial attitude to life. Their product is knowledge and this therefore is what they sell. Members are only members to have access to that knowledge. The RA cannot therefore give knowledge away to other institutes unless either:

(a) there is a fair exchange of knowledge or

(b) there is a compensating cash flow.

In the footwear industry the threat is not from within Europe and it is grossly inefficient for the research institutes to be overlapping and competing. An equitable solution to allow full cooperation and coordination is urgently required.

Question by: Mr J.A. Phillips

Can Lord Bessborough give any indication of the possible timescale of implementation of any or all of the recommendations in his report.

Answer by: Lord Bessborough

The work of this Committee has been completed with the submission of the Report. However, I think that the Report will receive serious consideration and that the various recommendations will be studied carefully. I make particular reference to the proposals for a Board of Industrial Research and Development which I consider could have a major impact on the work of Research Associations.

SESSION III

Thursday 26 April 1973 — Afternoon

THE INDUSTRIAL NEEDS FOR COOPERATIVE TECHNICAL ACTIVITIES IN 1980

Session Chairman:

The Rt Hon The EARL OF SHANNON
Director, Conference of Industrial Research Associations
Committee of Directors of Research Associations

The European Pattern of Industry

Dr Heinrich VON MOLTKE
Directorate-General for Industrial, Technological and Scientific Affairs, Commission of the European Communities

The question of how to achieve a European pattern of industry, is the basic problem of a Community-wide Industrial Policy.

In the Community, Industrial Policy belongs to the new generation of policies initiated after the completion of the transitional phase of the Common Market. During the first stage, a number of import measures have been taken at Community level which had a great impact on the creation of a vast unified market for industrial goods.

The most important of these were:

— the abolition of customs barriers and of quantitative restrictions to trade between member countries,

— the creation of a common external tariff at a relatively low level as a consequence of the Kennedy Round,

— the implementation of the Treaty rules on free establishment of capital and services,

— the control of cartels and restrictive practices to trade,

— and the first steps towards legal and fiscal harmonization.

All these measures have certainly contributed to the enormous development of trade between the Community countries. However, what they clearly failed to bring about was the achievement of a really unified economic area where individuals and companies would act under conditions comparable to those they are actually finding on their respective national markets. As a consequence, European industry as a whole was not in a position to fully adapt its activities to the requirements of a vast continental market and therefore still lays behind its American competitors in terms of cash-flow, added-value per person employed, innovativeness, and other criteria of efficiency. Even on the European market, foreign based multinational firms often succeeded better than European ones in adapting to the national peculiarities still prevailing. In fact, what we realize at the end of the transitional

phase is that European industry has been prevented from reaping the full benefits of the Common Market, because progress towards full economic integration has been too slow :

— Restructuring of the Community's industries has not gone far enough, and has not taken sufficient account of the existence of the Common Market and the need for allocating resources accordingly;

— Mergers were largely limited to national groupings due to disparities in the fiscal legislation of member countries and to the absence of appropriate legal support for the realization of transnational mergers;

— Circulation of goods is not completely unhampered because of tax frontiers and differences in regulations on public safety and public health, and because of divergent industrial standards;

— Last not least, there exist in all countries highly contradictory national industrial policies which by various means (ranking from R & D contracts and other kinds of financial support to preferential treatment in the award of public procurement contracts) tend to maintain artificial situations no longer compatible with the requirements of a vast economic space.

To make the long story short: the whole legal, financial and technical environment in which industry is used to operate, has remained largely national in all European countries. In order to change this situation, a whole bundle of measures will be necessary, sometimes of a general nature, sometimes more sector oriented, and these measures fall under what we call a Community-wide industrial and technological policy.

This goal has been formally recognized recently by the Heads of State or Government during the Paris Summit Meeting of last October.

Article 7 of the Communiqué issued at the end of this meeting clearly states that the participants to the Summit Meeting have considered it necessary to bring about what they call a 'single industrial base' for the Community as a whole.

This is spelled out with more detail in an extract from the Communiqué, which reads as follows:

'This involves the elimination of technical barriers to trade as well as the elimination, particularly in the fiscal and legal fields, of barriers which hinder closer relations and mergers between firms, the rapid adoption of a European company statute, the progressive and effective opening up of public sector purchases, the promotion on a European scale of competitive firms in the field of high technology, the transformation and conversion of declining industries, under acceptable social

conditions, the formulation of measures to ensure that mergers affecting firms established in the Community are in harmony with the economic and social aims of the Community, and the maintenance of fair competition as much with the Common Market as in external markets in conformity with the rules laid down by the Treaties.'

The Communiqué also calls for the development of a common policy in the field of science and technology, which I need not refer to in detail because it has already been dealt with this morning.

Let me dwell for a moment on the sort of programme which is outlined by this text.

If one leaves apart the measures dealing with special sectoral problems, the actions foreseen in this programme can be brought under two headings:

— the achievement of the Common Market and

— the promotion of competitive firms on a European scale.

As to the first point, it includes two important sub-objectives: the complete abolition of technical barriers to trade, and the progressive opening-up of public procurement markets.

Technical barriers to trade have proved to be among the most important remaining obstacles to the complete realization of home market conditions in the EEC, after the dismantling of tariff barriers and quantitative restrictions to trade. By technical barriers to trade, we understand state legislation interfering with industrial activities or setting minimum standards for industrial goods for reasons of public health and safety, of consumer protection and information, of environmental protection, etc. ... This legislation has to be harmonized in order to iron out existing differences, and an important work is already being done in execution of a general programme adopted by the Council in 1969 and which will be amended in the coming weeks on the basis of a proposal introduced by the Commission last year. But the Commission now feels it necessary to speed up these procedures in order to make sure that all the directives called for in the working programme can be adopted before the end of 1977. This will require an important effort from the Commission's services, for it is planned to double the number of directives transmitted each year to the Council of Ministers for approval so as to bring them to 25. It will also require the systematical introduction of more flexible procedures.

I am now turning to the problem of the effective opening-up of public procurement markets: here the difficulties are of a formidable nature, at least in some sectors, where national interests are particularly concentrated. This is why the Summit has put some weight on the progressiveness of this opening-up of markets. A first positive step

has been made recently by the application of a Council regulation regarding public works' contracts. As a result, invitations for tenders and the award of such contracts have now to comply with common procedures and criteria. A similar regulation has been proposed by the Commission in May 1971 for other public procurement contracts, but no decision has been taken by the Council so far; therefore the Commission will invite the Council to adopt this proposal before the end of this year. Even then, a number of important sectors will be excluded from a Community wide regulation because of differences in the legal statute of the purchasing agencies involved. This refers to sectors like energy and water supply and public transport for which a recent inquiry by the Commission has shown that purchases of equipment in other EEC countries are in fact very modest in comparison to products similar in specific value and degree of sophistication but made to cover the needs of private customers.

This calls for a specific regulatory action for the sectors excluded from the general rules on the basis of Article 90 of the EEC Treaty which deals with public utilities providing a service of general economic interest. The minimum requirement for these utilities should be that invitations for tenders be addressed to all competent firms in the Community.

But in all these sectors the obstacles to an effective opening-up of public procurement markets are by no means limited to national legislation and administrative practices resulting in a preferential treatment of national suppliers. On the contrary, some very important obstacles arise from the existence of different technical systems in the fields of railroad transport and telecommunications, differences which are very difficult to overcome in a short or even medium term approach because of the long life of the equipment already in service.

A complementary action for these sectors is therefore needed, which has nothing to do with the normal regulatory work of the Community. It should be based on the idea that for economic and technical reasons the emergence of a European network is desirable in the fields of both railroad transport and telecommunications. It would consist of inviting the corresponding national services to form common subsidiaries in order to promote joint technological development of future equipment and to coordinate purchasing policies.

Other complementary actions of a less specific nature would deal with the need to improve information of all those concerned by public procurement, and to stimulate discussions on the problems to be solved. But I have already spent too much time on this particular subject and shall therefore turn now to the second overall aim of a common industrial policy, namely the promotion of competitive firms on a European scale.

The basic idea herewith is simple: The main reason for the lack of optimum efficiency in industry is seen in the fact that restructuration has not been fast enough and has not taken into account the existence of the Common Market.

There has, undoubtedly, been a great expansion of trade between member countries, of marketing subsidiaries and of all the facilities which go along with trade. But we have not seen a full exploitation by European-owned companies of Europe's production resources — R & D, managerial expertise and so on from our entire continent. A relatively small number of European-owned firms such as Philips and Olivetti increasingly seek to exploit these to establish a rational division of labour and to optimize profits by treating Europe as a whole in their planning.

Of course, there has been a move towards more concentration in order to exploit economics of scale. But instead of merging with the many eligible partners to be found in the wider European Community, European companies marry the girl next door, or get carried off by the visiting American millionaires. In some industries where the American challenge is felt in a particularly acute way, we have even assisted at the creation of one single national company. In such cases national concentration tends to lead to local market domination and makes the solution of the public procurement problem all the more difficult, as these single companies become identified with nations. We therefore feel that transnational companies may sometimes be the only way of combining competition and economics of scale.

There is of course first the legal and fiscal side of the problem. As the legal obstacles in the way of creating a truly European texture of industries mainly lie in the divergences of company law, the Commission appeals to the Member States to give a special impetus to the discussions on the statute of a 'European Company' and to accelerate the harmonization of national company law. Furthermore in order to facilitate transnational cooperation between companies of all sizes and any legal status the Commission is preparing a proposal for the creation of a new and very flexible legal instrument called 'European grouping of cooperation'. Halfway between the legal and the financial measures lies the proposal already made by the Commission to extend the statute of 'joint undertakings' known from the Euratom Treaty to other applications outside the nuclear field, and with it the possibility to grant on a case by case basis special fiscal amenities or financial advantages in the form of loans. The applications which are foreseen are twofold:

1. transnational cooperations between public service administrations, the idea of which has been already mentioned when dealing with public procurement problems in the field of railroad transport and telecommunications;

2. transnational cooperations between companies having an important activity of common European interest in the sector of technological development.

Needless to say that both applications aim at strengthening the innovative capacity of European industries, either directly or through the creation of a vast market for advanced technology products.

Leaving aside the fiscal measures—however important they may be—I come now to another category of Community measures called for by the Commission. The question is: How can one accelerate the process of industrial integration in Europe in spite of the imperfect situation in the legal field and of the time needed to overcome all barriers?

The first idea which comes to mind is that of improving information. Big companies have succeeded at heavy expense to find their way through the jungle of European legislation and to organize some form of European quasi-mergers: Agfa-Gevaert, Dunlop-Pirelli, Hoesch-Hoogoven are the well known cases. Medium-size companies do not have the necessary expertise and information to exploit these possibilities and are often unaware of the existence of potential European partners. The Commission has therefore decided to set up a special Bureau with the task of providing the kind of information which is most badly needed.

The next step is to eliminate *de facto* discrimination against transnational industrial cooperations, resulting from government aids. Such aids do exist in practically all of our member countries, particularly in order to stimulate innovation in industry. They mostly take the form of loans repayable only in the event of success, and in practice sometimes even by virtue of law, only national firms can benefit from them. Joint ventures between firms in different member countries are therefore not eligible for any financial backing under the present circumstances. And yet, they should be encouraged, as the development of new products or processes is often a decisive element in a firm's strategy. If a transnational cooperation can be organized at that stage, the chances are good for a further development and strengthening of such links.

This is why the Commission has proposed the creation of a similar mechanism on a Community basis specially designed to deal with cross-frontier cooperations in the field of technological innovation. It would consist in granting what we call 'Community industrial development contracts' for projects aiming at the development of new products or processes of general economic or social interest. The initiative would lie entirely with the firms concerned. Applications for financial interventions would have to be introduced with the European Investment Bank, which would collect the necessary information on

the existence of reasonable prospects for technical and commercial success and would then submit the case for decision to the Commission. After having obtained a positive answer from the Commission, the Bank would be able to finance the project by a low interest loan which normally covers 50% of the cost and which would be repayable only in the event of success. In the first year, a credit line of 20 million u.a. would have to be opened in the Community budget to this effect, which would allow to finance approximately 20 projects, the scheme being limited to medium-sized projects. After having got a very favourable opinion from the European Parliament, the Commission now hopes that the Council will start its discussions on the proposal very soon and that a decision can be reached before the end of the year.

A problem which the Development Contracts cannot deal with because of their limited scope, is the question how to find the necessary risk capital for the production and marketing of an innovation. There are, however, specialized financial institutions in our member countries which are already active in this field, such as ICFC, IMI, SNI and others. These institutions might be invited by the Commission to cooperate between themselves through the creation of an appropriate financial mechanism which, like the Development Contracts, might prove to be of a special importance for medium-sized firms. An inquiry about this problem is under way.

The last two ideas allow me, at the end of my contribution, to stress one particular aim of a common industrial policy: i.e. the creation of the best possible environment for the technological progress of our European industries. I hope that this has clearly come out of my paper, even when it apparently dealt with other problems such as public procurement or the elimination of technical barriers to trade. For in our eyes, the creation of a vast and highly competitive market together with the promotion of appropriate industrial structures, will in fact strongly stimulate the technological capabilities of our industries which we believe to be considerable.

This general preoccupation for the technological competitiveness of European industry is something we share with your Research Associations, as well as the confidence we place in cooperative efforts. We might even have very specific interests in common such as the organization of a European cooperation in the field of scientific and technical information, which we are dealing with actively, or of some action for the assessment of future technological development and its impact on industry. We therefore welcome all moves towards closer links between your Associations on a European level as an important step in the direction of the common industrial base which we hope to establish.

Types of Research Projects

Dr N.K. BRIDGE
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TYPES OF RESEARCH PROJECTS

The principal reason for the existence of cooperative research is obviously economic, although there are other factors which contribute to its value. The pooling of 'know-how' which exists at the start of a cooperative project can reduce the amount of preliminary work required. Also, the project is more likely to be guided into areas having a wide appeal, rather than in the interests of a very small section of an industry. The primary disadvantage of course is that there does not exist in cooperative projects the close 'customer/contractor' relationship which helps to ensure rapid progress as a result of specialization on the customer's main problem.

The various types of reasearch project carried out in the United Kingdom research associations can be classified as follows:

1. Cooperative research.
2. 'Specially funded' research.
3. Government or Trade Association etc. contracts.
4. Multi-client projects.
5. Sponsored projects.

In addition there are of course projects which are the subject of bilateral or multilateral agreements with other national and international research institutes.

The terms used in the above list are probably self-explanatory, but in case they are not and to help you understand them, I should remind you that the research associations in the United Kingdom obtain their finance in three ways:

Member subscriptions.

Government grant based on a percentage of subscriptions—usually about 24%.

Contract fees.

The major single area of activity in many research associations is still cooperative research. This is paid for out of the members' subscriptions and Government grant, and falls into the following main categories:

1.1—Objective basic research

The aim of this type of work is to improve industrial efficiency. It achieves this by providing a better understanding of the processes or materials involved in the industry which lead to improved machine efficiencies, reduced machinery costs and reduced costs of raw materials, fuel, etc. On occasions, radically new methods of industrial operation are opened up as the result of the research. Typical of this area of work in our own research association are projects concerned with:

Ink absorbency of coated papers.

Causes of colour changes in printing wet-on-wet inks by offset lithography.

Vapour permeability of plastics packaging films.

1.2—Development of standard test methods

Again in our industries one could give as examples, measurement of paper folding endurance, lithographic blanket testing and 'taint' from food packaging materials.

1.3—Evaluation of the consequences of national and international legislation—especially pollution

In Pira we have projects dealing with the effect of biologically treated effluent on the ecology of the receiving stream; the migration of contaminants from packaging materials into foods; and work on the suppression of sewage fungus from paper mills.

1.4—Safety and health research

In the present climate in the United Kingdom there is considerable pressure to provide solutions in this area. Currently we are working on the problems of noise in our industries and, on a more practical level, the strengths of baling wires are used to tie up bales of waste paper.

1.5—Evaluation of equipment and instruments

These can be either laboratory or industrial equipment and instruments. For example we have recently evaluated both in the laboratory and in a paper mill a new instrument for continuously measuring the clay content of paper. We have also evaluated light sources for viewing colour prints and transparencies in printing factories, and are currently evaluating gas permeability instruments for use in the laboratory to test paper and plastics films.

Projects such as these typically cost between £2 000 and £50 000 and can last for periods varying from a few months to 2 or 3 years. They are all most carefully organized through the medium of industrial project groups and regular reporting systems to the members.

The second type of project referred to above was the so-called 'specially funded' project. In these projects extra money is collected from members who have a joint interest in a specialized field, not of sufficiently broad interest to attract the general funds of the association. The project is submitted to the Government for additional funding, and if it is judged to be of importance to the sector and to the national interest, the Government will support it. Examples of this in our own association might be quoted, such as work on the factors controlling the performance of some web-fed packaging machines and the provision of a Technical Adviser to the provincial newspapers.

The above two types of project, namely item 1—cooperative and item 2—specially funded, are supported by Government grant and represent one end of the spectrum of research projects. The other end is represented by items and projects which do not attract or use Government money and are carried out confidentially for one or for a few clients, the results of which are not published to the whole industry. These are obviously item 5—sponsored research and item 4—multi-client research.

However midway between these two areas we have item 3—projects specifically for Government agencies, trade associations and overseas agencies such as UNIDO, FAO, etc. This work is often of the technico-economic variety appertaining to our own particular industries. For example we have recently finished a study for the British Government on the technical and economic feasibility of plastics, printing and writing paper production in the United Kingdom.

It goes without saying that all these latter categories of projects will be on the subjects in which the particular association can be considered to be expert. This is one of the major problems of a research association, because there are so many subjects in any one industry which could be studied that it is very tempting to dissipate

effort, and we see it as essential for the research association to define clearly the areas of its expertise, not only to help itself, but also to be attractive to potential sponsors.

How will these activities fare in the world of the 1980s? I believe that industrial needs will demand a similar sort of project mix, such as basic research, equipment evaluation which is most cheaply and efficiently done on a cooperative basis, and contract work for one or a few clients who have a precise need for the institute's particular skill.

However I believe there is room for closer cooperation between research institutes working in the same field throughout the world, and in particular in the EEC. As an example of this I should like to mention that we in Pira were active in setting up two International Associations of research institutes. One is IAPRI, the International Association of Packaging Research Institutes, and the other IARIGAI, the International Association of Research Institutes for the Graphics Arts Industry. As we are guests in Holland I would particularly like to mention a very close cooperation which has developed between the Dutch Printing Research Institute (IGT) and ourselves in a defined area of printing composition. Both IGT and Pira regard this as a most valuable exercise. The key to success in this case I believe was the fact that there are experts working in this field in both laboratories and that there is a large demand in our two countries for this type of expertise. Having had experience in trying to set up meaningful technical exchanges with several other similar institutes throughout the world, I am convinced that the only satisfactory way to do it is to concentrate effort into a particular area. I believe therefore it is essential that, if there is to be collaboration between EEC research institutes, it must be between laboratories studying the same subjects.

If this method is chosen then, by a process of natural selection, some institutes will become pre-eminent in certain areas of work. As a result we could look forward in the field of printing for example to, say, the Dutch Printing Research Institute becoming the principal basic research centre for print composition, to which all the EEC printing research institutes would send their experts to learn about the latest advances for, say, one or two weeks per year. During this time they would help to formulate an on-going research programme and would absorb the latest developments to help them to solve the problems of their own national industries and clients. There will of course be many problems, and I look forward to this conference providing some of the answers in order to promote closer European collaboration in research.

Technical and Information Services

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The current trend is for technologically important research and development work to be conducted in the research centres of the major national and international companies; industry relies less and less on cooperative research institutions for its technological advancement. Furthermore, the increasingly large sums of money required for (and put at risk in) such R & D project work make it unlikely that industry will, in the foreseeable future, act to reverse this trend, nor are cooperative research institutions likely to be willing to commit such large sums of money from their cooperative research funds to finance major individual technological R & D projects.

This trend is forcing research institutions to concentrate more and more on good 'support' services for industrial R & D work in order to establish a sound and clear-cut role in the present industrial environment.

A major part of such services is centred around the concept of 'information supply'. The successful establishment of these services depends largely on how they can best be established to meet and satisfy the day-to-day needs of industry and, at the same time, attract sufficient financial support from industry. Such services embrace short term, and relatively minor, R & D projects that are designed to produce the technical information required to solve ancillary industrial problems, and cover a range of consultancy activities in which laboratory test and other work many be married to background experience and expertise in the provision of general or specific advice to industrial firms, training and conference activities which enable information to be disseminated directly to the staff of industrial firms, and services in which the world's existing store of information is made readily availbale to those in industry who require it.

A range of services such as these, and spanning the whole of a given technology, are expensive to set up and maintain, too expensive, in fact, to be established as comprehensive internal services within most

companies. However, when a number of companies can adopt a cooperative solution then a comprehensive range of efficient services can be established for the benefit of all and at relatively small cost to each. This obvious cooperative solution can be, and is, provided by the industrial research institutions with good efficiency and on a sound basis of logic and economics.

Thus, most of the research institutions in each of our countries have adopted, or are adopting, cooperative technical and information services as a major role and function within the industries they serve. However, the cost of some of these services, such as library and information services, is now becoming so large that the expenditure on them cannot be reasonably justified even in terms of nation-wide usage. Consequently, many of the formal services that have been established, or are being established, are aimed more and more at an international market, thus sharing costs among a considerably larger number of users. A good example of the vital need of some types of information service to work on an international basis is provided by the Chemical Abstracts Service, a service that is vastly expensive to operate and one whose costs can barely be supported even on a world-wide basis of usage. I say 'barely' because Chemical Abstracts appears to be hitting the 'cost barrier' : subscriptions have reached such a high level that many organizations can no longer afford to subscribe —the reduction in number of subscribers in turn accelerates the increase in subscription costs.

The concept of the international usage of services brings me to consideration of the EEC in relation to cooperative research institutions and operation of their technical and information services—and to the central problem involved which is that of the language of communication.

If such services are developed on a commercial basis (i.e. payments by users to meet the real costs of the services) with the objective of world-wide usage then, without doubt, English is the language which gives the best economic return since English-language readers provide by far the largest potential market for these services. If, however, services are developed purely as an EEC facility then a much less clear-cut situation exists since within the EEC, English, French and German language readers of information material provide markets of roughly equal size. This poses a dilemma: does an EEC-based service attempt to work with equal facility in these three (and possibly other) languages thereby providing good services for individual EEC members, but at a considerably increased cost because of the necessity of the multiple translation of information contained in documents, papers, articles, etc. and of records of these items, from one language to another, or does an EEC-centred service expend the money available to it in the provision of the wide range of 'best-possible' facilities for

world-wide usage in a single (English) language? Before working out a logical (and probably compromise) solution, financial and other objectives must be clearly established. These require that a decision must be consciously reached on whether service to EEC members overrides considerations of commercial viability or not. Thus, is some EEC body prepared to subsidize services tailored closely to the requirements of EEC members for their special benefit or are services to be established on a purely commercial basis and, possibly irrespective of convenience of usage to individual EEC members?

Since it seems unlikely that services can be produced that are ideal for each and every EEC member and which, at the same time, are truly viable on a commercial basis, it is likely that the problem will become one of devising an acceptable and satisfactory compromise. Such a compromise might be that detailed and comprehensive services be developed to operate on an English-language basis for world-wide usage, with spin-off sub-services developed from these in other languages according to individual markets and individual national needs. Such a solution would require realistic and effective collaboration between the cooperative research institutions of the EEC members on the basis of an agreed and effective compromise.

Another problem to be faced in considering the development of services is that posed by differences in general character and structure between the bodies of companies that make up the industries of each EEC member. These differences result in demands for different types of service. To illustrate the problem two extreme, perhaps exaggerated, cases may be compared; an industry in one EEC member may be made up largely of small- or medium-sized independent firms whereas, in another, it may be composed largely of a few big combines each with fairly well-developed R & D and information centres. The service demands produced by the small- and medium-sized independent firms in the one member country are likely to be quite different from those produced by the big combines in the other. These differences again raise the question of economics in relation to the design of services: how should services be developed in relation to the needs and economic potential of the differing markets which need to be served?

Again, there is no simple answer to the problem and a further dilemma is posed by the constant change in the structural organization of industry. Services may be developed for a particular industry in a particular country at considerable cost and then, when these become operative, it could be found that the service requirements of that industry had changed in a way that made these services of less use and hence less commercially viable.

I have, so far, been indicating in generalized terms problems that are posed in the provision of services for an international market and the complications introduced when two types of international market

may need to be served, i.e. an EEC market and a world-wide market. Perhaps it would now be useful if I discuss the problems that have confronted and are confronting my own organization, the Shirley Institute, during its present 5-year programme to develop computer-based information services for international use in the area of textile technology and science.

During the 50 years of existence of the Institute completed in 1969, the main objective of our information services was to provide the Institute's research staff and members of the Institute with information services. The fact that some of these services, such as abstracting services, came to be of importance to the world at large was more or less incidental as is evidenced, for example, by the fact that we gave away our abstracts to another organization, the Textile Institute, for publication on a world-wide basis.

The rising costs of these services, plus the growing need to formalize their operation in order that they could operate with efficiency, caused us in 1969 to re-establish our existing services and to establish future services with the principal objectives of serving an international market and making our services commercially viable. Because the English-language market was clearly so much larger than any other we based our services on the English-language. Because other-language markets were so much smaller and because the costs of operating in any other language would be as least as great as those for the basic English-language services (costs of translation, printing and publication), we made a positive decision not to operate additional services in other languages. On purely economic grounds, this decision remains right today even in the context of the United Kingdom's membership of the EEC. A decision to subsidize such additional services by some EEC body or the achievement of an effective and realistic collaborative arrangement with one or more other institutions within the EEC could, of course, alter the economics and hence the decision.

Collaboration, like tax reduction, is a simple concept that is difficult to implement. We have some considerable experience of the difficulties involved in attempts to attain good collaborative arrangements with other organizations in the United Kingdom, France and the USA in the area of information services. The objectives of such arrangements are the provision of a mechanism for sharing work loads and costs in the production of services and the production of special forms of service for particular markets.

A series of obstacles stands in the way of the realization of any effective collaboration.

First, each organization involved in a discussion designed to lead to the implementation of collaboration may have different motives or different ideas on priorities to the others involved. If one, for example,

is vitally concerned with economics and another is vitally concerned with prestige of language or status then the path ahead is likely to be rough because these differences leave very little latitude in the devising of an effective collaborative arrangement.

Second, there are a range of uncertainties to be faced and dealt with. I might mention a few of them briefly. *Trust:* trust in the sense that one organization, in disbanding internal mechanisms and arrangements for the production of information services, will need to be able to rely on effective and continuing replacement services provided collaboratively or by another organization—if this does not prove to be the case then the cost of reconstituting what was there before may be prohibitively large. *Speed and convenience:* since speed of operation is an important factor in information services and since it is obviously more difficult to maintain or improve the speed of day-to-day service operations if the various elements comprising a total collaborative service are to be separated by hundreds or thousands of miles instead of all being conducted under one roof. *Uniformity of operation:* since information originates in many languages and is presented in many styles, it is essential that the work of recording this information in an information system must be done with care, expertise and, in particular, with a high degree of uniformity over the whole field of information. It is obviously more difficult to produce this uniformity if the recording work is shared between, say, the staff of institutions in different countries, than between the staff of one office.

All these and other obstacles are, consciously or sub-consciously, in the minds of those who meet to discuss the establishment of collaborative arrangements. If those taking part in discussions intended to lead to active collaboration are not only conscious of the obstacles but also are able to declare and define them fully and clearly then a hopeful start can be made. If, however, the obstacles remain hidden or are not fully stated then the discussions are doomed to failure. Effective operational systems can only be founded on the starting basis of clearly-defined and accepted objectives and with full account being taken of known obstacles.

We at the Shirley Institute have been fully conscious throughout our programme of service development work of the fact that a large degree of active collaboration between organizations working in the same information field is highly desirable in order to reduce operational costs and to share workloads and also of the fact that services have to be aimed at the largest-possible market in order to have a reasonable hope of recovering operating costs from service users.

We were able at the outset to establish a collaborative operational mechanism on which to base our developing services when five United Kingdom Textile Research Associations agreed to work together on the promotion and conduct of textile information services. This colla-

boration has, from the beginning, worked well because the economics were right, and conditions for establishing the required high degree of trust, speed and uniformity of operation were extremely favourable.

However, we have so far been less successful in establishing collaborative operations outside the United Kingdom and/or outside the purely textile field. Attempts to establish a full textile information service on the world patent literature by means of collaboration with a United Kingdom-based, international patent organization have up to the present not met with success because although conditions of trust, speed and uniformity were quickly found to be at a satisfactorily high level, the economics were not right: neither party was prepared to invest time and money in new services unless the market was sufficient to bear the costs.

Attempts to set up collaborative routine operations in the USA and in Europe have also failed, up to the present, to reach a successful conclusion because one or more of the basic conditions for collaboration was not right for one or more parties.

I should mention here that use of the computer as a basic mechanism in the operation of information systems has further complicated the situation in that the use of computers adds to operational costs, at least in the early stages of operation, and introduces problems of compatability between different computer systems.

Thus, many difficulties have blocked and continue to block the paths we would like to travel towards bigger, better and more economic systems that are based on shared international effort and I strongly suspect such difficulties will be met in any area of technical information. The fact that I have, perhaps, emphasized difficulties may suggest that I have a pessimistic view of the possibilities. I do not wish to be pessimistic; my intention has been to emphasize as strongly as possible that the design of collaborative information services is more than a paper or committee-room exercise. It is an exercise which requires, prior to being undertaken, a deep and clear understanding of the current operations, mechanisms and motives of all the potential collaborators by all the potential collaborators. Such an understanding does not always appear to have been gained as the all-important initial step to this type of exercise. Consequently, one sees evidence of talk of collaboration leading all to often at a later stage to collaborative talk rather than collaborative action because suggested patterns of collaboration fail to satisfy the various basic conditions and hence fail to be attractive to one or more parties involved in the exercise.

And so, gentlemen, I end my brief paper humbly noting that I have failed to indicate in it prospects for collaborative technical and

information services in the EEC and that I have only outlined difficulties. I truly hope that at a similar conference in a few years time I, or some other speaker, will be able to establish clearly not only these possibilities but also how they have been realized in practice by effective international collaboration.

Other Areas, including Education and Training

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Please allow me to narrow down the topic we are going to concentrate on for the next few minutes to management education and training in the technological field, because there seems to be a real need for cooperative activities, which can be of prime importance for the *benefit* to be expected from R & D efforts.

Management in the technological field implicitly means the management of technological innovations and their diffusion. It should be clear from the outset that management of innovations does not cover all relevant managerial problems which are to be tackled in present practical management and which are dealt with at business schools or other management training centres. But the management of technological innovation becomes a more and more important facet of successful present management.

The gospel of successful management coming from American business schools during the past decades remarkably underemphasized the role of technology and its development, stressing mainly the financial efficiency of given production and marketing patterns of goods ands services. Only during the last decade has the origin of technology (namely R & D) been detected as a relevant topic for managers under the pressure of change. There had been the more or less outspoken conviction after the second world war (more in the public field and less in the private field) that only sufficient efforts in R & D would lead to quicker economic growth and greater industrial success. The snag, however, was (which led to so many well known disappointments with that approach) that R & D and innovation were mixed-up and considered as the same thing.

Findings of empirical research which was carried out during the last year on successful and unsuccessful innovation show clearly that successful innovation stems to a very large extent from a better understanding of markets and other needs rather than from the 'exploitation' of given technological solutions. It also becomes more and more obvious that funds are, in most cases, not the limiting factor for a promising innovation once the market potential is clearly assessable.

Furthermore, it is rare that a successful innovation was independent of external know-how and, in fact, the management style of usually a small group of entrepreneurs was paramount. This means that entrepreneurs had be able to bring together the whole process of innovation: ideas of new needs, production, financing, external and internal findings of technological potentials.

If we want to consider the problem that we might not have fully exploited the technological potential of Europe during the last decades, we could state that we generally have *underestimated* the *needs pull* and *entrepreneurship* and that we have by far *overestimated* the *technological push* and the *management of effectiveness.*

From this it would follow that there is a real need for management training in the field of technological innovation (which should not be confused with the question whether or not there is a demand). This training should mainly provide information to obtain needs and technological possibilities into harness and to develop the strategic skills for assessing developments realistically in advance and the entrepreneurial attitudes to combine resources and to be highly communicative.

Of course all this is difficult enough. These days, needs very often lie in social developments rather than in private ones. They very often require the combined effort of firms from very different branches or public and private organizations. The assessment of strategic options often requires technological, economic and social forecasting with all their uncertainties. Entrepreneurship nowadays often has to be rather a collective attitude than heroic and autocratic behaviour.

Is there a need for cooperative activities in the field of education and training for the management of technological innovation? Yes and no! Like research and development, training is carried out by quite different groups. Universities, special institutes, large firms and associations. There is no single solution, it all depends on the need. One should certainly be aware of two traps. One is to do cooperation for the sake of cooperation without a real and attainable objective. The other is to postpone necessary actions because scientists or trainers have not made up their minds.

The European scene and the national scenes in the field of training for the management of technological innovation are rather limited on the one hand and somewhat obscured on the other. Within the thousands of management courses offered each year in Europe by competent and incompetent institutions, one finds few activities devoted to R & D management.

Examples are (without being comprehensive):

— Manchester Business School, R & D Research Unit, Manchester

— C3E, Centre d'Etudes Economiques d'Entreprises, Paris

— Le CEPRIG, Centre de Perfectionnement pour la Recherche Industrielle et sa Gestion, Paris

— Courses at INSEAD, Institut Européen d'Administration des Affaires, Fontainebleau

— Courses at CEI, Centre d'Etudes Industrielles, Geneva.

Furthermore mention should be made of the important and successful activities of EIRMA which lead on a cooperative basis to direct exchange of managerial knowledge in the field of R & D.

But there are hardly any training courses, activities or programmes which deal mainly and directly with innovation processes as such. Only the very young IIMT in Milan has now started a programme with this objective.

In 1972 we started a whole series of short courses dealing with different aspects of the innovational processes, such as:

Managing human factors sucessfully in innovations

Assessing future markets

Technological entrepreneurship in medium-sized firms

Management of know-how and the financing of innovation

Future oriented R & D management in private and public organizations.

We are also dealing with urban technology, technology assessment and different fields of technological trends and strategies.

The IIMT carries out some limited research in the field of factors influencing success in innovation (together with TNO) and entrepreneurship as well as technology transfer and technology policy.

The mode of present activities in the field of R & D management training is mainly cooperative. This means several industrial firms have put up money to support institutes to run these activities. This applies to Manchester, C3E, CEPRIG and Milan. To a fairly large extent, these institutes are additionally funded directly or indirectly by governments.

I think it would be advisable to develop a cooperation between cooperative research associations and cooperative management training centres where a need is felt or seen. The few existing institutes dealing with R & D and innovational management including the IIMT, would certainly welcome such a cooperation.

Syndicate discussion

Report of Syndicate A — A.W. Holmes

Syndicate A discussed how to achieve maximum cooperation. It recognized two situations.

(a) Where no research association existed in a country. In this case the British RA felt free to recruit members in the normal way.

(b) Where an RA exists we should aim at cooperation between the laboratories. The group were unanimous in believing that this has to come from the grass roots, and no imposition of common policies will work. There are problems such as:

  (i) getting staff to collaborate;

  (ii) the costs of collaboration such as exchange of staff;

  (iii) the varying costs of research in different countries.

We welcome the possible provision of EEC funds to aid international collaboration. We hope that individual governments will follow this lead.

We recognize a lack of information in some instances regarding which laboratories exist in various countries, and suggest that delegates from each country submit information about their *own industrial* research laboratories through CDRA or the secretariat for inclusion in the report of the conference.

Report of Syndicate B — Dr Theisen

The discussion partners agreed that interesting material had been presented both in the morning and afternoon sessions concerning the possible function of EEC Research Associations. One of the most pragmatic approaches of cost benefit and use of information is the modern form of industrial research, defined as multiclient sponsored actions.

Cooperative EEC or bilateral associations were unanimously considered to be a convenient neutral but competent body to enhance both the formation of multiclient interest as well as execution of the research either in own laboratories or in one or several most competent research units.

In order to create innovation and protect the industrial property and the use of the generated know-how, it was felt that in this concept it seems generally preferable not to mix users and suppliers at the stage of execution of a project. A suitable supplier in case of success, is determined only afterwards by decision of the sponsors.

Whereas internationalization of this approach should not create any major problem between Research Associations working on the principle of voluntary financial contribution—mixed multinational multiclient projects with partners having a levy tax financement may create a problem.

Questions to EEC Commission (Dr Schuster, Dr H. von Moltke):

1. In case of participation of partners in a multiclient project with governmental pretax financement (with no permission for funds to cross national borders) can the EEC contribute to find a solution?
2. Whereas EEC funds are generally not requested, nor favourable for the execution of multiclient research projects, EEC funding could be profitable for the establishment of research strategies, techno-economic forecasting, information on market needs and demands and promotion of the industry receptivity factor.

   Community funding could be profitable use for relatively small investments for the initial stage of formulation of innovative projects and feasibility studies.

   Does the Community foresee similar actions in conjunction with Research Associations?

Reply to the questions asked by Syndicate B — Dr Theisen — Dr H. von Moltke

1. The Commission might seek a solution to this problem in the following way:
   - — make an inquiry into the existing systems of governmental aid to RAs including the levy tax system, in order to identify possible obstacles to cross-frontier cooperation resulting from these systems;
   - — should such obstacles be identified, the Commission might examine the possibility of addressing a recommendation to governments concerned with a view to eliminating such obstacles.
2. The Commission is at present trying to earmark a first sum in its budget for fiscal year 1974 in order to promote cooperation between RAs in the fields indicated by Syndicate B.

Syndicate discussion Group C — B.W. Oakley

1. *Information Services.* The group agreed that the EEC Commission could usefully stimulate Information Services by some financial support. But there was some concern that the variations in national funding policies for Information Services could cause difficulties.

2. *Exploitation.* The group was very conscious of the major problem of exploitation of the work of bodies like the RA's (This problem had been raised during the preparation of the Bessborough report but had failed to be given adequate exposure in the report.) The problem takes two forms:

   (1) There is a considerable amount of material locked up in RA's that fails to get used through lack of adequate communication with the firms who might readily make use of it.

   (2) There are occasions in which the firms who are the members of the RA simply have not the financial resources to exploit successful R & D in the RA. This is, perhaps, a problem that the EEC Commission (Dr. von Moltke) could usefully examine.

3. *Multiclient Contract Research.* A comment on Dr Bridge's paper on cooperative research: One successful method of cooperation is through a multiclient contract research approach, where the clients could come from the various countries of the EEC (or outside). This requires the expertise of a body like an RA to run such a project.

4. *Emphasis on Classical Technology.* The group was unanimous in recommending that the EEC should concentrate its support emphasis on classical (medium or low) technology, because it was felt that this was likely to be more rewarding in the context of the European situation.

5. *Multinational Companies.* A problem will arise for national RA's whose terms of reference are directed to the well being of their national industries if their member firms become increasingly multinational companies. A particular aspect of this is the attitude that the Commission intends to take in its industrial support schemes to companies which, while operating in Europe, are owned and dominated by companies based in, say, the USA or Japan (Question for Dr von Moltke).

6. *Steps towards cooperation.* If all national RA's and similar bodies in the EEC countries become European and all attempt to recruit members from throughout the EEC, a ridiculous scene of confusion will result. On the other hand the approach of direct cooperation between the existing EEC RA's raises problems because of the competitive position of the member firms who the RA's support, where there are very different methods of financing the different bodies from country to country.

   One way out of this dilemma would be for RA's to cooperate, in the first place, in those areas where progress could easily be achieved such as in the field of standards, information services, environmental and pollution work, but not to cooperate, in the

first place, in those areas where the problems of inter-firm competition raises the major problems. Maybe some division of the income and membership subscriptions into these two areas could be made. This would lead to cooperation and so lead on to wider cooperation in the more difficult areas in due course.

7. *OECD and EEC.* A question to Dr von Moltke or Dr Schuster: Do they not find an overlap between their activities in the Science and Technology field and those of OECD?

Answer by: Dr von Moltke

— We agree that special emphasis should be given to the exploitation of research results, and in fact the proposal concerning Industrial Development Contracts does not deal with research but much more with the proper innovation phase.

— We agree that there should be no preferential treatment whatsoever for advanced technology in the application of Industrial development contracts and that classical industries should equally benefit from them.

— Industrial development contracts are mostly for support of European industries, but inclusion of foreign-based firms should not be formally ruled out if they have an important contribution to make. The Commission's proposal makes allowance for such cases.

— There seems to be no overlap with OECD which is providing very useful studies the results of which are often exploited by operational proposals of EEC.

Question by: Dr Rossi

I think the question posed by Group C on the difficulty in giving EEC aid to multinational companies operating in EEC countries and owned by the USA or Japan will not occur in practice. If I understand well, the present trend is to help mostly the small or medium industries, which is not the case for the abovementioned multinational companies.

Answer by: Dr von Moltke

We agree on principle that industrial development contracts are supposed to support medium sized industries much more than big ones. Yet one cannot rule out any participation of big firms, an example

being the case of vertical cooperation between a big and a smaller firm, when the contribution of the big firm (e.g. a chemical group) is essential for the smaller (e.g. a paper mill).

Syndicate discussion Group D — Dr N.E. Holmblad

Comment on paper by: Dr Bridge

The group finds, that the paper does not raise much discussion as it merely mentions a number of interesting facts.

Among the types of research projects on p. 124 it is proposed to insert 'EEC-contracts'. About the collaboration between EEC research institutes mentioned on p. 127 the group remarks that such collaboration is not always possible with all countries. Some countries may not have institutes of similar type or no institute at all in the field. It is recommended that EEC explores the situation as regards available institutes, and it is found desirable that this should be done before new institutes are established within EEC.

Comment on paper by: Dr Seetzen

The group wishes to emphasize the importance of Education and Training for R & D personnel. It therefore regrets that so little time has been available whereby several important aspects of the subject have had to be left out.

Comment on paper by: Mr Cumberbirch

1. Technical information services are of growing importance to industry, and we think there is a great danger of proliferation and overlap of such services in the different countries of Europe.
2. We think that these services must be based on real industrial needs, and cover not just published literature but also research reports, and intelligence from contacts with firms. They therefore depend very much on personal activity awareness and we all agree that they cannot at this time be computerized.
3. We understand this is an area where EEC intends to promote an efficient European Service and we suggest that it should be based on best existing practice in the principal industrial sectors, where it would often be found that RA could provide a good starting point.

Comment on paper by: Dr von Moltke

The group (D) does not accept that the greater development of collaboration in R & D within Europe is dependent upon a growth in multinational companies and organizations. It believes that much can and should be done in the existing situation.

Does Dr von Moltke have any specific actions in mind in saying that 'RA's clearly seem to have a role to play in supporting such a European policy'?

Answer by: Dr von Moltke

— The way for more transnational cooperation is motivated by various reasons relating all to the Research possibilities it seems to offer for exploiting the potentialities of a vast continental European market, e.g. in terms of marketing, managerial expertise and last but not least R & D capacities. This does not mean that nothing can be done at a national level, on the contrary.

— RAs are part of that industrial base that hopefully will become a European one. Their role could be very positive in the fields of cooperation research, of information, of the assessment of future technological trends and their impact on industry ... Furthermore the Commission might have an interest in recurring to the enormous reservoir of central expertise, as representend by RA's, for the administration of Industrial Development Contracts.

Question by: Syndicate discussion Group E to Dr von Moltke

What is the Commission proposing to do for the industries comprising large numbers of smallish companies that are very important contributors to the economy—for example the food industries of the Community? Is it significant that there seems to be no representation of food research at this conference from any country except the UK?

Answer by: Mr Friz

Commission Services, namely the Directorate-General for Industrial and Technological Affairs, has recently launched a programme to establish what is the state of research and the possibility of cooperation in an EEC framework in about 20 main subsectors of food industries with the technical assistance of nine national experts. For the time being, the activity is limited to fact-finding but it will be pushed ahead when the interest of the initiative will be established.

The motivation of this action resides in the importance that an improvement of applied research can have in this sector, so important for the quality of life, for the presence of so many little industries and for the necessity of coordinating the activities yet existing on EEC level in the agronomic field with a similar activity in the food industries.

Question by: Syndicate discussion Group E to Dr Bridge

The syndicate is interested in Dr Bridge's reference to the close collaboration with the Dutch Printing Research Institute in the area of printing composition.

Could Dr Bridge define whether this work is fundamental research or whether it is industrial application of research? If the latter, could he explain whether industrial constraints of trade secrecy, etc. have any adverse effect?

Has Dr Bridge considered within his list of 'Research' projects the area of 'exploitation'? Does he include 'exploitation' as a part of each type of project where appropriate, or could this form an additional type of project?

Answer by: Dr Bridge

1. The collaboration with IGT in the field of print composition was industrial applied research. No difficulty has been found so far with individual industrial company members and confidentiality.
2. Exploitation of results is of course a difficult question. As a first and most important step we at PIRA clearly state the proposed method of exploitation at the beginning of a project, so that at all stages of the project we can take action to involve the eventual users of the results. With the exception of a large project currently wearing the stage of exploitation, we normally only have to deal with the exploitation of relatively small and specific research results. We then employ the usual range of information techniques, but would welcome the comments of delegates who have discovered any particularly useful methods.

Question by: Syndicate discussion Group E to Mr Seetzen

Management of Technology is common to Industry, Government and indeed RAs which are themselves probably as close as one can come to a government/industry interface.

Has Dr Seetzen had any success or has he any panacea to effect exchange of personnel concerned with Management of Technology?

Has he used Industrial RAs for this very purpose—and if not why not?

The CDRA members would welcome his examination of, and patronage to, CDRA activities in Management training.

Answer by: Dr Seetzen

Exchange of research personnel between RAs and governmental research outfits can help technological innovations considerably. The UNT can to some extent be instrumental to facilitate this exchange.

Comment by: Syndicate discussion Group F — Capt. C.A. Planten

1. The first step of coordination is to know each other and exchange views as we do now; the next is to work on a bilateral base.
2. Community meetings should be organized by industries and their trade associations and research associations on a sectoral basis. One of the items of these meetings should be a discussion on a good system of literature retrieval and information. All reports should have an English summary.
3. If the Community will ever be effective there should be a Community fund to overcome the different financial backgrounds of the various national research institutions.
4. If a foreign research institute applies for membership of an RA the Community fund should pay the same grant to the RA, which they should get if a British firm becomes a member.
5. The different trade associations and the technical associations should be active in promoting international cooperative research.

Remarks by: Group G — Dr J. Uhler

1. The group discussed the barriers (von Moltke) and their importance. No agreement on their importance was obtained in the group. The question arises which of these barriers the RAs could counteract.
2. One example discussed was harmonizing standards and standardization. A question is whether one could expect RAs to have initiatives to promote standards (international), acceptance tests and similar.

3. With respect to types of research the group discussed general tendencies of decrease and increase of these types. Though it is hard to generalize there was a common opinion (almost) that there is a flow from cooperative research towards contract research. Such tendencies must be taken into account when analyses of internationalization and promotion of it are made.
4. As an end remark: The observation had been made during the conference that a remarkable amount of cooperation is already going on.

Questions by: Syndicate discussion Group H — Mr J. Cronley

To Dr von Moltke

1. What are the EEC definitions of a large, a medium-sized and a small firm?
2. To what extent should EEC acquire money from industry through member governments and redistribute it to industry? In doing so, what priorities or criteria should be used?

To Dr Bridge

How does he think meaningful research projects should be formulated?

To Mr Cumberbirch

Can he suggest how selectivity can be introduced into an Abstracting System so that only relevant material is founded and 'rubbish' is eliminated?

To Dr Seetzen

Where do you get Teachers of Innovation Management?

How does EEC view the merits and demerits of the para-fixed systems as against voluntary subscriptions for industrial R & D? Should there be unified votes within the EEC for both systems?

Answer by: Dr von Moltke

1. A clear cut definition of small, medium and big firms in commercial terms seems to be very difficult. Discussions within the Economic and Social Council of the EEC have nevertheless resulted in the elaboration of some more qualitative criteria which can provide guidance.

2. The only case of a special levy presently existing is that for coal and steel industry under the ECSC Treaty. I have no knowledge about any discussion to extend this scheme to other industrial branches.

Answer by: Dr Bridge

Whether it is cooperative for one country only, or for several, I believe the most important step, by far, is to assess critically the economic need and potential market for the results to be obtained. We rely heavily on the stated needs of the various industrial sectors we serve, but before recommending a project to our Council we try to:

(i) Survey the information already available.

(ii) Carry out a technico/economic study of the potential benefits.

(iii) Consider the project in light of Government interests and interests of the appropriate trade associations.

Answer by: Dr Seetzen

We try to employ as far as possible the teacher 'Experience'. There are already a number of relevant cases and we are developing more such cases of European background to be used for training purposes. On the other hand it is not very difficult to find experts on certain aspects of the innovational process. Finally 'teaching' in a modern training approach means a high degree of cooperation between participants and faculty.

Remarks by: Syndicate discussion Group I

Our group felt that the Commission of the European Communities had a useful and important role to play with respect to the industrial RAs or cooperative research organizations in EEC countries by:

A. Providing financial means for the different IRAs to meet and to learn of each others' activities and to discuss future plans and means of coordination through conferences such as this and through travel grants.

B. Extend these activities to EEC related countries to the advantage of EEC itself.

C. Foster sub-groups within EEC of RAs with related interests such as GERIG—the leather and shoe RAs.

D. Provide the means of a RA cooperative organization as ASLIB (Library Procedures) to coordinate the activities in the field of information storage and retrieval to prevent wasteful duplication in this field.

E. Provide financial aids to the RAs in their work regarding the development and establishment of standards.

F. Recognize in developing procedures and policies that the industry RAs in differing industries have quite different structures and therefore EEC must be very flexible in their procedures and policies to accommodate these variations in structure.

G. Provide monetary support for technico-economic forecasting of R & D needs on a European basis:

   1. to analyse the differences and overlaps in assumptions;
   2. to suggest how the forecasting methods might be usefully nationalized;
   3. to fill the gaps in countries where no technico-economic information has been available to date. The research institutes are in a very good position to foster this work but they can not individually finance it from their present competitive demand budgets.

SESSION IV

Friday 27 April 1973 — Morning

COLLABORATION AND COMPETITION

Session Chairman:

Mr Charles GRUSSARD
Scientific Director
Société Pechiney Ugine Kuhlmann

A Practical Approach to the Internationalization of Testing

Dr H.J. SELLING
Director
Fibre Research Institute TNO

Internationalization is at the moment very popular, also in relation to research. Officials and directors of industry but also directors of research institutes, they all see in the future, internationalization of research as unavoidable. However, listening to their arguments, one has to conclude that the ambition of the promoters of the internationalization is quite different and sometimes even oppositional.

Officials and captains of industry, in general the most important sponsors of research, have the idea that by international coordination, doubling of research subjects can be avoided and that in this way the expenses for research can be reduced and money can be saved.

Directors of research institutes all over the world nowadays struggle with a shortage of money. Inflation trends increase the cost more than income. To fill up this gap, directors of research will look over the border to find new clients and new financial sources. One doesn't need to be a high-skilled mathematician to find out that these two tendencies will collide with each other. The consequence will be a competition between the institutes. When this is unavoidable it has to be done but you have to remember that the attainable savings are mostly exaggerated and that the losses by limiting informal exchange of research results are never mentioned. In my opinion internationalization of R & D work can only lead to a collaboration when this is not accompanied by an increase of available money.

Being rather pessimistic concerning the possibility of international collaboration in research, there are however fields with more prospects, for instance the information of the consumers.

Three groups of consumers have to be distinguished e.g.:

(a) 'the man in the street', buying only on appearance and price;

(b) institutions (hospitals), buying on obsolete specifications;

(c) mills, who have to make the half-products into their end-products (textile, making-up industry), without the knowledge of workability properties.

The scope of this type of work can in principle extend far beyond the limits of the economical aspects.

The 'Club of Rome' warned in their report of shortage of energy and materials but also against the unacceptable pollution of the environment in the future.

By a relatively small increase of spent material, energy and pollution of the environment, it is possible to extend the wear-life of products considerably. Along this way important savings in material and energy can be achieved with a relative decrease in spoiling of the environment.

I believe that for research which will tackle the three sources of predicted scarcity at one time, officials will have interest and that this type of work will lead to real collaboration without a fear for competition.

Summarizing I come to four statements:

(a) Internazionalization of the R & D work of the institutes will lead to competition and not to collaboration when no extra earmarked financial resources come available.

(b) When competition arises, the existing informal exchange of research-results between institutes will at least be limited.

(c) Consumer-information, based on international recommendations and testing, is a field where a collaboration in a broad sense is possible. The knowledge, present in the institutes, can be commercialized in this way.

(d) In the scope of the report of the 'Club of Rome' international research of extending wear-life of products, to save materials, energy and the environment in the future, must be recommended to the Governments.

Discussion

Question by: Dr von Moltke

Dr Selling suggests that Consumer-information based on international recommendations and testing is a field where a collaboration between RAs is possible. What kind of information is he aiming at?

Answer by: Dr Selling

(a) 'The man in the street', buying only on appearance and price.

(b) Institutions (hospitals) buying on obsolete specifications.

(c) Mills who have to make the half products into their end products (textile, making-up industry), without the knowledge of workability properties.

Question by: Dr A. Strub

Could you explain more deeply to me why you feel that internationalization of R & D work will lead to competition and *not* to collaboration (your statement (a))?

Answer by: Dr Selling

Statement (a) is based on the supposition that the quantity of money available for research is limited.

In countries where research institutes exist, industry and government finance the activities of these institutes. When, by internationalization, institutes from foreign countries come over the border to enlist new members and clients, a competition between the institutes is unavoidable, when no extra earmarked money becomes available. This competition may perhaps lead to an increase of the international efficiency of research but the achievable savings are many times exaggerated.

Comment by: Dr Crussard

As an argument to explain how internationalization may lead to difficulties by increasing the demand for new financial resources, one may quote a 'law' which has been given by P. Algrain.

'If R & D organisms of different countries add their effort on a particular project, the output is multiplied, not by N, but by $\sqrt{N}$.'

Thus, the efficiency decreases as $\frac{I}{\sqrt{N}}$, and for the same sum of money, you have less result than if all the work is done in a single organism.

The Operations of a Research Association in Europe

Dr A.J. KENNEDY
Director
The British Non-Ferrous Metals Research Association, London

In view of the ground that has already been covered by previous contributions, I have considerably revised what I intended to say at this meeting. In the time available, I will try to give as concise a resumé as I can of my own experiences in cooperative research ventures together with my views on the way things are likely to develop in the future. My opinions are naturally shaped by the nature of my own organization, which is based on the concept of membership and is actively seeking to widen this membership internationally. Many institutes represented at this meeting will have quite different outlooks, as indeed will many RAs, and they will no doubt give us their views in the discussion.

This session is about cooperation and competition: I believe both these aspects of life are necessary and desirable in R & D as in anything else. So far as Europe is concerned, it seems to me that its past research investment, in institutes and in people, is one of Europe's great assets, and if we are interested in the overall success and prosperity of the new Europe then we cannot fail to be concerned about the way this asset is to be utilized and developed.

1. First, a few brief facts about the BNF and its overseas work.

We have increased the numbers of our European industrial members from 12 in 1967 to 38 in 1972, and if we take into account *all* overseas support to the BNF in the form of membership subscriptions, contributions to Group Projects (what are sometimes called Multiclient Projects) and funds for sponsored research and service work, we find that 35% of our income comes from outside the UK. This fraction increases year by year and I believe that in five years time more than one-half of our income will come from abroad.

The support of our Group Projects reflects the considerable participation of our non-UK members; we have run 13 such projects to date, and if we add up the numbers of members in the different categories the figures are: UK 119; Europe 38; Other 28. European support for such projects is, in fact, higher than the number of European members

would suggest; in other words, the proportion of our European members who support Group Projects is higher than it is for the UK membership.

2. Why do members participate in cooperative projects, and for what benefits?

Briefly, I believe the important factors are:

(a) Involvement in large-scale process projects, beneficial because of :
  (i) the costs to the member,
  (ii) the control exercised over the results,
  (iii) the capability of a practical follow-up in applying the results in the member's works through teams of people knowledgeable on, and experienced in, the field concerned.

(b) The value of having access to the wide range of plant covered by membership. BNF has gained greatly from this, and has been able to undertake measurements on plants in Europe, for the benefit of groups of European members, which would not have been possible if the exercise had been restricted to the UK.

(c) The benefit of pooling empirical knowledge and working experience, so that a more logical and discriminating approach may be made, in the first instance to optimization, and in the longer term to an overall re-designed and improved approach. Very often such projects start as data-collecting exercises but quickly develop into genuine research projects. They are particularly attractive to the members because the results are of universal value, and do not raise problems of competition; if some sector of industry can improve its existing practices and operate more efficiently then everyone in that sector obviously gains.

(d) Techno-economic studies and evaluations.
These form an increasing part of the effort of most organizations concerned with R & D, with estimates of the benefits of projected research becoming a standard requirement in research proposals. So far as the BNF is concerned, its work in this field, which necessarily demands close study of the technology and economics of all the industrial processes within the non-ferrous metals industries, has placed it in a strong position to provide information and advice to its members, coupled in some instances with the ability to offer specific programmes of immediate industrial value (rolling schedules, for example).

(e) The collective protection of a particular industrial sector.
Very often the performance of a particular material or product is criticized in comparison with its competitors in terms which require technical action and reply. In such instances, cooperation between

the firms concerned in establishing the facts, promoting whatever research is needed, and promulgating the findings with the authority of a central institute, are all actions which an RA can do particularly well.

(f) Environmental projects are particularly appropriate as cooperative exercises, supported by all the parties concerned, and BNF has done a great deal already on a European basis—for example, surveying the use of water in nearly 50 plants, checking the performance of installations which melt brass swarf, and publishing manuals setting out the best practice and procedures. It has also set up a separate International Environmental Bureau for the Non-Ferrous Metals Industries, providing information and advice to the members of this Bureau on all relevant factors—noise, dust, fumes—on the plant available to deal with such hazards, its performance and cost.

(g) Bringing together industrial engineers and technologists with related purposes—not a negligible consequence of BNF's work in recent years. I think that the assemblies of Europeans within the non-ferrous metals industries which have at times come together to discuss common research actions must be unique in the history of those industries.

3. What are the necessary, if not sufficient, requirements for good collaboration between industrial members?

In my view they are:

(a) That the common interests of the membership transcend their differences.

(b) That the 'central' organization, whatever its precise form may be, is more than R & D. In other words, it must have the capacity to service its membership through technical support, and one of its prime functions may indeed be to demonstrate clearly when research is *not* necessary, and when expert application of existing knowledge can suffice.

(c) That there should be the capability of working realistically to implement research results industrially, that is, through teams of people who can transfer work out of the laboratory and give direct aid in the painful process of industrial change.

4. What, then, are the problems ?

(a) The reconciliation of the different needs and priorities represented in the membership, particularly where there are direct collisions of interest. There is no general answer; each case has to be worked

out on its merits, and all RAs have problems of one kind or another in this respect. The truth is that they turn out to be less severe than might be imagined.

(b) Exploitation of the results by competing members, and the effects that patents exert on the nature of the exploitation.

(c) The extent to which members can call on help and advice without further payment. There obviously has to be some limit; in some RAs this is precisely defined, in others (as with BNF) it is not.

(d) The servicing of a wide-spread international membership; the problems of time, cost and effort are obvious.

(e) Communicating successfully with a multi-lingual membership.

(f) Avoiding any national bias in the overall polices of the organization.

5. What changes can one foresee in the future ? Speaking only for the BNF, they are:

(a) A revision of our constitution so that the membership of the BNF Council is open to representatives of non-UK members as well as to those of UK members.

(b) A new title for the organization giving better expression to its actual work.

(c) A preservation of the membership concept, but with membership subscription income forming a smaller fraction of the total income than at present.

(d) The growth within the organization of a genuinely European staff. I hope also that we may see this happening in European research institutes generally.

6. What is the role of such an organization in the future?

(a) We are already pressed by our industries to do more work than we can afford, and there is no doubt that there are some very clear ideas within the non-ferrous metals industries of the lines which technological research should take over the next ten years or so. We might clarify the work as:

(i) Optimizing what we have; a difficult and often tedious business, lacking many of the attractions of classical research, but very worthwhile.

(ii) New technologies, in the widest sense; real change, in other words, affecting the whole nature of an industry.

(iii) A greater concern for the wider interactions of technology with management, economics, planning, strategy, marketing, and so on.

7. And what can we learn from the past?

So far as RAs are concerned, they have learnt the value of becoming an integral part of some industrial sector, so that their life is naturally interlinked with that of its member companies and their federated interests. We have also learnt that no reliance can be placed on general terms of support; we cannot depend on Government or on Governments, however valuable the past aid from our own Government may have been. Nor can we depend on the Commission in Brussels or anywhere else. Those of us working in industrial R & D know that there is little to stop any Government investing more in genuine industrial R & D if it wishes—most waste enough money one way and another as it is—and all R & D organizations must have become bored long ago with all the proposals, protestations, paper-work, debates, and the rest, on the financing of industrial research. Governments, like the rest of us, must be judged by their actions. If they support industrial R & D badly, then one must assume that they value it poorly in comparison with the greater return on the sums spent on non-industrial R & D. They cannot have it both ways.

I believe the first need, so far as European R & D is concerned, is to *make the best of what exists at this time.* This is far more important than abstract and distant planning of R & D, remote from the hard business of industry.

As for collaboration, this is successful only when there is a real need for it. Frequently there is no such need, and manufacturing reasons for collaboration has, I am afraid, become an activity in its own right in recent years. We seem to have become obsessed by the idea that work done in a single institute must be half as valuable than the same work shared by two. I believe that complementary expertise is more important than a sharing of common knowledge; we need to collaborate with institutes which can bring to some particular study experience and facilities which we do not have and could not afford.

Some of the difficulties foreseen by speakers at this meeting I regard as insubstantial. My experience leads me to believe that quite diverse organizations, companies and interests will work together if they believe in the quality and merit of the enterprise. That, I think, is the real challenge.

Discussion

Question and Comment by: Dr Crussard

BNFMRA is an excellent example of a Research Association which has succeeded in overcoming some of the difficulties mentioned yesterday.

— Dealing with multinational firms.

— Finding an area which for most projects, is not too competitive on a commercial basis. This area is the improvement of processes.

But BNFMRA seems privileged in the sense that it did not have equivalent organizations in other European countries. Am I right in assuming that the continental European companies which subscribe to BNFMRA do not subscribe to similar associations in their own country, because there are none?

The case of ferrous metallurgy is quite different; collaboration started on an equality basis of RAs already existing or in creation in different countries.

Answer by: Dr Selling

We have to congratulate Dr. Kennedy with his international success but this story is not combative to my first statement that internationalization will lead to competition.

When he has achieved his results in countries where institutes of the same character already exist then his story only confirms my statement (a).

Comment by: Dr R. Bult

You gave a very clear picture of the possibilities of collaboration between a research institute and the industry, especially with respect to the beneficial effects of overseas members to the work of your research association.

In the case that you have similar institutes in various European institutes and they all would adopt the same policy, this would result in increased competition between these institutes.

Cooperation in an Industrial Sector

Mr J. LEICESTER
Director
British Launderers' Research Association

Following the theme for cooperation that has emerged during the earlier papers, I would prefer to alter my title to 'Cooperation within Industrial Sectors', as I intend to refer to four examples of cooperation, only one of which applies directly to the industry served by my own research association.

First, the domestic example where, 25 years ago, the laundry industry throughout Europe anticipated the present efforts of the Community in the field of cooperative research. It did this by setting up a committee known as the International Scientific and Technical Committee on Laundering (ISTCL). This committee, on which 10 European countries are now represented, meets at least annually at Director level and it arranges extra meetings at senior staff level for discussion on specific areas of technology that are of common interest. The members exchange research programmes, technical reports and other publications on a regular basis.

The ISTCL has also undertaken collaborative projects in areas of common interest such as methods of test, colour measurement techniques, the development of standard methods of testing machine performance etc. with a view to all members adopting these as a standard procedure. The committee maintains links with the International Standards Organization (ISO) so as to ensure that the interests of industry, represented by the members is fully safeguarded when an ISO standard is being prepared.

The ISTCL has no income and therefore provides no funds for members' work. Costs of any collaborative work are borne by the individual members undertaking the project, as are the costs of the Secretariat which are met by the Association supplying the member of staff who acts as Secretary. He, and the other offices (Chairman, Vice-Chairman, etc.) are nominated by the member institutes on a rotating basis.

Does this attempt at cooperation succeed and does it provide a valuable service? The answer, after 25 years' experience is, without

doubt, yes, but there is considerable scope for improvement. Why has the ISTCL succeeded, in spite of no financial income, honorary officers and a changing secretariat at the mercy and generosity of one of the member countries. The answer lies in the nature of the industry it serves—one which carries out a service to the community and not one that manufactures a product and is troubled by trade collaboration, is something that must be overcome.

My second example of cooperation is the more sophisticated arrangement that has built up in the United Kingdom between the six textile research associations. Starting again over 25 years ago as the Committee of Directors of Textile Research Association (CDTRA), later linked with a Conference of Textile Research which included the research associations' industrial Chairmen plus a representative of Government and which, in the last two years, has become a unified body known as the Textile Research Conference (TRC), of which the Directors' Committee is a part and which is now serviced by a full time Secretariat.

In the early days, the CDTRA did little but meet to discuss common problems, exchange research programmes and the technical reports published by the member associations.

Around 1960, the Conference and the Directors' Committee decided to undertake a number of specific collaborative research projects funded out of a 2% levy on the income of each of the member research associations.

Two typical examples, the treatment of textile effluents coupled with the re-use of purified waste liquor and the second, Flammability of Textiles.

Both of these projects were spread over a number of years, each cost approximately £ 300 000 and used staff and facilities in whichever of the organizations were best suited to the project. Each project, once industrial support had been identified, was supported by additional government funds on a contract basis.

These have been extremely valuable projects—on any cost benefit assessment basis an outstanding contribution to industry. If an attempt to start them had been made by the individual research associations, there is doubt whether they would have attracted sufficient income to become a viable project. If they had, the duplication of effort would have been considerable and the cost to industry, three or maybe five times the amount quoted.

The important factor to note from this second example is that even within the United Kingdom, it was difficult to identify project areas where individual research associations were prepared to allocate finance and to give up autonomy and responsibility for the direct execution

of the work to a third party — in this case myself, directing a team made up from staff from three of the six research associations and spending money freely donated to a collaborative fund. A step forward in time and imagination to a similar concept in the European Economic Committee highlights the problems ahead but equally shows the value that could accrue.

The third example, which is a current and continuing project involves much wider collaboration between research associations, government and a number of other bodies.

Realizing the rapidly increasing problems of industry, vis-à-vis the environment, CDRA took the example of the textile research association's work on effluent and water re-usage a stage further, and set up the Effluent and Water Advisory Committee (EWAC). This, as originally constituted, consisted of 16 research association founder members, all working or having a member interest in the research, development and technical service area of effluent treatment, hazardous waste disposal or atmospheric pollution.

The committee membership has now increased to 20 research association members, plus two government departments, the Department of the Environment and Department of Trade and Industry, the United Kingdom Atomic Energy Authority, the Ontario Research Foundation, Canada, the Institute for Industrial Research and Standards, Dublin, and a number of other non-research association members.

The purpose of this advisory committee, which has a permanent secretariat provided by the Water Research Association and partly financed out of members' subscriptions, is to provide a central point of contact for information and advice. Anyone with a problem in effluent treatment and/or water re-usage can seek advice and be put into touch with the relevant organization and person able to give that advice, either free or at a cost according to the policy of the particular organization. This provides contact between the potential customer and the centre of expertise for his particular problem. It ensures that he does not unnecessarily attempt to set up facilities for his own work thereby duplicating effort and encouraging wastage of scientific personnel.

The Committee also aims to provide a conference platform, as it will this Autumn in London, for the dissemination of new knowledge. Contact with the Secretariat can be made through the Water Research Association, Medmenham, England, via the CDRA, London, England.

To enable it to undertake this advisory work, the Committee has built up a comprehensive card index giving full details of work projects and expertise available in the member organizations. This has proved so valuable that the Advisory Committee is now publishing this in the form of a carefully indexed reference book for industry, and

this will shortly be on sale throughout the United Kingdom and to any country in the world wishing to tap in to the knowledge and expertise that exists within the UK Laboratories.

This third example of cooperation in the industrial sector is, perhaps, the most typical of what we should be trying to offer at the EEC level.

The protection of the environment is common to all, yet, as individuals, industry is slow to undertake the work required. The wastes produced by industry are in many cases similar, and the need to avoid costly and wasteful duplication is obvious. Yet, if we are not careful, everybody will be doing just that. Government aid, whether it be national or on a supra-national scale, is both necessary and desirable on matters that affect the Community as a whole.

Finally, one further example of cooperation in an area already referenced by Lord Bessborough and by Dr Schuster in their earlier papers—desalination of brackish and salt water. Research in many of the European countries has reached an advanced stage, but the most costly phase of full scale plant test facilities is often beyond the reach of any individual country to achieve. Europe could, however, provide such a central test plant facility.

In the United Kingdom, collaboration exists between research associations, the United Kingdom Atomic Energy Authority and industry. The focal point of a wider European collaboration might well lie within the European Federation of Chemical Engineers and its working party on 'Fresh Water from the Sea'. A working party of experts nominated to represent their country by the relevant Professional Institutions in the various countries. If Europe wishes to act in collaboration, the framework for expert advice is already in existence.

I hope that in these few examples, I have shown that there are many areas where the British Research Associations have learnt to collaborate. That collaboration, although sometimes not easy to arrange, provides results more economically and with a more effective use of manpower. If the experience of the British Research Associations can be of value to Europe, then, Gentlemen, we are ready to cooperate.

Syndicate discussion

Report of Syndicate A — A.E. De Barr

We believe that there are many ways in which RAs can usefully cooperate and hope that EEC will not insist on any particular framework as a condition for funding cooperative work; each situation should be considered individually.

We see few problems when there is only one institute in a given field—the situation which Dr Kennedy has discussed—but I would like to ask him how he tackles recruitment of overseas members—through individual firms or through trade associations?

When there are several national institutes covering the same field we believe that informal cooperation along the lines discussed by Mr Leicester is a desirable prerequisite for formal cooperation on projects funded internationally, but we believe that these informal groups should not be formed specifically to share out EEC funds; they should have a proper reason for existence.

We should like to ask Mr Leicester if he considers that it is desirable or necessary in such groups to have agreement not to poach members from the research associations.

Answer by: Dr Kennedy

We recruit individual companies in the main, but we do have arrangements with some trade groups.

Report of Syndicate B

We have heard three papers, the authors of which have expressed three quite different and even conflicting opinions.

Dr Selling says that collaboration is undesirable to a certain extent.

Mr Kennedy is of the opinion that collaboration is desirable but is effective only if it takes place between RAs and industry.

Mr Leicester thinks that cooperation between RAs working in the same field is not only desirable but very fruitful and rather easy.

The group suggests that a public discussion between these three gentlemen take place in order to reconcile their points of view, if at all possible.

We believe that the offering of services in each other's country is desirable and should be encouraged.

Attempts to gain foreign members should be done with full consultation between the two similar institutes.

Question by: Syndicate C

1. If EEC funds are available to finance cooperative projects will there not be intense competition between the Institutes to have the largest share of the cake?

2. If Institutes agree among themselves to restrict their activities solely to their own country, is this not a contravention of the Monopoly laws?

Answer by: J. Leicester

Competition for funds from any source is nothing to fear. What must be made absolutely clear is that in receiving these funds, it does not merely result in setting up technical facilities and employing additional staff when existing work and facilities already exist. This is why a collaborative body such as the International Scientific and Technical Committee on Laundering is a vital factor.

Report of Syndicate D

The group asks whether collaboration can most effectively arise from within RAs or whether it would not be more successful if it was initiated by international groups of Trade Federations, Producer Interests or Professional Societies. As precedents we cite the success of the international Wool Secretariat or the Tin Research Institute and consider that more prominence should have been given to hearing their history during the conference.

We also consider that with increased collaboration there should be increased efficiency, hence industry may wish to reduce the total funds available on a European basis. Problems mays also arise through basic differences in the financial structure of existing national research establishments and what might be considered unfair competition by commercial research companies. Whilst these may be reconciled they must be considered if collaboration is to be more than superficial.

Answer by: Dr Selling

Requirements are in agreement with the national capacities of the institutes.

To increase the international efficiency by a decrease of the national research capacities leads right or wrong to a competition between the institutes.

Answer by: J. Leicester

Improved collaboration on a European basis will not necessarily mean that industry in any specific country decides that it can reduce support for its own research institutes.

This is because application of research results will always be affected by national habits and national developing trends.

Report of Syndicate E — T.P. Flanagan

Group E felt that research collaboration would march hand-in-hand with trade collaboration.

Having solved the apparent paradox of achieving collaboration between UK competing companies via RA membership, overseas company membership is merely a logical extension of this process. The real problem arises in achieving collaboration between institutes, because of size disparity and the need for financial adjustment. Could this be solved by collaboration by Community trade associations who could share results and find a mechanism to balance the accounts.

Question by: Syndicate F

Would the speakers agree that a good way to start collaboration between the research organizations with the same industrial interests in different countries is for each to seek the help of the others in securing application or exploitation of its own research results in other countries so that any research result is made available with greatest speed in the widest area of EEC at the least marketing cost?

Report of Syndicate G — Dr J.C. Wright

Syndicate G felt that European Research Institutes can be divided into (a) those whose fields of operation are specialized and not very much duplicated in other countries, and (b) a larger group where there are similar Institutes in several or all of the countries.

Group (a) might be encouraged to act as solo centres for Europe as a whole, using centres in the various countries to disseminate and interpret research information locally. This could be a rapid process.

Group (b) are more likely to internationalize by first exchanging information on their own research programmes, later by pooling some, and perhaps an increasing proportion of their financial resources for jointly controlled *new* research of multinational interest. Specialisms would then begin to evolve for each of the national laboratories. This is likely to be a slower development but might be much accelerated by some industries being regarded as European rather than National (e.g. shipbuilding) particularly where Trade Associations could also be multinational.

Do this morning's speakers agree, or is this an oversimplification?

Is there need for some form of 'neutral books' to advise on how the catalogue of EEC Research Institutes might be divided into groups (a) and (b) as a simple first step?

Report of Syndicate I — J.P. Berry

The Group considered the general questions posed by the possibility of collaboration and competition between the various technical organizations within the EEC. It reached the following conclusions:

1. Because of the diversity of their internal structure and organization and the national environments in which the bodies operate, there can be no single universal pattern of framework for interaction. This will be determined by the particular groups concerned.
2. Collaboration is most likely to be practical and fruitful when the technical subjects are of general concern, as in pollution and environmental matters and where the work is undertaken with general, assured funds. In these circumstances the arrangements for the sharing of costs, pooling of resources and exchange of results and experience can be formulated by the parties directly involved.
3. The possibility of competition arises more strongly when new projects involving additional funding are under consideration. In order to make the most effective use of resources the Group feels that coordination of the activities of the various appropriate technical groups is most desirable and that this should be implemented on a multinational basis. The function of this coordinating body or bodies could be to act as intermediaries within the Rothshild customer-contractor scheme, with a function analogous to that of the CIRIA in the UK.
4. The principle of membership is inherent in the RA movement in the UK and expansion of activities outside that country immediately raises the issue of competition. How significant this is depends again on the particular circumstances, such as the availability of national technical resources, the existence and strength of trade and professional organizations, etc. Nonetheless it is recognized that there is here a directly competitive situation, but it is felt that this is not necessarily disadvantageous since it will tend to promote the efficiency and effectiveness of the competing bodies.

SESSION V

Friday 27 April 1973 — Afternoon

POSSIBLE FUNCTIONS OF AN EEC ASSOCIATION TO SERVE COOPERATIVE INDUSTRIAL RESEARCH INSTITUTES

Session Chairman:

Dr B.E. KING
Chairman
The Committee of Directors of Research Associations

Activities and Funding of the European Industrial Research Management Association

Dr K.-H. STANDKE
Secretary-General

The Association was established in 1966. It is a permanent body in which European science based firms meet together to discuss and study industrial research policy and management and through which they can take joint action to try to solve some of the outstanding problems in this field.

The membership consists of individual manufacturing firms that carry out scientific and technical research; they are represented in the Association by senior persons responsible within the firm for research and development. Other people on the staff of Member companies also take part in the various specialized activities of the Association which include conferences, seminars and studies by working groups. EIRMA now groups 130 companies from 15 European OECD countries. As EIRMA membership is only open to industrial companies carrying out substantial research in Europe, research institutes, government agencies and similar bodies are not eligible for membership.

The origin of EIRMA can be traced from discussions which took place in Europe in the mid 60's in connection with the gap of technology between USA and Western Europe at that time. One of the reasons why it was felt that the American industry was 'better' was the existence of a body since before the war, where all research directors of the large American corporations could exchange experience. This organization is the Industrial Research Institute of New York to which today, some 230 companies covering all industries in USA belong. The Industrial Research Institute was used as a model for the setting up of EIRMA.

Internal Organization

The affairs of the Association are directed by a Governing Board consisting of 11 senior representatives from Member companies. The Board is elected by the general assembly at which all member companies

are represented. The Governing Board has a President who is elected for a two year period and who is designated one year in advance of taking office. He remains on the Governing Board for a further year as a Past President.

The permanent staff consist of a Secretary-General appointed by the Governing Board, his assistants and secretarial staff. The Governing Board has at its disposal a number of committees e.g. a Planning and Programme Committee, Publications Committee.

The programme of the Association is defined by the Governing Board in a sort of permanent process in which all member companies are invited to participate. Out of a list of topics which are proposed by Member companies, the Governing Board decides on the priority of subjects to be studied by the Association.

Funding

The Association is completely independent from public sources and is financed by entrance fees of new members, annual fees and participation fees for various types of activities. The annual fee is related to the annual consolidated sales of the group of the Member company and varies between FF 2 900 p.a. - FF 9 000 p.a. The annual budget is just over FF 1 million.

Types of Activities

The Association organizes activities of different kinds: conferences on specific topics in addition to the annual conference which takes place in a different European country each year. However, the backbone of the Association's work is carried out by working groups which consist of multi-disciplinary groups of delegates designated by the Member companies. The average working group consists of 20 - 25 delegates who meet four times a year in plenary session and also in sub-groups who meet to prepare reports in accordance with the terms of reference of the group laid down by the Governing Board in consultation with the Chairman of the group. The reports are presented to all members of the Association on the occasion of the annual conference.

The following are a list of working groups—some of which have completed their work:

No 1 Patents

No 2 Research Bought outside the Firm

No 3 Career of the Research Worker

No 4 Research Laboratories
Buildings
Budgeting and Control of Expenditure and Personnel Administration
Communications

No 5 Use of Computers in R & D
Technical Applications of Computers in R & D
Computers as Aids to R & D Management

No 6 Methods for the Evaluation of R & D Projects
Project Evaluation and Review

No 7 Industry/University Relations

No 8 Information and Documentation

No 9 Cooperative International Research

No 10 Technological Forecasting and Long-Range Planning

No 11 Industrial R & D and Environmental Protection

No 12 Allocation of Research Resources

No 13 Research and Development for Industry of the Future

No 14 Creativity and Motivation in Industrial R & D.

After the publication of the working group report, seminars are arranged during which the results are disseminated.

From time to time, round table meetings are arranged which are devoted to one specific problem of interest to one group of companies.

External Relations

The Association maintains close relations with the Industrial Research Institute of New York and the Japan Techno-Economic Society of Tokyo. EIRMA follows the work undertaken in the field of science and technology by international organizations as the OECD, EEC and UN organization and its suborganizations; also government agencies, federations of industry and universities.

Trends in Industrial Research Management

At a recent EIRMA conference entitled 'Industry and the Constraints on Growth' held in Zurich, a number of problem areas for management of R & D in the future were discussed.

1. R & D as a percentage of total turnover will very likely not be reduced, despite great pressures resulting from shrinking profit margins. The figure of between 5 and 10% for high technology companies is

likely to be maintained. One reason is that the outside pressures such as environmental protection will create new and demanding research tasks. A second reason seems to lie in human nature: The desire to innovate is inborn, nature is designed for evolution and not for the steady state. But lower profits will exert constraints upon research. It has been said that this is not a hindrance, but even a stimulation. A further observation is this: Research efforts will most likely be redirected towards more short-term goals.

2. Certainly more selective criteria for choice will be applied before a research project is started. It has even been said that as much effort should be spent on deciding whether and how a project should be conducted as on the project itself. This will eliminate many projects that really never should have been initiated—a beneficial effect without doubt, as I am sure all who are directing research will agree.

3. There was no agreement on whether the new constraints will have the effect of pushing research inside the firm or outside. By 'outside', I mean into joint research institutions or government laboratories. There was agreement that the notion of critical size—in other words, the notion that projects which are conducted by excessively small groups are of doubtful value—will find increasing acceptance.

4. Ways are needed to measure research effectiveness more accurately. Managements are demanding a yardstick to evaluate whether their research functions are well managed, much in the same way as they can measure the performance of a profit centre or a sales department; and I believe they are entitled to such a yardstick.

5. Ways will have to be found to integrate, in some way or other, the social sciences into the decision making process in research in order to help avoid a further alienation between industry and the population. There was general agreement:

— that this will be difficult,

— that we now see no clear way how to do it,

— and that the social sciences meant are probably not identical to the social sciences which sociology students currently are taught at our universities.

6. The concept of zero growth is not practical. It is not practical because of the developing countries which, it is felt, should grow not in population of course, but in industrial production and it is not practical because of the powerful pressures towards a still higher standard of living which very likely will persist.

7. We have to expect more government intervention in all our activities. The intervention will come through research money, through legislation and through selective taxation. Increasingly therefore, we

as business and research leaders must face the fact that when we meet to take decisions, there is an additional partner sitting at the table— visible or invisible—who will demand to be a participant in all our deliberations. We have a reason to hope and to expect that this partner is going to be a competent and responsible one. Accordingly, we have to hope for a staffing of public agencies with increasingly competent people. It will be in our best interest to help bring this about. Government intervention in many cases runs contrary to the interests of multinational companies, because governments place the national interest at the top of their priorities. This severely restricts the freedom of multinational companies to make best use of their research resources.

8. Everyone agrees that industry is part of society. It is not 'we' and 'they'—it is all 'we'. We all are managers and citizens at the same time. Realising this unfortunately does not remove a fairly severe conflict of interests to which we are occasionally exposed.

An Organization to serve EEC Cooperative Technical Centres

W.F. WATSON
former Chairman, CDRA

When CDRA organized the programme for this meeting in The Netherlands, it put as its fourth objective:

> 'To explore the possibility of establishing an EEC Association to serve cooperative industrial research institutes.'

It was then thought that the experience of EIRMA as described by Dr Standke in the previous paper might suggest that the cooperative technical centres could follow that example. Dr Standke has well justified that anticipation and has also indicated the outward-looking nature of EIRMA to the extent that we might look forward to help and cooperation. The paper was put last in the Programme for another reason; the proposal in it was to be submitted very diffidently and without expectation of any great value of such an Association, at least in the near future.

I share with many connected with the management of cooperative technical centres the immediate reaction—'Not another organization to be connected with!'.

CDRA had no conception that the eminent speakers and the participants in the discussions at this meeting would come back time and again, directly or by implication, to the need for some means to be established to—as Dr von Moltke so well expressed it—tap our collective reservoir of knowledge for EEC and wider benefit.

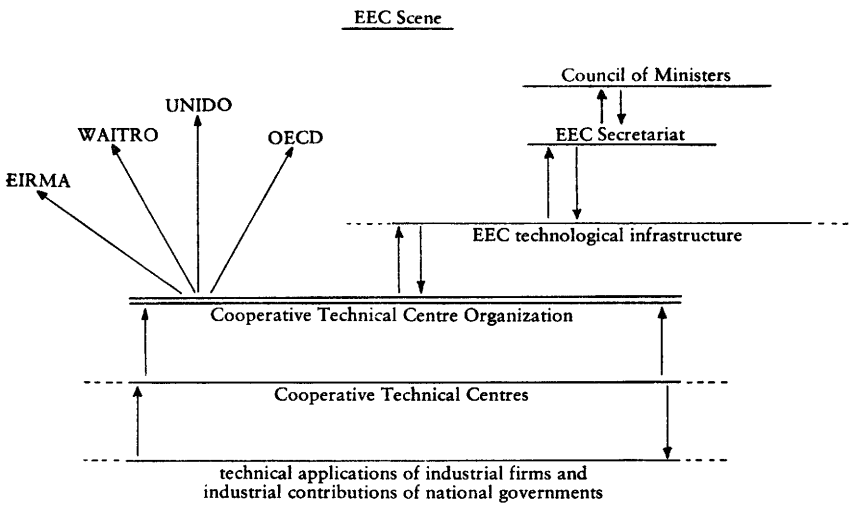
Hence, Lord Shannon and I agreed that it would be better not to circulate the very exploratory paper I had written and he had printed. Instead, I try now to bring together some of the issues raised at the Conference which indicate the requirement for some organization of ourselves as technical centres and to indicate one among alternative frameworks for it. I should say at the beginning that I am not speaking for CDRA. CDRA has not discussed the idea of an EEC organization. I am acting here as a collator of views and any others are my personal ones.

what is the 'market' for this envisaged organization? With the need to put some limits in order that the organization could be effective and avoid duplication, I suggest that its market could be 'those representing EEC cooperative technical centres and the cooperative technical centres themselves on a voluntary basis.'

What is the situation of cooperative technical centres for which an organization can supply some of their needs? The situation includes:—

1. A natural evolution of cooperation between centres.
2. Changes in the nature and scale of cooperative technical activities.
3. More homogeneous needs of industries and governments in the EEC.
4. Growth of the activities of the Commission of the European Community.

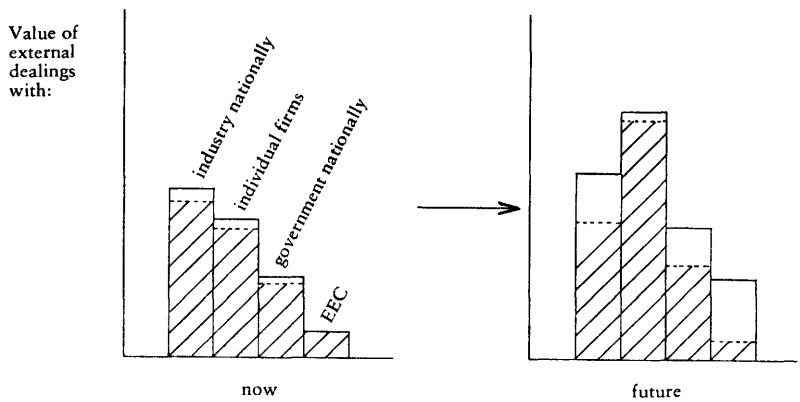
How might such an organization fit into the EEC scene? Following a recurrent theme of the need to plan from the top-down and do work from the bottom-up, I offer this rough diagram indicating a place for the organization:—



Note that I suggest that the organization is not itself an EEC-run body. We would, of course, anticipate that collaboration with EEC could be a main purpose. The diagram also indicates the developing of common interests additional to these with the EEC Commission.

What needs can this organization satisfy? Here I would like to express these by a simple methodology (I adopt here a procedure which my colleague Dr J.P. Berry has developed to the benefit of RAPRA for expressing the market and marketing of RAPRA). First, I distinguish External Needs from Internal Needs. External Needs are those activities of cooperative technical centres with others of a different type. Internal Needs are those of the individual cooperative technical centres themselves in meeting their objectives.

External Needs in the EEC situation now and appearing likely in the next few years are represented schematically by the histograms:—

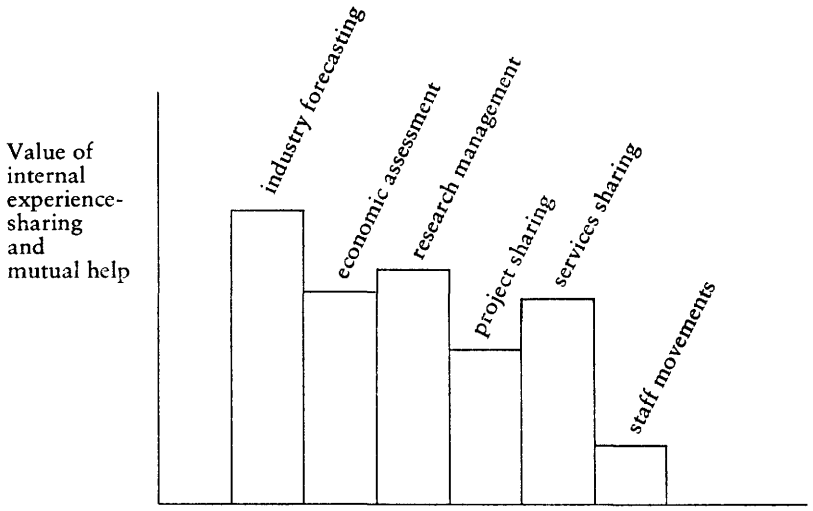


The shaded part represents the value of effort by technical centres without help of any organization. The clear part indicates activity which might be supplied now and later by the proposed organization.

Internal Needs are those of the experience-sharing and mutual-help variety. (Dr Standke has indicated very cleary the value of these as the main activities of EIRMA.) A very incomplete histogram on undoubtedly an erroneous scale may yet serve to make the point (see page 179).

I can move from this thematic approach to some concrete activities that have been voiced at this conference:—

1. Facilitating contacts and communications—conferences, smaller meetings, individual visits. Such a meeting as this next year has been mentioned once or twice as if it were a fact; however, such a meeting obviously will not arise simply from an uncoordinated wish for it. Very interesting to us also has been the suggestion



from Dr Shuster on the desire of the EEC Commission to foster interchange and cooperation by funding assistance and here an organization to belong to would make for an easier and probably more flexible mechanism.

2. Information-collecting-and-analysis activities have been mentioned. One is 'a Bessborough Report on other technical centres in the EEC'. Another has been the collecting of useful and informative data on our facilities and activities. I venture to suggest that such activities would be of little value if initiated and carried out by any outside body, including by the present limited personnel of the EEC Commission. One has to spend most of the planning time in answering the question 'why should this be done?' The experience of CDRA in initiating and arranging for the carrying out of the Bessborough Enquiry, including taking the initiative in gaining the support of the United Kingdom Government, is surely a good example of this point.
3. There is a natural development of international groupings for special sectors of industry—textiles, paper, plastics and so forth. There are also groupings cutting across sectors of industry in dealing with common issues such as water conservation. The experience of CDRA is that such groupings often benefit from the status of coming under its umbrella, often with no bureaucracy between the working group and CDRA. Perhaps a little more systematic marketing of such activities within the compass of the EEC cooperative technical centres might be worthwhile.
4. To facilitate tapping the reservoir of knowledge for EEC. It seems clear from the important contributions of Dr Shuster and Dr von

Moltke among others that the EEC would welcome somewhere to turn to rather than the present struggle with the present chaotic situation, at least as regards a voice representing cooperative technical centres.

There are obviously alternative structures for such an organization. To come to more firm proposals on structure would need a consensus representing historical development in individual countries. I merely here suggest one alternative to indicate that the proposal seems to me a practicable one and without a great deal of investigation and politics needed for getting started.

The experience in the United Kingdom suggests a two-tier organization. One tier would be what might be called the 'professional tier' similar to CDRA. The other tier would be an industry-based one acting on a wider scale similarly to the AIF in West Germany and the planned BIRD in the United Kingdom.

On the professional tier, I suggest that this could not be a political body. Indeed, it would have no right to be so if composed of executives of the technical centres. However, like CDRA, it could well act as a forum for discussion particularly of the Internal Needs and play some appropriate part in satisfying these. Like CDRA, it could also furnish much of the ideas and work out proposals for the industry-tier.

The industry tier envisaged would have the vital difference that it had a very strong power-basis. It could then deal with real authority with the EEC Commission and national governments.

There seems no reason for delaying the creation of an expanded-CDRA type of professional tier. The market for it exists, the market situation of this market suggests it could provide benefits greater than the efforts involved to gain them, and definite activities for it have already been proposed. I personally believe in involvement to the ultimate units involved, the cooperative technical centres themselves. They would seem to be of a finite and manageable number, particularly considering that only those sufficiently interested would want to belong. By election procedures by them, a management and planning group could readily be formed. It is simply a matter of whether there is sufficient will among the technical centres themselves to put in the necessary effort among all the other immediate pressures upon them.

Regarding the industry-based tier, there are interesting differences between different countries. For example, it would appear that this is the only tier existing in West Germany. Until recently, even the embryo of such a tier did not exist in the United Kingdom. In overlapping with the professional tier, this one would be concerned with the broader political issues. It should not be using up the valuable

time of the appropriate people in it discussing such subjects as the programme of the next annual meeting of the cooperative technical centres, taking time on discussing any harmonizing of economic assessment of projects, and the many other things of interest and value at the professional level. It would no doubt be carrying out its duties by offering the type of participation the Earl of Bessborough suggested of taking part in the EEC technological infrastructure, dealing with officials of the EEC Commission, and the civil servants of national governments. In cooperation with the professional tier, it could perhaps act as a truly independent Technical Requirements Board autonomously within EEC.

Again following my limited United Kingdom experience, the first thing would be to establish the criteria for membership of the organization. Secondly would be to establish some funding procedure, best by some voluntary basis. Thirdly, the one or two tiers of executive management would need to be elected by those in the membership. Finally, the one thing I would advocate strongly is the establishing from the beginning of a permanent secretariat common to whatever organization is set up. (It might well be that an existing secretariat, such as of CDRA, could be expanded by perhaps only one person in order to cover secretarial needs for a year or two.)

Dr Shuster in his paper told us that the positive needs within EEC and the great threats of international competition require us to do what we can for EEC in a world context. Taking this down to our more limited sphere of operations, the message seems clear to us that we also have no time to lose. I end therefore by suggesting that we have come after these $2^1/_2$ days of intensive discussion to at least one decision-point. The decision to be made is whether we go ahead together to look more fully into the idea of an organization to serve the cooperative technical centres of the EEC. I hope some such proposition will be put during the discussion so that we can have our views democratically known and then to take any action accordingly.

Discussion

Question by: Dr Bult.

1. I want to make a positive statement with regard to the interest of TNO to look into Dr Watson's proposal especially on behalf of the institutes who by nature are directed towards cooperation research.
2. How could the experience of existing European organizations or institutes operating in the same industry be made available for the new group.

Answer by: Dr Watson.

I thank Dr Bult for his positive statement from TNO on looking further into the proposal to set up some organization to help cooperative technical centres.

There is no doubt that the experience of existing European organizations of institutes could be useful in considering the functions of the proposed new organization. Certainly those operating in the same industry may be useful. More useful would be the experience of organizations embracing many industries, such as CDRA and TNO to identify the really important common questions of interest to technical centres as a whole.

Question by: C. Crussard.

It seems difficult to decide immediately about the structure of a European Cooperative Technical Centre Association: as has been mentioned repeatedly in this meeting, the situation differs from branch to branch; in some cases cooperative organizations exist, in others the structure or financing situations are so different that cooperation risks to be unfair from the beginning.

Thus, a prior enquiry, of the Bessborough report type, seems a necessary first step. If EEC can make it, or at least help it, it would be good to use its means. It would also be appreciated to have the approval of UMCE, otherwise the Industrial Federation may have an unfavourable reaction.

Answer by: Dr Watson.

I agree with Mr Crussard that it is difficult to decide immediately about the structure of the proposed organization. For that reason, I have suggested only one of several options for its structure and would hope that this would be followed up by a much more detailed and representative investigation to arrive at some optimum consensus of views.

However, not to do anything because of the organizational difficulties and fears of some risks of being unfair seems to me to be a defeatist attitude.

I agree entirely with an enquiry of the Bessborough type for organizations other than those already surveyed in the United Kingdom. However, it is putting the cart before the horse to suggest this

as a 'prior enquiry'. Any self-respecting group would surely wish to initiate this for themselves, as did the research associations in the United Kingdom.

I am, of course, all in favour of discussions with UMCE and any other interested parties before the definitive proposal is submitted back to the technical centres involved on what organization they should have to serve them.

Question by: N.K. Bridge.

I am afraid that an organization of *individual* research centres might duplicate the contacts which already exist in plenty between research institutes in Europe working in the same or allied industries.

For this reason I believe that the proposed new organization should consist of a representative from each country's committee which represent the Research Institutes in the country. This new organization could deal with the EEC, and also arrange meetings of individual members on topics of common interest.

Answer by: Dr Watson.

In the fuller written text which I was unable to present orally, I have dealt with the issue of an organization for the individual research centres and yet an organization of manageable size to be an authoritative voice from each country involved in the proposed organization.

I feel that an effective organization must generate interest in the individual technical centres by their involvement in it, at the same time having some much smaller executive group. Hence, I propose a two-tier system to deal with this important question raised by Dr Bridge.

Question by: Morten Knudsen.

We recommend that Dr Watson and a small working group work out a proposal for such an organization as sketched, as we have many common problems, i.e. research management, personnel education, standard contract-formula, technological forecasting. Further we could try to influence the EEC R & D policy in a direction which also includes 'bread and butter industries'.

We ask if it should be favourable to have an organization, which is enlarged to the OECD countries and not only the EEC countries.

Answer by: Dr Watson.

I agree with the comment of Mr Knudsen that the proposed organization could have the two types of function:

(i) to act between the European technical centres on their many common problems as indicated by Mr Knudsen and

(ii) to act externally, particularly within the EEC, on important general issues such as encouragement of R & D for the 'bread and butter industries'.

With regard to enlargement to OECD countries rather than only EEC countries, it is here a question of what is the optimum enlargement in relation to being effective. There is already a World Association of Industrial Technological and Research Organizations. Personally, I favour at least limiting the scope at the beginning to EEC countries.

Question by: Dr Holmblad.

Would not the proposal of Dr Watson be valuable by creating an organization which could be the 'Spokesman' of the EEC technical centres towards the EEC Council?

Answer by: Dr Watson.

Il fully agree with Dr Holmblad that the organization proposed in my paper could be the 'Spokesman' of the EEC technical centres towards the EEC Council. In fact, this probably would be its most important function.

Comment: The Earl of Shannon.

It has been suggested by a previous speaker from the floor that we should wait for the result of a 'Bessborough' report on all EEC Institutes before attempting to form any form of Association.

From recent experience in the United Kingdom had there not been a CDRA to show the strength of feeling that existed amongst RAs that there should be a survey, in all probability none would have been carried out. It was therefore only because there was a strong association to press the views of its members that 'Bessborough' happened.

Answer by: Dr W.F. Watson.

All I need do is support Lord Shannon and emphasize again that the horse should drive the cart in the matter of whether we get ourselves better organized or not.

Comment by: C. Crussard.

In France, the enquiry on Professional Technical Centres has been made on Government request, five or six years ago. The committee was presided over by Mr S. Giraud.

If EEC can launch a similar enquiry on a European scale, it could be the best way to start the action, as it would be the best way to meet objections from other circles.

Motion

'That this Conference is of the opinion that there is merit in the suggestion of forming an Association of Industrial Research Institutes in the European Economic Community for the purpose of assisting in cooperation and collaboration between its Members.

Therefore, a working party consisting of a coordinating representative from each country in the Community should be formed to examine the suggestion in detail and, if thought fit, to put forward specific proposals for such an association and its field of useful activities, to be considered at a further Conference to be held within twelve months.'

After debate this motion was carried *nemine dissentiente* and the Committee of Directors of Research Associations accepted the responsibility for calling for representatives to attend the working party, for arranging meetings of the working party and for arranging a further Conference within the stated period.

Summary and Conclusions

Dr B.E. KING
Chairman,
The Committee of Directors of Research Associations

Perhaps I may remind you of the objects we set ourselves for this Conference. The first involved exchange of information and the ten papers presented on Wednesday afternoon and two papers on Thursday morning fully covered the present situation.

In particular the paper by Dr Schuster outlining the science policy of the EEC Commission was complemented by Lord Bessborough's Summary of his enquiry into the United Kingdom RAs.

From all these papers certain points arise:

1. The United Kingdom Government, many other European Governments, and especially the EEC Commission must give careful consideration to the apportionment of 'public' funds for industrial research, with particular reference to the 'bread and butter industries'.

2. In principle, cooperative research is recognized as being most important and must be developed both within individual countries and between EEC members and others.

3. A survey of the expertise, facilities, and capacity for industrial research existing within the Common Market countries must be prepared and this Conference will hope that it is completed as soon as possible. The papers on Wednesday showed that each country has its own unique methods of operation and funding but this must not prevent a continuous effort being made to harmonize relations at all levels, particularly between similar institutions in the various countries.

4. The work of CERD will be followed with interest, and the Conference hopes that it will consider these points carefully.

This has already taken me into the area covered by objects 2 and 3 for our Conference which were most adequately covered during the sessions on Thursday afternoon and this morning.

I would emphasize that concern was voiced that all sizes of firm and all types of industry must make up the industrial pattern being considered by the Commission.

I personally support the comments that exploitation of results is most important and costly. Dr Von Moltke told us that the Commission is particularly concerned with the introduction of new technology on the shop floor. A suggestion was made to start by exploiting results from one institute in factories of other countries.

Collaboration and competition was thoroughly reviewed this morning and presented us with many thought provoking suggestions and opportunities—to the good of all!—I'll say no more.

When considering my concluding remarks I had not heard this afternoon's papers. We have heard a most interesting paper on the activities and funding of EIRMA by Dr Standke which will be useful in development of relationships within Europe.

I am glad to say that following Dr Watson's paper we have achieved our fourth objective, and have an approved proposal to give further consideration to a European Association to serve the interests of the industrial research associations in Europe.

May I remind you that publication is through the courtesy of the Commission. Please address any of the proceedings enquiries to Miss Auzat or Mr Nicolay in Luxembourg.

The bases for a successful conference like all good marketeering require:

1. The right theme.
2. At the right time.
3. At the right place.
4. With the right people.

The last being by far the most important.

I can, without fear of contradiction, say that we have had all the right people here. My sincerest thanks go to all our speakers for their time and the careful thought they have put into the preparation and presentation of their papers and the excellent way they answered questions. Also, my Co-Chairmen, I thank you for the admirable way in which you kept your sessions in order.

Also to the delegates—whom we have worked very hard through long hours.

To TNO and to Professor Van Trier for his excellent hospitality on Wednesday evening and all the help he and his colleagues have given us as your co-hosts.

To the Director of CDRA—Lord Shannon—and the Secretary —Miss Ellithorne—and their many helpers who have made the whole proceedings possible.

Ladies and gentlemen—may I thank you for your attendance, wish you a safe journey home and hope to see you again very soon.

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