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FIFTEEN YEARS OF SUCCESSFUL JOINT RESEARCH IN EUROPE:

COST RESEARCH COVERS TEN PROJECT AREAS

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FIFTEEN YEARS OF SUCCESSFUL JOINT RESEARCH IN EUROPE:

COST RESEARCH COVERS TEN PROJECT AREAS

For almost fifteen years there has been joint cross-frontier research in Europe. This goes beyond the countries of the European Communities since from the outset it has been meant to cover the whole of Europe. Nineteen European countries, including the 12 EEC members, have taken part in the very wide range of COST projects. Some of these have awakened so much scientific and technological interest that they have spawned national or Community research programmes because their contribution to technological change in the world has become increasingly significant. In addition, participation by the various European countries illustrates how closely people can work together when they have common aims. The COST projects also show how potential cooperation could operate and progress within the EUREKA projects currently under discussion. So far about 55 COST projects have been completed or are still in progress. COST began in 1970 and the participant countries have so far invested more than 150 million ECU in its projects.

COST is the abbreviation of the French "Coopération européenne dans le domaine de la Recherche Scientifique et Technique". In English this means European Cooperation in the field of Scientific and Technological research.

Europe is holding on to its lead

The European nations are still playing a leading part in the development and application of new technologies. Their competitors on the world market for modern technologies are North America and Japan. These are countries having different structures and therefore different market forms. The European nations cannot allow themselves to be elbowed aside from important areas of future technological development by these competitors. They therefore wish to attempt to tackle all of their problems through mutual accommodation. If they work jointly, they can overcome or compensate for a whole series of disadvantages caused by the multiplicity of fairly small nations in Europe which have less potential for technological development. This applies particularly in view of the large home markets in North America and Japan. The COST projects make it possible to take on these competitors in a "European" manner.

According to a recent survey 19 countries have been involved in concerted COST projects since 1971. These include not only the European Communities newest members, Portugal and Spain, but also the Scandinavian countries Norway, Sweden and Finland, as well as Switzerland, Austria, Yugoslavia and Turkey.

The European Communities have assumed responsibility for coordinating the COST projects so as to avoid any unnecessary friction which might hamper the cooperation: a special group of European officials has been attached to it and a Secretariat set up. Each COST project is coordinated by a committee in the form of an equal partnership.

The special feature of all COST projects is the complete freedom of action of each country involved. Any country can join in at any time, and a declaration of intent by such a country is the only legal framework required. This governs the joint aims, the type of activity to be pursued, the terms of participation and compliance with both sovereignty and protection rights.

The European Communities thus provide no more than a service for the COST nations. They make available their experience in relations with totally different States and research systems. This cross-frontier scientific knowhow includes the surmounting of language barriers and the organization of specialist conferences or symposia, plus administrative duties.

Thus funding with EEC money is also kept to a bare minimum, mainly in the form of administrative costs. The individual countries themselves bear the research and development costs incurred themselves, either by awarding special research funds or subsidies, or by providing research laboratories and the requisite staff.

The great advantage of this approach lies in the significantly quicker exchange of information between scientists and technical experts, and the jointly agreed arrangements as to who is to do what future work.

It has been possible in this way to increase Europe's technological lead, or at the very least to consolidate it.

There are on average eleven countries working on each project

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Owing to the early successes in the '70s the interest in COST projects has now mushroomed. This is a sign that the advantages of cross-frontier research and development are being recognized and put to use. Thus, for example, many new and specific COST projects have developed in the telecommunications field. Work on various projects of this type will be carried out jointly this year and in the future. This is astonishing since it is a field previously considered by companies and national customers to be their exclusive domain. Present and future competitors for market shares thus come face to face here, but they nonetheless pursue the same research aims.

The Centre for Medium-range Weather Forecasts in Reading (United Kingdom), founded in 1973 by 17 countries, must be considered to be the most successful example of COST cooperation. This is understandable, since the quickly changing weather conditions in Europe cannot really be monitored adequately by small individual States and, moreover, they greatly affect agriculture and transport in Europe.

It is striking to see from the list of project participants which European countries are especially open to cross-frontier research: the Federal Republic of Germany is level-pegging with France, both having taken part in 49 projects. They are followed by the Netherlands with 48, Sweden with 47 and Belgium with 46 projects. In only one project are there no more than two countries as partners. This concerned research into materials for superconducting electrical machines, and this is extremely surprising since it is a field with vigorous research in both the USA and

Japan. Only Austria and Switzerland joined the project, which did not go beyond 1982, even though from an energy-policy standpoint superconducting magnets can yield drastic energy savings. Superconductivity will probably regain its attraction once again when more recent materials research results have been obtained.

Greece and Turkey bring up the rear. The number of their commitments in isolation does not tell us a great deal. It does mean, however, that despite their structures and spheres of interests, these countries are showing an interest in areas of cross-frontier research and know-how which are significant to them.

Thus Turkey is researching such areas as sludge processing methods, the Centre for Medium-range Weather Forecasts, improvements to telecommunications networks (including their digitization), and the use of micro-organisms as sources of albumen and maize as a basic feed for beef production. These are all therefore problems in which Turkey could not go it alone so quickly.

More heavily industrialized countries are naturally interested in a wider range of problems.

Problem-orientated research projects

After the initial "groping in the dark" in the early '70s roughly three main problem areas have emerged. These are:

- Research on worldwide international topics such as oceanography, meteorology or environmental protection; the development of modern materials;

- R&D appealing to a greater or lesser extent to all European countries, both individually and jointly, such as data processing, information technology, agriculture or food technology;

- Mutual adaptation of the various standards and specifications among the individual European countries in order to achieve the most widespread cross-frontier uniformity possible, as in telecommunications and transport.

All of the COST projects must be able to fall within one of these problem areas. It has so far been possible to define ten main groups in the following areas:

- data processing
- telecommunications
- transport
- oceanography
- metallurgy and materials
- environmental protection
- meteorology
- agriculture
- food technology
- social engineering and industrial safety

This selection of topics reflects both the interests of European industry and its common problems.

In order to provide easily comprehensible, effective operating procedures without resorting to top-heavy administration, four different categories of cooperation were drawn up:

- European Community research projects in which non-Community countries may cooperate (Category 1);

- Projects put forward within COST and implemented under a Community programme in which non-Member States can take part (Category 2);

- Research projects in which the European Communities as such are involved alongside Member States (Category 3);

- Projects with no EEC involvement (Category 4).

It is thus intended to keep the various sources of funds distinct from the work of the research institutes. This also applies to differing spheres of interest or the areas on which the research programmes in the individual countries are concentrating. Indeed, in none of the various European countries are there fully comparable structures for the research and the attendant research policy. As far as possible all bickering should thus be stifled at birth.

It can be seen that so far there has been virtually no involvement in COST projects by the EEC as a research partner in its own right. Because of the job it does, the EEC itself can only cover a narrow spectrum of the research projects. At least 70% of these are in Category 4, whilst the remainder are spread roughly evenly between Categories 2 and 3.

In view of the growing success of the EEC's own research projects, it is to be expected that the number of Category 4 projects will decline. It is also possible that, for example, the EFTA countries will wish to become more deeply involved in this research since it has generated confidence in this new type of broader European research. This is an important realization, which boosts the feeling of European togetherness.

As a result of the EEC Commission's coordinating and progress-monitoring activites, the officials responsible for a project and its participants have all gained an insight into a sizeable part of European research and they can use that knowledge directly for either new or follow-on projects. Where at all possible and when finance by the participating countries can be guaranteed, the European "research scene" can quickly adapt to the genuine requirements. Because of the voluntary nature of participation in COST projects, many of the earlier sources of friction within the cooperation can now be avoided and effective European research can take shape without impinging upon national characteristics.

Successes due to COST projects

The success of the COST projects cannot be measured by conventional yardsticks. Since the programmes are not primarily aimed at immediate, economi-

cally exploitable advantages, no comparisons can be made. The immediate beneficiaries are the scientists working on the projects.

Since these are mainly employed by State research institutes and are working on national research projects as part of COST, the know-how acquired is quickly disseminated and used throughout the countries concerned. Turning this into marketable products is not restricted solely to national forums: where there has already been conversion of this type, it has in most cases also led to cooperation and to offers from various European manufacturers. There has of course been a time-lag, since the results of basic research are only turned to account in stages.

In the view of both scientists and research ministries, one of the great assets of this Community research, but one which it is difficult to quantify, is that it transcends all frontiers and linguistic barriers. People get to know and assess - and thus come to trust - each other.

COST projects on transport, metallurgy and materials, for example, have already found success in the marketplace. However, a more detailed description of the successes gained by other projects is warranted.

COST project on Transport

This project began as a cross-frontier programme of electronic traffic aids on congested trunk-roads. The aim was to use modern, practicable methods to find a better way of controlling traffic in built-up areas and also of doing so during holiday peaks or under extreme weather conditions. These are typical European problems which no country could solve on its own owing to the increased mobility of Europeans. Moreover, the results obtained deeply affect the legal and law enforcement policies of each country, while their economic benefit is due less to powerful computers and their software than to the avoidance of accidents, delay and the resultant unnecessary costs.

The already foreseeable rise in the number of cars and lorries on the road shows that there will be further increases in traffic. We must be able to cater for these both regionally and on a broader basis.

The Dutch Government has carried out an ambitious demonstration project in this field under COST auspices. It very quickly proved its mettle and will now be gradually extended. Not only psychologists, electronics and computer experts and road-builders but also the police and highway officials had to be brought together in order to make it work. The know-how to be gleaned from the demonstration projects is equally diverse. It extends from proposals for more effective, easily comprehensible traffic signs which can be varied to deal with differing traffic situations, to software packages for semi-automatic traffic-routing programmes. Multiple pile-ups which previously occurred very often in fog patches are, on the test section, now a thing of the past. Even road works can now be carried out without causing tedious jams or, in most cases, accidents. The experience gained in setting up and operating this modern traffic-routing system has generated many new ideas extending well beyond route guidance systems. These include, among others: broadcast warning and advisory systems, regional traffic information, the detection and early warning of

traffic disruption, and automatic bad-weather warning systems. The majority of the experience gained is also prelevant to ship guidance systems and moreover, cross-links have been forged with other research areas. These include energy and fuel-saving propulsion systems for mass transit equipment such as diesel/electric trolley buses, or the use of alcohols and liquefied gases as substitutes for imported fuels and petroleum.

Heading in the same direction is the research into higher fuel efficiency in engines and gas turbines through the use of ceramic components. This can provide a link with the projects on "Metallurgy and materials science".

European ceramics research is second-to-none

There is no reason to overestimate Japanese ceramics research. Many problems underlying the use of ceramic components in internal combustion engines and gas turbines have not been solved satisfactorily in either Japan or the United States. Europe is keeping pace with its foreign competitors in this important sphere of research. It is, however, true that European research workers, and above all the industries involved, are more tight-lipped about their successes than the Japanese or Americans.

One day ceramics will be able to replace metal alloys in high-temperature applications around and above 1,000° C. So far, owing to the brittleness and resultant susceptibility to fracture of parts and assemblies made entirely of ceramics, the only option has been to coat metallic components with them. The state of the art as regards this coating technology is roughly the same throughout the world. Entirely ceramic engines or turbines are development targets now being worked upon.

So far there has been no spin-off in the form of marketable products. However, the European development teams working on ceramics have got just as far as their Far Eastern or American colleagues. Feelings of technological inferiority are thus out of place.

Several industrial companies have also taken part in the many COST research projects. Initial fears that know-how or protective rights could fall into the hands of competitors were easily dispelled. Efforts were concentrated on those problems affecting everybody. These included methods of monitoring service life, materials quality, crack formation or corrosion behaviour. The research was not restricted to ceramics, but included all high-temperature-resistant materials, problems affecting powder metallurgy, and the necessary machining techniques.

Also included are areas of research which are close to practical application such as gas-turbine shafts and blades made of metallic and ceramic materials, fluidized-bed combustion processes for the gasification of coal, and improvements to steam turbines.

The results of the progress made under these COST projects are so varied that only experts in the research and industrial laboratories can speak

authoritatively about them. They state that in general it has been possible to save a great deal of time through joint research and that they wish to take part in further projects.

Long-term COST research projects

Of the wide range of COST projects we should mention here the joint research into meteorology, telecommunications and information technology. This has also meant that the relevant problem areas have overlapped during the cooperative ventures. Thus, for example, weather forecasting problems impinged upon those working on the early warning of road users. Similarly, there has been cross-fertilization between the projects on the cable and broadcast transmission of information for traffic-routing purposes.

This is understandable since new knowledge in one specialist area generally spills over into other areas. Where there is more accurate weather forecasting, critical traffic situations can be detected and controlled more easily than possible hitherto. This also applies to data transmision via existing networks or satellites.

Additionally, the use of high-frequency signal transmission, for example, has unleashed potential for the early detection of hazardous rain or snowfalls, for measuring their magnitude and for issuing advance warnings at specific points.

Expansion and further developments under discussion

At the moment the COST project panels are considering how improvements need to be made, and what form these should take, in order to examine what place the cooperation should occupy alongside Community programmes and other European ventures such as EUREKA.

The question will be studied of whether other European Communities research activities such as BRITE, EURAM, ESPRIT and RACE can be linked with COST projects. However, it is already obvious from discussions on the EUREKA project, as they now stand, that there cannot really be a direct link with the COST system. Administrative or specialist experience could naturally be transferred, of course.