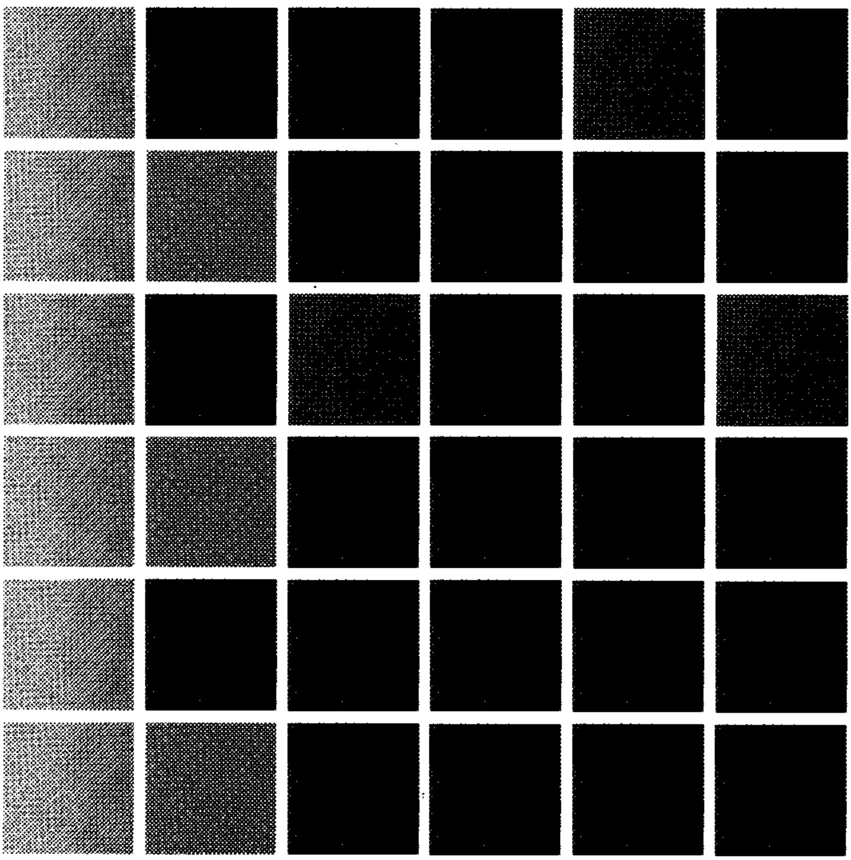
Periodical 2/1985

THE EUROPEAN COMMUNITY'S RESEARCH POLICY



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Contents

I — Research — the key to the future

In the early 1980s the industrial countries face five major problems:

(i). Economic crisis has brought inflation and unemployment;

(ii) European Community countries are failing to compete with the major non-member States such as the USA and Japan, not just in science and technology but on the agricultural and industrial fronts too;

(iii) Management of energy resources and raw materials is inadequate;

(iv) Cooperation with the developing countries needs to be improved;

(v) New technologies have caused social change.

Each country is affected by these problems to a different extent, but common to all is the fact that research and science are inextricably bound up with economics and politics. More than ever before they are influencing economic development, setting the pace of progress and changing our society. Issues affecting political and economic life and our very survival are increasingly being decided in laboratories and research centres.

Changes are coming thicker and faster. Knowledge is multiplying to an extent undreamed of not so long ago, and in some areas it is virtually doubling every three to four years. Less and less time elapses before research results have a practical impact on the life of each one of us in fields such as medicine, food production, industrial output, the products we use every day, new transport systems and the controversial areas of new technology, energy and environmental protection. Research results are not a matter of chance but depend directly on educational systems and the ways in which research is promoted all over the world.

II — European cooperation on research — is it necessary and what are its prospects and limitations?

Cooperation on research is booming in Europe, as can be seen from the increase in the number of joint research programmes in recent years, the growth in cross-border coordination of activities and the steady rise in the share of research, development and demonstration expenditure in the general budget of the European Communities. The Council of Ministers is firmly convinced that research and development will continue to be the driving force of the economy in the years to come. Europe can hold its own in the ever-growing competition with the USA and Japan only by making the most of its opportunities for renewal and advancement, by recognizing where good market prospects lie and by steadily increasing the competitiveness of its industry. It has already proved that it can do this, when it rose to the 'American challenge' of the 1960s. With massive injections of public and private capital Europe managed to make up some of the ground it had lost in R&D in some key areas (electronics, data processing, nuclear energy and transport), and it can do the same again today. Since the countries of the European Community are much more dependent on imports of vital raw materials than is the USA, they must not only be willing to keep up with the keener international competition — they must create the conditions in which they can do so.

Statistics show that Europe has the human and financial resources to meet any future challenge. The European Community provides a framework for cooperation in an entirely new dimension, the ultimate goal being the integration of Europe. Research is a tool for achieving this end. Joint research, development and demonstration activities boost the potential of each Member State. The political situation in Europe as a whole, economic interdependence, dependence on vital imports of raw materials and energy, responsibility in deciding how the workload is to be shared internationally — all of these are a challenge for the scientists. It is easy to see why the Community is becoming more involved in this important area too, moving towards objectives which will benefit all other areas of cooperation as well.

At a time when all Community Member States are having to 'tighten their belts' it has become even more important to avoid duplication of effort and to move the main thrust of research to Community level. Although public spending on civil research and development is twice as high in the Community countries as it is in Japan, Japanese researchers are filing substantially more patent applications in key technologies. Although some caution is called for when making such comparisons, this is one which gives cause for concern and from which the necessary conclusions should be drawn.

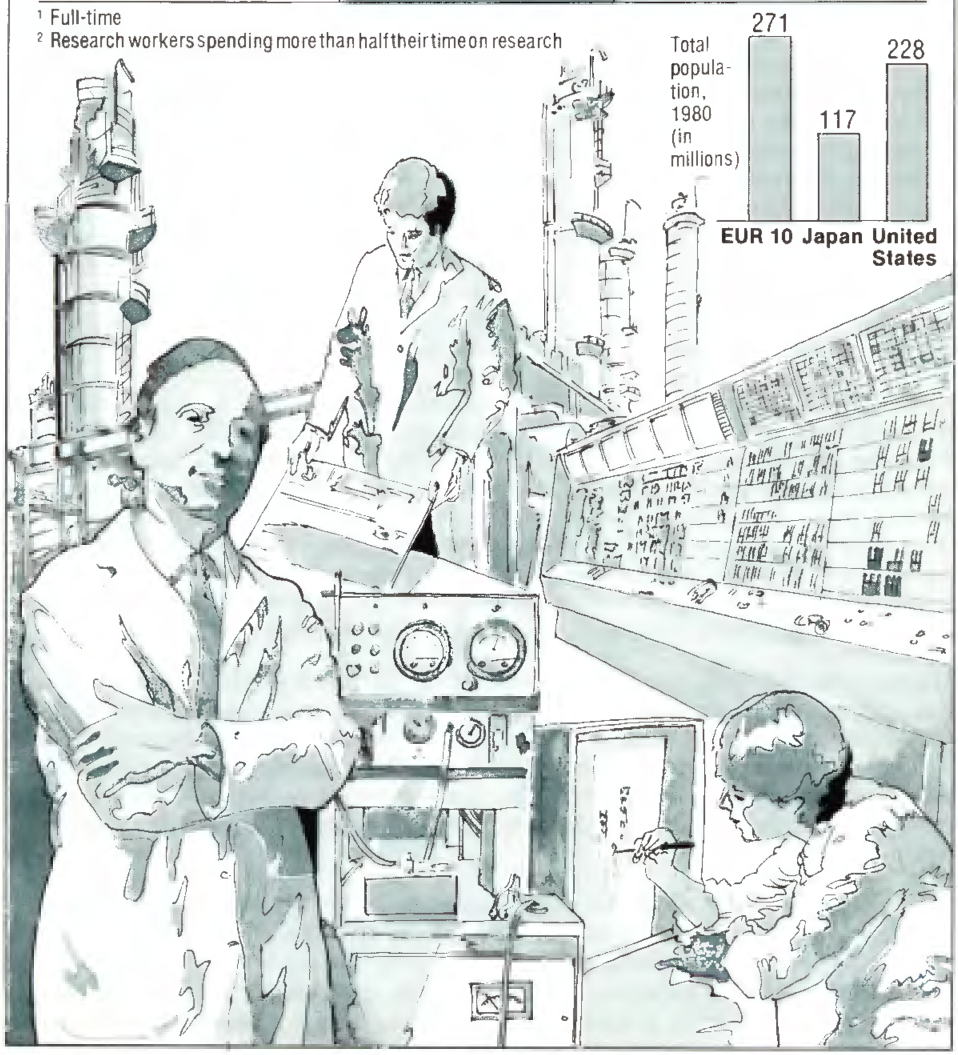
It is in the nature of research workers to be internationally minded and to want to cooperate with their fellows in other countries. This cross-frontier activity is often merely coincidental, however, and between some countries it is 'one-way only'. Researchers can give no guarantee that the contacts they set up for themselves are with the most suitable partners. The obvious way to improve efficiency is to coordinate at the European level. Another fact to be consid-

Number of research workers, technicians,
manual workers and administrative staff employed in research (1979)

	Research workers	Total number employed in research (research workers, engineers, technicians, manual workers, administrative staff)
European Community [1]	**360 000**	**1 020 000**
United States [1]	**560 000**	(figure not available)
Japan [2]	**330 000**	**565 000**

[1] Full-time

[2] Research workers spending more than half their time on research



ered is that European researchers often know their colleagues in the USA better than their fellows in the neighbouring European countries and cooperation and knowledge of each other's work suffer as a result. The Community has done some useful spadework here and must keep it up.

Community R, D&R (research, development and demonstration) projects come into consideration primarily when the objectives cannot be achieved by one country 'going it alone', either because they are beyond its human or financial capacity or are likely to be worthwhile only in a Europe-wide market, or because by their very nature they require an international approach (for example, the fight against pollution of the sea). Another reason for joint research might be that the problems to be solved are common to several Member States.

Cooperation at Community level seems most appropriate wherever the individual Member States have insufficient resources of their own to tackle a problem single-handed. A good example is the very expensive and demanding research into the energy source of the future — nuclear fusion. Costs are high and results can be expected only in the long term. Then, however, nuclear fusion might make an economic and political breakthrough which not only solves national energy problems — the raw material for nuclear fusion being water — but also completely changes the international power structure and the system of political and economic interrelationships.

Community support for research takes a numer of forms. First, in the 'Joint Research Centre' set up at the end of the 1950s with establishments at Ispra in Italy, Karlsruhe in the Federal Republic of Germany, Petten in the Netherlands and Geel in Belgium, the Community is carrying out its own research work. Secondly, the Community finances projects carried out by national research scientists, research teams and research centres. And, thirdly, the Community has the task of coordinating national research programmes in specific areas of research. The Council of Ministers is now preparing to adopt for given research sectors action programmes which combine all the approaches employed hitherto. This means that while some parts of a programme will be carried out in the Community's Joint Research Centre itself, others will be implemented either by commissioning government, university and private research establishments in the Member States or with the Community acting as coordinator.

Experience so far has shown that the tools available to the Community are many and varied and sufficiently flexible to enable action to be taken wherever this is considered to be in the interest of the Community.

The Community selects the following types of project for joint scientific or technical action:

(i) Very large-scale research projects for which the individual Member States have difficulty in raising the funds or finding the personnel they require;

(ii) Research projects for which joint action offers clear financial advantages despite the extra cost involved in any scheme of international cooperation;

(iii) Research projects which can provide results of importance to the whole Community by bringing together complementary research activities in the individual Member States, because the problems to be faced require research to be conducted on a large scale, especially in clearly-defined large geographical regions;

(iv) Research projects which promote the unity of the common market and European cohesion in science and technology and, if necessary, research projects which lead to the adoption of uniform standards.

1. *European and international cooperation on research*

The common research and development policy is dovetailed into the international framework and blended into the network of scientific and technical cooperation: cooperation with the countries of Western Europe in the COST projects (scientific and technical cooperation with non-member countries: see below); association agreements with industrialized countries outside Europe; international organizations like the UN and its subsidiary bodies and the OECD and the Council of Europe; coordination of effort and cooperation with European research organizations such as the European Organization for Nuclear Research (CERN) in Geneva, the European Molecular Biology Laboratory in Heidelberg, the European Space Agency and the European Southern Observatory, as well as in European programmes like the European Gaseous Diffusion Consortium (Eurodif) and the Airbus programme. Finally, mention should be made here of the work of the European Science Foundation in Strasbourg and the scientific communication system Euronet-Diane set up by the Community.

2. *Finance*

The budget for the European Community's research and development activities rose from 70 million ECU (about DM 160 million at the current rate of exchange) in 1973 to 477.2 million ECU (about DM 1 060 million) in 1984.[1] The 1984 budget breaks down as follows:

Industry	23 600 000
New technologies	48 770 000
Raw materials	14 501 000
Energy	297 431 000
Health, medicine, biology, environment	41 460 000
Other sectors (agriculture, developing countries, etc.)	51 511 000

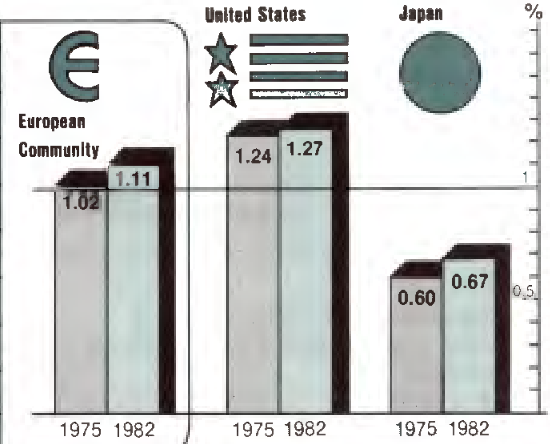
Despite the substantial increase in Community research spending, its proportion in relation to the other areas of expenditure remained relatively low and today it accounts for a mere 1.63% of the Community budget. The R&D share of the budget amounts to only 1.5% of the total expenditure of the Member States for this purpose and 16% of the Member States' expenditure on international cooperation.

The common R&D strategy that appears to be essential for the years to come will call for an increase in spending. For the European Commission there is no doubt that expenditure and priorities have to be subjected to scrutiny. Attaining the objectives of the Commission's framework programme for 1984-87 would require appropriations totalling 3 750 million ECU (at 1982 rates) in those years.

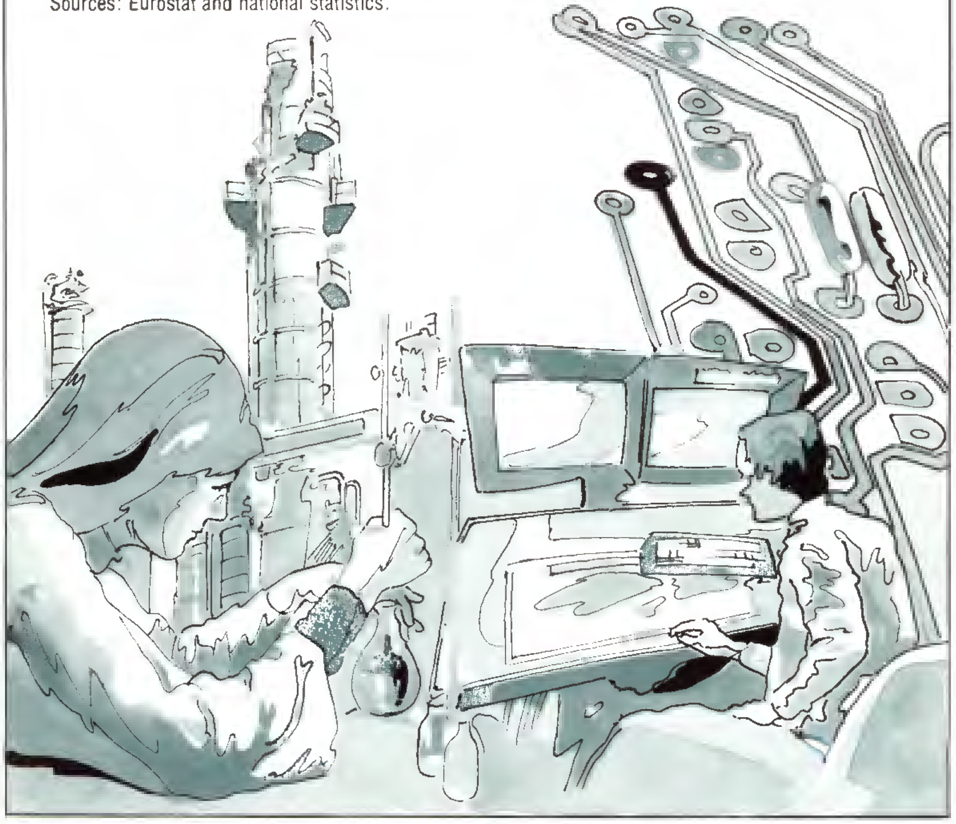
[1] In payment appropriations.

Public-sector expenditure on research and development (R&D) as % of the gross domestic product (GDP) at market prices (estimate)

	1975	1982
Federal Republic of Germany	1.23	1.20
Belgium	0.73	0.68
Denmark	0.58	0.48
France	1.17	1.36
Greece	—	0.20
Ireland	0.44	0.41
Italy	0.36	0.64
Netherlands	0.96	0.92
United Kingdom	1.27	1.36



Sources: Eurostat and national statistics.



In its resolution of 25 July 1983 the Council of Ministers approved the framework programme for 1984-87 and confirmed its agreement on the need to increase spending on research, development and demonstration activities. The resolution states that 'while bearing in mind the need to frame Community policies but awaiting the outcome of the general discussion on the Communities' resources and policies, for the time being the Council takes note of the financial indications relating to the objectives to be attained in the period 1984-87'. The planning and adoption of programmes will, of course, take account of financial constraints.

Framework programme for 1984-87
(including planned volume of funding)

	million ECU[1]	%
1. Promoting agricultural competitiveness:	130	3.5
(i) developing agricultural productivity and improving products:		
● agriculture	115	
● fisheries	15	
2. Promoting industrial competitiveness:	1 060	28.2
(i) removing and reducing barriers	30	
(ii) new techniques and products for the traditional industries	350	
(iii) new technologies (including Esprit, biotechnology, telecommunications)	680	
3. Improving the management of raw materials	80	2.1
4. Improving the management of energy resources:	1 770	47.2
(i) developing nuclear fission energy	460	
(ii) controlled thermonclear fusion	480	
(iii) developing renewable energy sources	310	
(iv) rational use of energy	520	
5. Stepping up development aid	150	4.0
6. Improving living and working conditions:	385	10.3
(i) improving safety and protecting health	190	
(ii) protecting the environment	195	
7. Improving the effectiveness of the Community's scientific and technical protential:	85	2.3[2]
(i) horizontal action	90	2.4
	3 750	100.0

[1] At 1982 constant values.
[2] Corresponds to 5% by the end of the period.

III — Strategy for the 1980s

Statements of principle on the need for a European research policy must find expression in practical projects. Only practical programmes and projects can make it clear what these often vague generalizations are really aiming at.

The eight principal objectives of European Community cooperation on research in the coming years are:

(i) Promoting agricultural competitiveness (and that of fisheries);

(ii) Promoting industrial competitiveness;

(iii) Improving the management of raw materials;

(iv) Improving the management of energy resources;

(v) Stepping up development aid;

(vi) Improving living and working conditions;

(vii) Improving the effectiveness of the Community's scientific and technical potential;

(viii) Improving the flow of scientific information; Euronet-Diane.

In the following pages an attempt will be made to illustrate these eight areas of cooperation by way of examples. This survey does not claim to be complete. A list of all projects and programmes is given in the annex.

1. *Promoting agricultural competitiveness*

The agrifoodstuffs sector is a key branch of the European economy. The importance of the common agricultural policy and its now almost prohibitive cost — about two-thirds of the Community budget is spent on agriculture — have been the subject of controversy for some considerable time. It cannot be denied, however, that agricultural research receives insufficient financial support from the Community. The Commission has therefore proposed that the funds made available be more than doubled, with the aims of:

(i) Making better use of waste, thereby cutting down requirements of fertilizers, energy and animal feedingstuffs, and promoting the production of biomass (fuel crops such as fast-growing plants);

(ii) Integrated development of marginal regions, in particular in the Mediterranean area, the object being to establish a data base containing objective information on land use and potential and on natural risks and their ecological characterization, and to set up agricultural warning and forecasting services which make use of advanced technologies such as remote sensing;

(iii) Promoting alternative plant production, especially for economic studies on the effect of replacing traditional crops by crops such as maize, tobacco and high-protein animal feedingstuffs, which at present have to be imported in large quantities;

(iv) Reducing agricultural surpluses by making existing products more competitive or by changing to alternative products, efforts being directed towards demonstration projects, especially on land conversion, cropping techniques and products;

(v) Improving food quality, intensive farming methods and the toxicological 'safety' criteria for foodstuffs;

(vi) Improving animal production, notably through a joint effort to control diseases affecting young animals and by increasing the livestock breeding yields;

(vii) Controlling diseases and pests, in particular through better coordination of national research efforts and by financing pilot demonstration projects on integrated control.

In the case of fisheries, the main factors are productivity, quality and processing, priority being given to:

(i) Monitoring and evaluation of resources, especially in view of the high cost of research ships and the difficulty of covering vast expanses of ocean, including little-known regions such as the South Atlantic;

(ii) Fishing and selective catching techniques, especially improving fishing gear and minimizing energy consumption; application of advanced processing and preservation methods;

(iii) Improvement of product-processing techniques, for example, the use of small Mediterranean fish as a source of protein for human and animal consumption;

(iv) Study of marine pullution and its effects on the quality of fish products;

(v) Development of aquaculture.

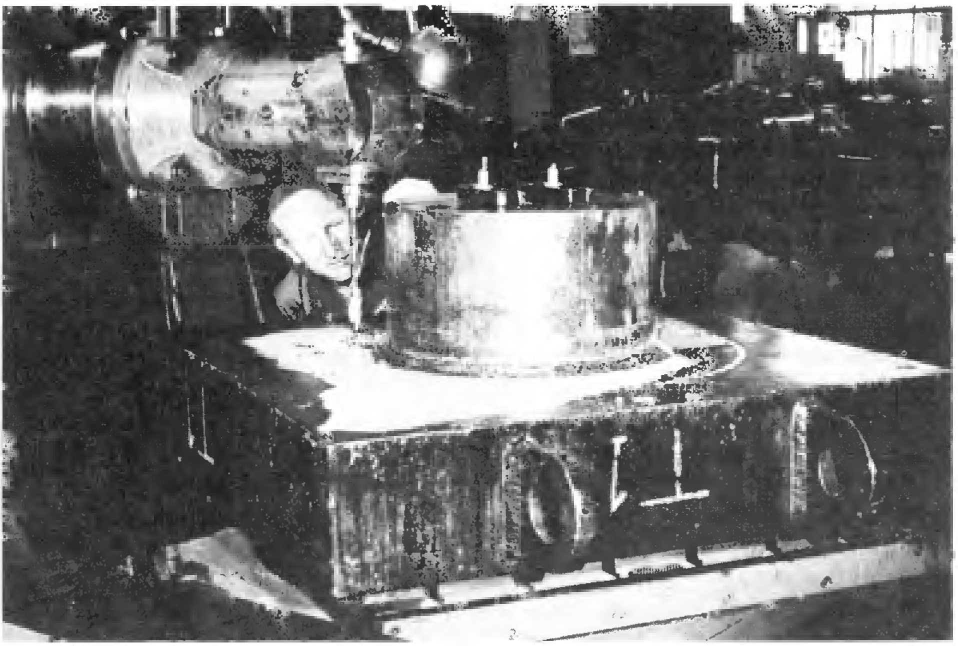
2. *Promoting industrial competitiveness*

The rapid development of new technologies and their inevitable introduction into the industrial fabric will bring about radical changes not only in manufacturing processes but also in the nature of products and services and in the structure, organization and siting of industrial activities. It is essential to anticipate these changes if industry is to be able to adapt quickly enough and become more competitive. It is primarily up to industry to make the necessary effort, but the Community can play an important role in the process by stimulating and coordinating activity, especially through observation and forward studies, through research and development projects in the new technologies and through pilot or demonstration projects on the modernization of selected branches and sectors of industry.

The prime scientific and technical objectives are:

(i) To remove barriers to intra-Community trade by introducing standard measurement and calibration methods and by preparing and certifying reference materials;

(ii) To modernize the traditional industries through research and development on key technologies common to many industrial sectors, especially the motor, machine-tool, non-ferrous metals, transport and chemical industries, through R&D for technological renewal in



Cutting a steel plate to check results obtained with the use of non-destructive test methods (Reactor safety project).

specific sectors such as computer-aided manufacturing, new materials and new joining techniques, through pilot or demonstration projects, especially in the steel and clothing industries, and through additional observation and prospect studies;

(iii) To promote and develop new technologies, priority being given to information technology (micro-electronics, software technology, advanced information processing, office automation, computer-integrated manufacturing, communication logistics and improved marketing) and biotechnology (support for basic research in key sectors and pilot or demonstration projects in the applications field).

A recent example is the Esprit programme, the European strategic programme for research and development in information technology. It is undeniable that Europe has fallen well behind the USA and Japan in information technology. The intention now is to make a new breakthrough with a joint research programme involving 12 major European companies and hundreds of small and medium-sized firms, as well as universities and research centres. Two to three thousand of the best scientists are to be associated with this programme, which is planned as a 10-year partnership between the European Community and industry. The Commission wishes to secure a place for European countries in this fast-growing industry, which in a few years will be one of the dominant production sectors in both job numbers and turnover.

3. Improving the management of raw materials

Besides being dependent on imported fossil fuels the European Community relies heavily on imports of raw materials. Its dependence on outside sources is put at 75% for all the products it needs most, and even up to 100% for materials such as phosphates, chromium, cobalt, manganese, platinum and titanium. Community research will help the Community to become less dependent on outside sources by building up its own production potential and making optimum use of the raw materials available.

There are four specific objectives:

(i) Improving the exploitation of existing mineral resources, the emphasis being on new prospecting techniques and the development of advanced ore extraction and treatment technologies;

(ii) Promoting research on wood with the aim of reducing dependence on outside sources (wood imports are second only to those of oil) and improving the economic viability of the wood industries, one important area being that of papermaking;

(iii) Improving the recycling of raw materials, especially through the improvement of domestic and agricultural waste-sorting and processing methods and through techniques for the recovery of strategic metals;

(iv) Replacing strategic substances such as chromium, silver, tin, tungsten and cobalt, which are essential materials in the electrical, electronic and machine-tool industries, by more common elements.

4. Improving the management of energy resources

Like the availability of raw materials, energy resources have become a matter of survival for the Community. They are a crucial factor in supplying the needs of the population, maintaining industrial production and ensuring that the entire political and economic system can continue to function. Keeping prices stable, reducing unemployment and preserving the balance of trade depend to varying degrees on how far energy supplies can be guaranteed, especially in the long term. Since 1974 this has become the most important area of European cooperation on research.

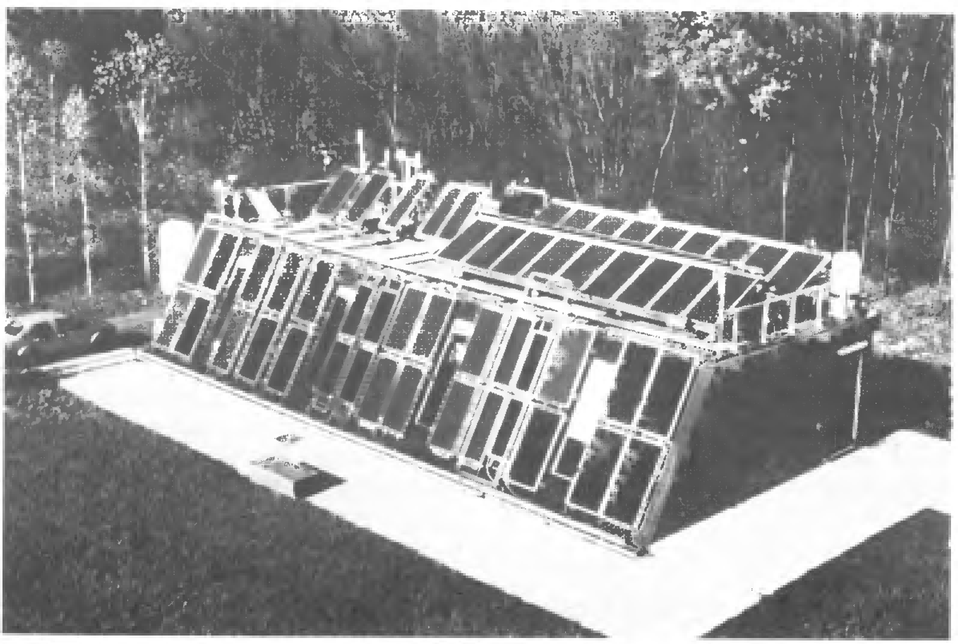
Triggered by the 1973 oil crisis, in the 1970s the energy problem became one of the central political issues in Europe. Accustomed as the peoples of Europe had been for far too long to cheap and reliable energy supplies, the shock of the temporary energy shortage and the subsequent skyrocketing of energy prices hit them all the harder and showed them how quickly the structure of economic stability can be disrupted and how greatly individuals are affected by the ups and downs of world politics.

This is why for many years some two-thirds of the Community's research funds has gone into research on energy, whether it be conventional energy (coal, oil and gas), nuclear energy or new and alternative sources of energy. Energy conservation has also become a focus of scientific research, this activity being geared to the principles of independence, long-term security of supply, competitiveness and safety.

There are four principal areas of research:

(i) The development of nuclear fission, which the Commission regards as one of the main ways of reducing dependence on oil by diversifying energy resources. Research activities are to focus on nuclear safety, health and environmental protection and fissile-materials safeguards. European research in areas such as light-water reactor and fast-breeder reactor safety, management of radioactive waste, decommissioning of nuclear power-plants, safeguards and radiation protection has scored some important scientific successes and, thanks to its independent and objective approach, has helped to take some of the heat out of the nuclear debate.

(ii) Thermonuclear fusion has become the spearhead of the Community's energy research. Virtually the whole of fusion research in the Community is now coordinated and largely financed from Brussels, the most important project being the Joint European Torus. JET is an experimental installation which has been built at Culham in the United Kingdom and was started up in the summer of 1983, with a view to the development of a future fusion reactor. Thermonuclear fusion might well become an inexhaustible source of energy, and thanks to cooperation at Community level Europe can compete here on equal terms with the USA and the Soviet Union. It will nevertheless be some decades before practical results can be expected.



Aerial view of the Solar energy laboratory for research relating to space heating and cooling systems (Solar energy project).

(iii) The increased use of renewable energy sources (sun, wind, water, geothermal energy) is another of the priority objectives; it will help to reduce dependence on oil and to improve the competitiveness of European industry, the productivity of agriculture and Europe's contribution to the development of the Third World. The Commission attaches the greatest importance to direct solar energy, biomass, wind power and geothermal energy. Particularly in the solar energy field, research done in the Community so far has highlighted some important possibilities, stimulated new developments and contributed substantially towards improving the energy situation. Eurelios, the world's first solar power-station in the megawatt class, has been constructed in Sicily under a Community programme carried out by a consortium of three countries (Italy, France and the Federal Republic of Germany) and is giving researchers opportunities they have never had before to study specific problems of solar energy.

(iv) The fourth area of research, just as important as the other three, is that of the rational use of energy. The aim is to optimize the energy economy, and some important activities directed towards this end have been: systems analyses which contribute to a better understanding of energy supply and demand and how they interact; projects for examining ways of saving energy in housing, commerce, industry, agriculture and transport; studies on more rational and less polluting ways of producing and using solid fuels, especially coal (including coal liquefaction and gasification); research into more efficient use of heat; investigation of new ways of using electricity.

5. *Increasing development aid*

Up to now the development aid provided by the European Community has been confined to *ad hoc* co-financing of research projects. This is to change. The Commission has started to increase its scientific and technological aid to the Third World. With due regard to the needs and options of the countries concerned, the emphasis will increasingly be placed on the expansion of indigenous scientific and research structures, the aim being to train a body of indigenous research workers able in the medium term to take on their countries' R&D tasks themselves. Particular importance will be attached to giving them the necessary competence. Within the European Community itself, extra support will be given to research which is geared to the needs of the developing countries.

In accordance with the Community's development policy concept — rural development and self-sufficiency in food — priority subjects for scientific cooperation are agricultural, forestry and fishery problems, the campaign against the spread of desert areas, questions of hydrogeology and climatology, and health problems, notably tropical diseases and the nutrition of infants and their mothers. Further research topics are geological exploration for minerals, renewable sources of energy appropriate to subsistence economies and demographic studies of population trends.

6. *Improving living and working conditions*

Joint R&D efforts are indispensable for greater safety at work and better health protection, and for improving the working environment and protecting the environment generally. Dominant themes of health research are man's relationship with his living and working environment, advanced methods in health technology (in diagnosis and treatment) and organizational problems of health care.

The basic objectives of the environment policy are to preserve health, human life and biosystems necessary to man, to safeguard plant and animal life and the natural environment as a whole, and generally to improve the quality of life. There are four main problem areas: preventing pollution (monitoring, control, study of effects); safeguarding natural resources (soil, water, flora and fauna); interactions between man and his environment (effects of urban encroachment, tourism, intensive agriculture and population increase); and overall understanding of environmental problems (improved understanding of ecosystems and climatic mechanisms and their impact on water and land resources, public awareness, risk-assessment techniques).

7. *Finding ways to use the Community's scientific and technical resources more efficiently*

The European Commission is doing this in a direct effort to strengthen the Community's scientific competitiveness. In R&D there are a number of activities that cannot be planned in advance. The Commission therefore wishes to be able to provide support for research teams and various R&D activities on an *ad hoc* basis wherever difficulties are encountered in certain sectors or opportunities arise for multidisciplinary international cooperation or for research in entirely new directions. The main aim is stimulation of cooperation in the form of research grants, laboratory partnerships and development contracts. Research areas first in line for such support, though by no means exclusively, are mathematics and information technology, optics, surface chemistry and physics, chemistry, biocommunication, earth sciences, oceanography and scientific instrumentation.

8. *Improving the flow of scientific information; Euronet-Diane*

Easy, fast and cheap access to all sources of scientific information has become an important factor in any scientific work. The efforts of the European Commission and Council of Ministers to reduce the USA's lead resulted in the launching in February 1980 of Euronet-Diane, an information processing and communication network operated by a consortium of all the postal and telecommunications administrations of the Community Member States. Diane is an abbreviation for 'Direct Information Access Network for Europe'. The network now consists of over 300 data bases and banks spread throughout the Community, containing over 60 million facts and references covering just about every field of human knowledge. The data available fall into two categories: data banks providing factual information and data bases giving bibliographic references (title, authors, source references, etc.) usually accompanied by a short summary of the contents. Diane has a network control centre in London and five switching nodes at Frankfurt, London, Paris, Rome and Zurich. Concentrator terminals have been installed at Amsterdam, Brussels, Copenhagen, Dublin, Luxembourg and Athens to connect the user terminals to the nearest switching node.

In January 1982 the network had nearly 3 000 users, accounting for some 200 000 searches and covering such sectors as industry, trade, medicine, administration, research and education. In the longer term there are expected to be 10 000 regular users. Charges are especially attractive. While the rates for local link-ups to Euronet continue to be based on national tariffs, international transmission of data is subject for the first time in Europe to a single common tariff which prevents discrimination between users in different countries.

The equipment needed in order to have access to the Euronet-Diane network is simple and compact: a computer terminal equipped with a screen or printer and connected by modem to the telephone network. This equipment is scarcely more expensive than an electric typewriter. Although initially designed to carry scientific and technical information, the network has expanded into other fields of knowledge, such as agriculture and food, medicine and biology, engineering and technology, physics and chemistry, energy, environment, law, economics, business and the social sciences.

There are, however, major problemes due to the many different languages in use. For this reason, in November 1982 the Council of Ministers adopted a five-year research programme for the development of a new generation of automatic translation systems (Eurotra). Although initially only a small-scale prototype is to be developed, the target even now is automatic translation for use in data transmission as well. One can envisage, for example, that in a few years' time it will be possible to put questions in Italian to a German data base specializing in medical problems. The question would be translated automatically into German and the reply given in German would be automatically translated into Italian before appearing on the enquirer's screen in Italy.

IV — How the Community implements its research policy

There now follows a brief description of how the European Community organizes cooperation in research and development, i. e., who is involved in planing, advising, decision-making and implementation and how the various committees and other bodies operate. The discussion on the evaluation of results and their dissemination and use will also be described.

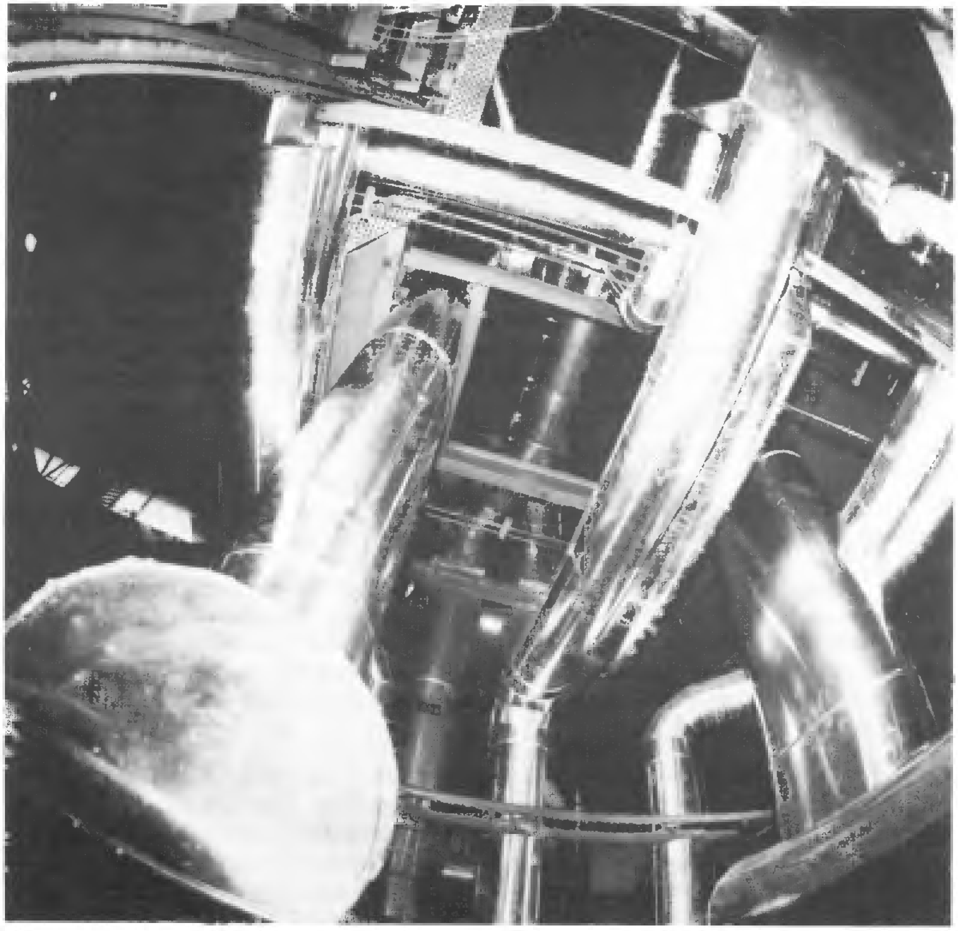
The Community's R, D&D effort stems from the Euratom Treaty, eight of whose articles are devoted to the promotion of research, albeit solely in the nuclear field since this is the Euratom Treaty's general area of concern. This Treaty did not provide for a general research policy, but the Community research activities developed within its framework unquestionably provided the basis for, the work being done today.

The ECSC and EEC Treaties do not contain such detailed provisions as the Euratom Treaty. The ECSC Treaty deals with research in Article 55, which provides that technical and economic research relating to the production and increased use of coal and steel and to occupational safety in the coal and steel industries shall be promoted. Such research may be initiated and facilitated by joint financing by the undertakings concerned or by allotting funds received as gifts or derived from levies.

There are not specific provisions on research in the EEC Treaty, but Article 235 contains a general one enabling appropriate measures to be taken if the Council regards Community action as necessary in order to attain one of the objectives of the Community in the course of the operation of the common market, and if the Treaty has not provided the necessary powers. It is therefore important that the Council, as the Community's central decision-making body, should be in agreement as to the need for action. Each of the 10 Member States is represented in the Council by its foreign minister or by the minister with responsibility for the subject under discussion. The Council has no permanent members; its composition changes according to the subjects to be discussed, so that its meetings are attended by different ministers on different occasions.

All Community action and programmes in the R&D field have to be referred to the Council for approval. Proposals for Council decisions are drawn up by the Commission, one member of which is responsible for research and science. The Commission takes its decisions unanimously, as a body.

The form the cooperation takes and the preparation of R, D&D programmes are the outcome of in-depth consultation at the various administrative, scientific and political levels, all intended to ensure that the action taken is as objective, effective, professional and scientific as possible. The Commission is advised by a network of committees composed of senior officials from the Member State administrations and of scientists and experts from the private sector. The two most important committees are:



High-pressure hydraulic test rig (Light water reactor testing programme) (Reactor safety project, Ispra).

(i) The Scientific and Technical Research Committee (CREST), which is composed of senior officials from the national ministries and departments responsible for science policy and acts as a vital link between the Commission on the one hand and the Member States and the Council on the other;

(ii) The Committee for the European Development of Science and Technology (Codest), a sort of advisory board to which 21 well-known people from science, technology and industry are appointed in a personal capacity. Codest superseded the European Research and Development Committee (CERD) in 1983. It advises the Commission on the implementation of its policy of stimulating the Community's scientific and technical potential and will help the Commission to devise the common R&D strategy. The aim is gradually to set up a 'European science region' in which the present geographical, sectoral and also psychological limits to the mobility of research workers are removed, thus creating one of the conditions for unhindered scientific exchange and cooperation.

In addition, there are numerous technical committees which play a part in both the preparation and the implementation of research programmes. These Management and Coordination Advisory Committee (CGCs), composed of experts from the Member States, have the task of contributing to the optimum implementation of programmes, evaluating results and providing a permanent link between the programmes at Community level and the R&D work going on in the Member States.

All Commission proposals for a Council decision are referred to the European Parliament and to the Economic and Social Commitee for their opinions, which are of an advisory nature only and in no way binding on the Council. Parliament can, however, use its budgetary powers to exert a direct influence on decisions. On many occasions, moreover, its debates have provided the stimulus for new developments and have drawn attention to existing shortcomings.

Once the Council has made up its mind its decisions are put into effect by the Commission. The latter issues invitations to submit projects, consults its advisory committees before making its selection, approves the funds, monitors the progress of the research, sees to the publication and dissemination of the results and, where appropriate, proposes means of complementing or extending the research.

There are three ways in which the Commission can implement the research policy:

(i) through the Joint Research Centre (hitherto called 'direct action');

(ii) through research under contract (shared-cost projects, hitherto called 'indirect action');

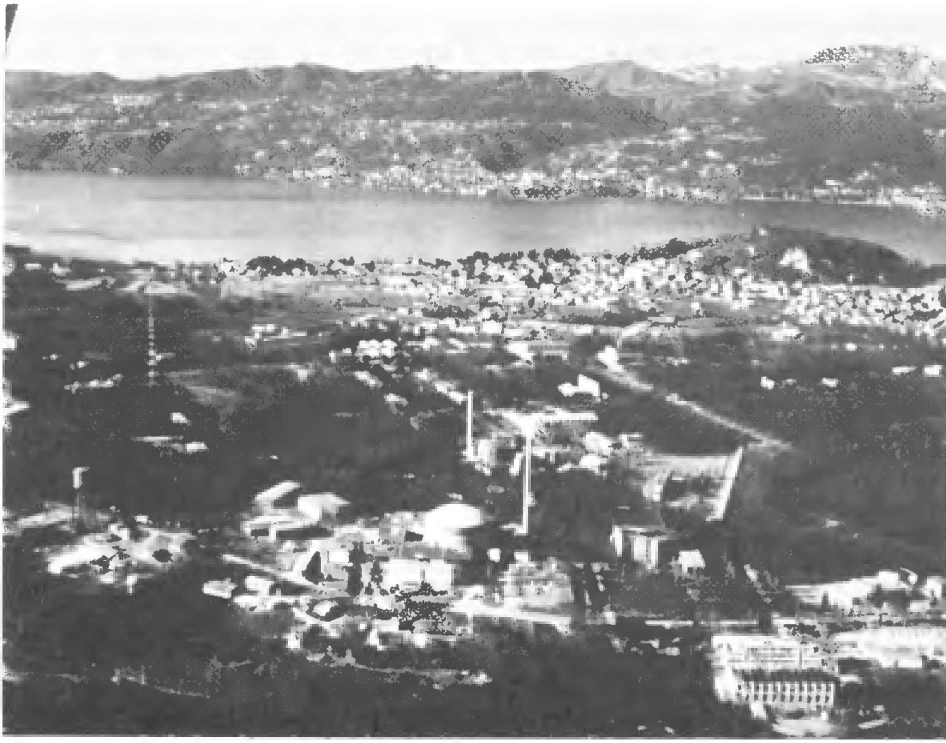
(iii) through coordination of research (hitherto called 'concerted action')

1. *The Joint Research Centre (JRC)*

The Joint Research Centre with its four research establishments at Ispra in Italy, Karlsruhe in the Federal Republic of Germany, Geel in Belgium and Petten in the Netherlands was founded by the European Atomic Energy Community (Euratom).

Euratom was established in 1957 with the aim of developing the peaceful uses of atomic energy by a joint European effort and thereby loosening the grip of oil on the economy. At the same time, there were expectations that with a new and cheap source of energy Europe could win its rightful place among the major economic and industrial powers.

In practice, however, a rivalry soon emerged between German and French industry. Both countries developed prosperous nuclear industries which competed with each other on the world market. At the end of the 1960s this led to difficulties in Euratom as a result of which the JRC had to abandon its research on the development of new commercial reactor types and on the fuel cycle. A new start was made in 1973, however, when the JRC was called upon to do non-nuclear research in addition to its nuclear activities. The main thrust of the JRC's work under its new four-year programme (1984-87) is in the following areas:



The Ispra establishment on the shores of Lake Maggiore in Italy is by far the largest of the four Community research establishments; it employs three-quarters of the total workforce.

(i) Nuclear fission energy, with special emphasis on reactor safety, radioactive waste management, safety monitoring and research into actinides. These subjects account for about 50% of the JRC's work.

(ii) Thermonuclear fusion technology, especially with contributions relating to conceptual studies on post-JET devices, investigation and development of materials, and studies on the breeding blanket. This makes up some 6% of the JRC's activities.

(iii) Three further areas of research representing about a third of the volume of work, namely the environment (environmental protection, remote sensing from the air and from space, industrial risk), applied industrial research (materials, nuclear measurements and reference materials), and non-nuclear energy sources (methods for the testing of solar energy systems, use of energy in the housing sector).

(iv) Services: operation of an extremely powerful materials-testing reactor at Petten (about 8% of the JRC's work).

(v) Just under 2% of the programme funds is allocated to projects of European importance which have yet to be defined.

Ispra, the JRC's largest research establishment, is concentrating increasingly on safety research (nuclear safety and the environment). Whilst the other three establishments are primarily concerned with research into the transuranic elements (Karlsruhe), nuclear measurement and reference materials (Geel) and operation of the HFR materials-testing reactor (Petten).

The decision relating to the new programme for the new programme for the JRC assumes a staff requirement of approximately 2 600. The JRC's budget for 1984 amounts to 180 million ECU.

In the not-always-easy discussion which have taken place about their role, the JRC establishments, together with the Commission and the Council, have worked out three important functions:

(i) The JRC's activities must be on a significant scale, i. e. in a sensible proportion to the considerable funds provided for the JRC by the Community.

(ii) The JRC's activities must not be carried out in isolation but must tie in with similar efforts being made inside and outside the Community. The intention is that the JRC should be a focal point for existing national activities or a catalyst for the development of new ones.

(iii) The JRC's activities must form an integral part of the Community's overall R&D strategy, i. e. they must be in keeping with the seven main areas of Community cooperation on research.

In addition, the Joint Research Centre has something of a symbolic character in the context of European cooperation. In the JRC, scientists, engineers, technicians and other personnel from the 10 Member States daily put into practice this cooperation which transcends national and linguistic frontiers. It has become second nature to them and to their families to think and behave as Europeans.

2. *The Joint European Torus (JET)*

No description of the Community's own research is complete if it leaves out the JET Joint Undertaking. Although JET is a legal entity and as such not entirely comparable with the JRC, next to the JRC it is the most obvious example of a joint venture at Community level. Receiving 80% of its financing from the Community budget, the world's largest experimental installation in the field of fusion research was erected at Culham near Oxford in the United Kingdom within the planned time and cost framework. Construction was completed in June 1983, and as early as December of that year experimental values were attained in and with the plant which reveal a clear lead over all other comparable installations in the world. This success was achieved by a relatively small team of 329 scientists and technicians (including 165 Community employees) from the various Community Member States. The great importance of this experimental installation is underlined not least by the fact that non-member States, namely Switzerland and Sweden, are also taking part in the project.

3. *Research under contract; shared-cost projects*

The second way in which the European Commission can promote research is by concluding research contracts with national research establishments, universities or industrial firms. The Community generally pays half the costs, while the remaining half has to be put up by the contractors concerned. For the Commission, this is an important means of putting in hand R&D work which cannot be done by the Joint Resèarch Centre on account of its objectives. It also affords the possibility of making use of the research teams and laboratories in each country and of bringing the best teams together. The research workers continue to be employed within their own national administrative framework. There are only two exceptions (the biology and fusion programmes) in which there are Community scientists working in the national laboratories of individual Member States.

Research under contract — possibly with JRC participation at least in the planning stage — enables links and feedback to be established between national and international research activities, provides incentives for national research as well and at the same time offers a means of coordinating national programmes.

Finally, there are two fields of Community activity which deserve special mention in this context: the FAST programme and the so-called 'horizontal activities'.

FAST, or 'Forecasting and assessment in the field of science and technology' is a programme which aids in planning the further development of European research policy. The aim is to give thought, far in advance of future decisions on projects and programmes, to research projects that will be required in specific fields. A call for proposals for FAST projects first went out in 1980. The work concentrates on four problem areas:

(i) technology, work and employment;

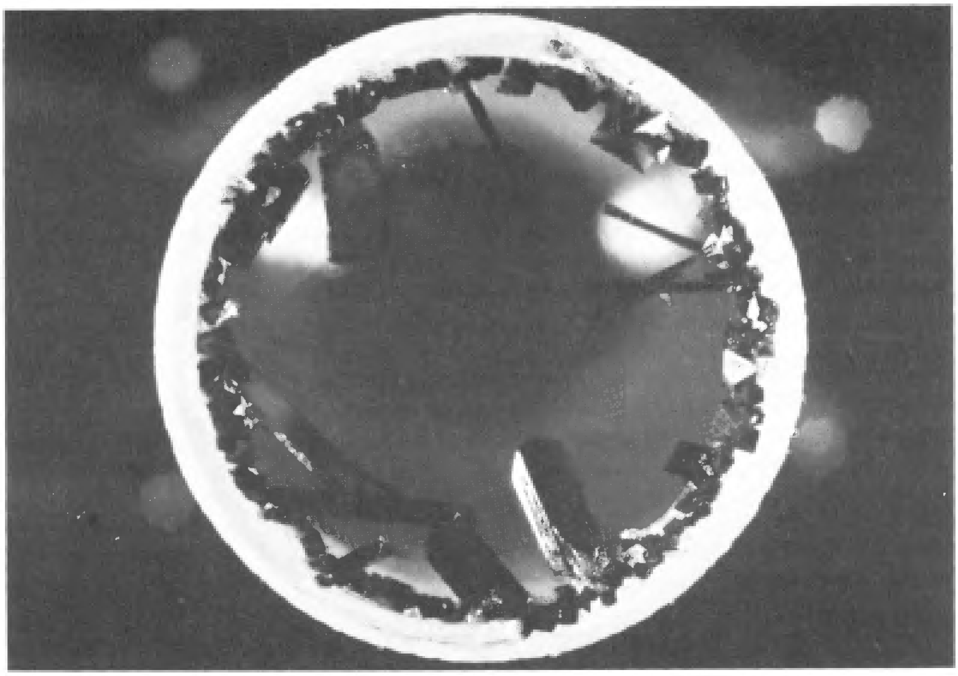
(ii) services and technology change;

(iii) new industrial systems — communication, nutrition;

(iv) renewable resources.

'Horizontal activities' are so called because their field of application covers a number of subject areas. Examples are the above-mentioned project to stimulate exchange and cooperation in the scientific and technical field in Europe, the educational grants programme and the vocational training programme.

Demonstration projects form a special category under the heading of research under contract. The Commission regards the demonstration project as the link between a preceding R&D phase and a subsequent investment phase. Demonstration projects are used to test whether a project can be applied in industry and whether it will be economically sound, the Community bearing the full financial risk for the duration of the project. If the project is successful, no more than 49% has to be paid back to the Community. The demonstration project is the logical continuation of the Community R&D projects, although not all of these undergo their first trial in a demonstration project. In 1978 the Council of Ministers adopted the first demonstration programmes, in the following areas of vital importance to the Community's future:



Uranium dioxide monocrystals used to determine the material's physical properties (Ispra).

(i) use of alternative energy sources, geothermal energy, solar energy, liquefaction and gasification of solid fuels;

(ii) energy conservation, building, provision and use of process heat and electricity in industry, power economy and transport.

These programmes have so far been implemented without interruption.

The results obtained up to now in the demonstration projects have had the effect of steadily raising the commitment of all Member States. Industry can see opportunities to derive greater benefit from a market on a Community scale. The Council of Ministers recently approved a new financial support programme providing for the funding of demonstration projects in the energy sector with up to half of the project costs. The programme embraces energy conservation, coal upgrading, substitution of hydrocarbons, solar energy, biomass, wind-power installations, geothermal energy, energy from the sea, and small hydroelectric power stations. The call for proposals in respect of the programme as a whole went out in March 1983.

4. COST

The COST project — European Cooperation on Scientific and Technical Research — has its origins in the discussion of the 'American challenge' and the 'technology gap' in the early 1970s. The COST 'club' comprises 19 European countries, including the Member States of the European Communities; and it is at the Commission of the European Communities that the project is coordinated. One of the basic features of the COST project is that research projects are planned jointly but financed on an individual contry basis. COST has thus become an important instrument of cooperation between the European Community and non-member States in the research field. The areas of cooperation are currently limited to:

(i) data processing;

(ii) telecommunications;

(iii) oceanography;

(iv) metallurgy and materials science;

(v) environmental protection;

(vi) meteorology;

(vii) agriculture;

(viii) food technology;

(ix) medical research;

(x) health.

5. Coordination of research

Coordination of research allows the framework and aims of a research programme to be defined jointly at Community level. The individual components of the programme are, however, filled in by the Member States, which provide all the finance and bear the responsibility. The Commission offers to help in coordinating national programmes and research work on a voluntary basis, the Community paying only the costs of coordination.

Coordination here means joint definition of aims, avoidance of unnecessary duplication, organization of meetings of research teams and exchanges of scientists, and wide dissemination of research results.

6. Evaluation

In 1981 the European Commission began systematically to have the procedure and the results of a few selected research programmes evaluated by outside experts. In their evaluation, these experts make use of reports on interim and final results, seminars with the research workers, individual interviews, questionnaires, hearings and the like. They look at the quality of the research results, ascertain how effectively the programme has been organized and the funds used, and decide how the results can be applied and evaluated and what medium- and long-term benefits a research programme had brought the European Community in the pursuance of its aims.

In January 1983 the Commission presented a Community plan of action relating to the evaluation of Community R&D programmes, which is to play a key role in the implementation and periodic updating of the framework programme for Community scientific and technical activities. It covers a three-year period and provides for:

(i) Continued strengthening of existing internal evaluation methods applied during the implementation of R&D programmes, so as to be able to keep a closer watch on the progress of the work and to adapt more quickly to changing requirements, priorities and developments;

(ii) Retrospective evaluation of the results of Community R&D programmes by teams of independent outside experts;

(iii) Studies on specific aspects of evaluation and support for research in this area, with a view to developing or improving certain methodological features;

(iv) Encouragement of the Community-wide exchange of information in this field by holding workshops and seminars and gradually building up an informal Community evaluation network.

V — Specific examples of Community research projects

Remote sensing from space

The expoloration of the universe is not merely the realization of a dream of mankind and a field for fascinating scientific adventure. Satellite technology opens up a wide range of practical applications, including weather forecasting, long-distance telecommunications, position-fixing for ships at sea, cartography and mineral prospecting. In the space-technology field the Commission has initiated numerous research projects relating to mineral exploration, to agriculture in Europe and the determination of moisture content in soils, and to pollution, with particular reference to coastal pollution in Europe. The Joint Research Centre has now acquired particular expertise and competence in remote-sensing techniques.

The Tellus project, launched in 1977, aims at studying the factors that influence agricultural crop yields in the Community, particularly the amount of moisture in the soil and the extent of evapotranspiration. Twenty-six laboratories in seven member countries have participated in the project, which concentrated on three main research topics: a study of the moisture content in soil and of evapotranspiration, investigation of the impact of man-made landscape changes on the heat economy of a specific region, and the effects of anthropogenic heat release.

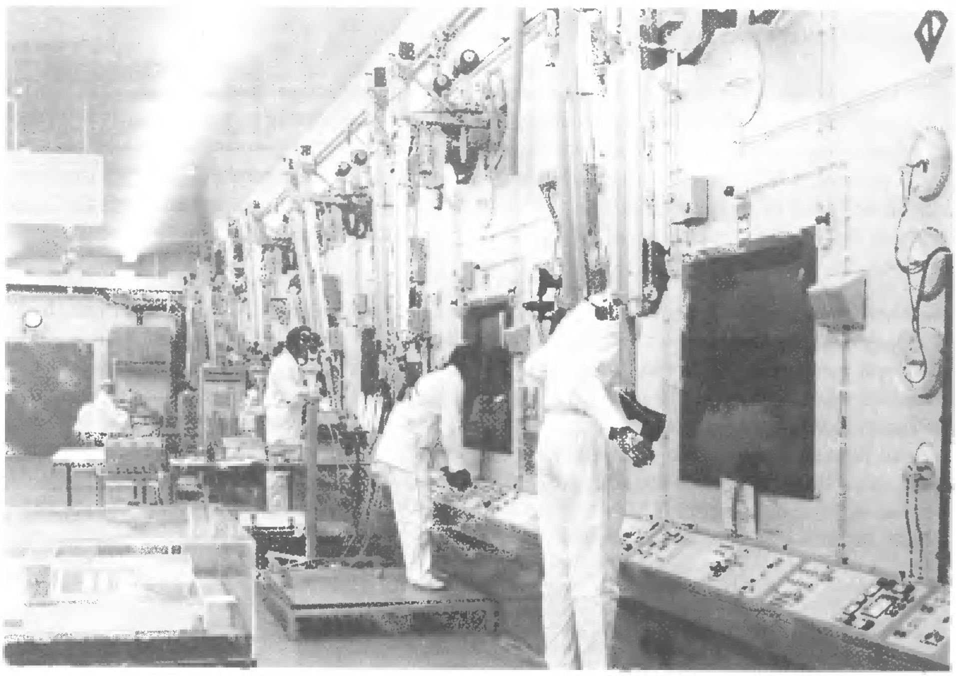
Another remote-sensing project in the agricultural sphere links the Communiy's aid to developing countries with the wider need to help Third World countries to increase their indigenous food production. The twin aims of the 'Rice production in Mali-Guinea' project are to ascertain whether it would be possible to forecast the annual rice crop in the Niger Valley, and to examine the feasibility of more detailed, longer-range forecasting with a view to better overall management of rice production in the region. The researchers hope that the project will enable them to predict the size of the rice crop with 80% accuracy one month before the harvest in 9 out of 10 years. This will help African countries plan their imports of cereals sufficiently far in advance to avoid serious shortages.

Neutron radiography

Medicine was revolutionized when X-rays were first used for viewing the skeleton and vital organs of the human body. Fifty years later the discovery of the atomic structure of matter gave rise to another technique for 'photographing' objects inaccessible to the human eye. With neutron radiograhy the interior of objects can be radiographed, the image obtained often being quite different from an X-ray picture. Whereas the X-ray image of a cigarette lighter, for example, visualizes only the metal parts, the neutron radiograph shows up the wick, the fuel in the wadding and the fibre seal on the closure. JRC studies have clearly indicated that there are many potential applications of this technique in industry. The neutron radiograph can be used for inspecting welded and soldered joint for instance. Even joining methods used 2 000 years ago have been studied by this technique. Examination of a Roman spear revealed that there was a kind of lead soldered joint between the head and the shaft. Close study of a Saxon shield yielded information on the metal-joining techniques practised at the time. The wide range of applicaions of more immediate relevance extends to inspections of aircraft-engine parts for solidified oil and grease residues in the lubrication system and to the detection of gaps in printed circuits for electronic components.

Energy conservation

From 1978 to 1982 a total of 89 million ECU was spent on 202 energy-conservation projects. By 1990, such projects could be saving the 10 Member States of the Community 130 to 150 million toe (tonnes oil equivalent) every year, which represents between 12 and 14% of pre-



Laboratory with hot cells for post-irradiation analysis of fuel (Ispra).

sent energy consumption and nearly one-third of present oil consumption. Savings are possible in all sectors of the economy, although the levels of investment and return vary from one sector to another. Heating, ventilation, lighting and hot water for buildings accounted for

35% of total energy consumption in 1980. In 157 homes in five member countries, Community-financed projects are in hand to try out ways of reducing energy consumption through better insulation, more effective temperature control and improved construction methods or by raising the energy yield with better boilers, heat pumps, district heating networks, combined heat and power generation and other means.

In Rome, a new type of emulsifier has given impressive results by improving combustion and reducing smoke emissions and fouling in the boilers of hotels, hospitals and other buildings. In Groningen in the Netherlands, a 73% energy saving was achieved by improving the lighting of an office block.

Industry accounted for another 35% of Community energy consumption in 1980, the most energy-intensive sector being the steel industry. Projects with Community support include production improvements which, at a steelworks at Dunkirk, France, for example, have resulted in a saving of 100 000 toe a year. Energy savings are often achieved through waste-heat recovery, and here again the Community is supporting numerous schemes.

Every year Europe produces 2 000 million tonnes of urban, agricultural and industrial waste. Between 70 and 90% of this could be recycled — with benefit to the environment — as animal feed, fertilizer and, above all, as fuel: some 100 to 120 toe annually could be saved by incinerating waste materials or by gasifying or fermenting them to yield methane or alcohol. This is currently being demonstrated in a pilot project at Pavia in Italy.

The European Solar Test Installation

Annual expenditure on the testing of solar energy equipment for commercial use and on further developments in that field is currently about 10 million ECU. Among the most important projects is the European Solar Test Installation (ESTI), designed to permit a careful cost-benefit analysis of the new technology. With this installation tests can be carried out and comparisons made with regard to ageing, corrosion behaviour, reaction to heavy rain, frost and thaw, hail, normal rain, snow and wind and the weathering effects of salt, dust, sand or biological aggression.

The Joint European Torus (JET), The European Community's largest joint project, started up in June 1983. The essential objective of JET is to obtain and study plasma in conditions and with dimensions approaching those needed in a fusion reactor. The problem with fusion is that the reaction takes place at over 100 million degrees centigrade. In order that a sufficient number of fusion reactions may take place, the problem of bringing the fuel to these extremely high temperatures and maintaining the conditions for combustion has to be solved. The reactor walls are subjected to extremely high thermal, mechanical, chemical and neutron-induced loads which necessitate very extensive further studies of the materials to be used. The reactor containment, which is continually being bombarded with high-energy neutrons, has to be made of highly resistant material.

Nuclear fusion has definite advantages over nuclear fission. An almost inexhaustible supply of the raw material required, deuterium, is to be found in the sea. Little exploration has been done for desposits of lithium, another material required, but there are likely to be considerable reserves quite apart from the possibility of extracting it from seawater. The final fusion products (mainly helium) are not radioactive. The present design of fusion reactor does make use of radioactive tritium, but this is confined to an internal circuit of the reactor and does not need to be transported. Since the amount of fuel in the reactor zone is very small there are not serious safety problems.

The importance of fusion can be seen from the following figures. To generate the quantity of electricity corresponding, for example, to the annual consumption for 1975, power stations with an efficiency of 40% would have to consume:

1 700 million tonnes of coal; or

25 000 tonnes of uranium in conventional fission reactors; or

1 000 tonnes of uranium in fast breeders; or

1 000 tonnes of lithium in fusion reactors; or

135 tonnes of deuterium in fusion reactors.

VI — Attempt at assessment

Any attempt at assessment of European cooperation in R, D&D is fraught with difficulty. Community programmes can often be classed neither as basic research nor as the final stage in a process of innovation in which new products, processes or services are developed; most of them attempt instead to fill the gap between basic research and research intended for immediate application in industry or to come up with facts nd figures for the political and legislative decision-making process (for example in the fields of environmental protection and nuclear safety). The results and effects of jointly-financed projects or of Community coordination of research are therefore difficult to put into a statistical form or to quantify in any other way.

Nevertheless, the integrating effect of the Community's research policy and the European awareness which has emerged from the complex pattern of cross-border contacts may be placed squarely on the credit side of European research and development.

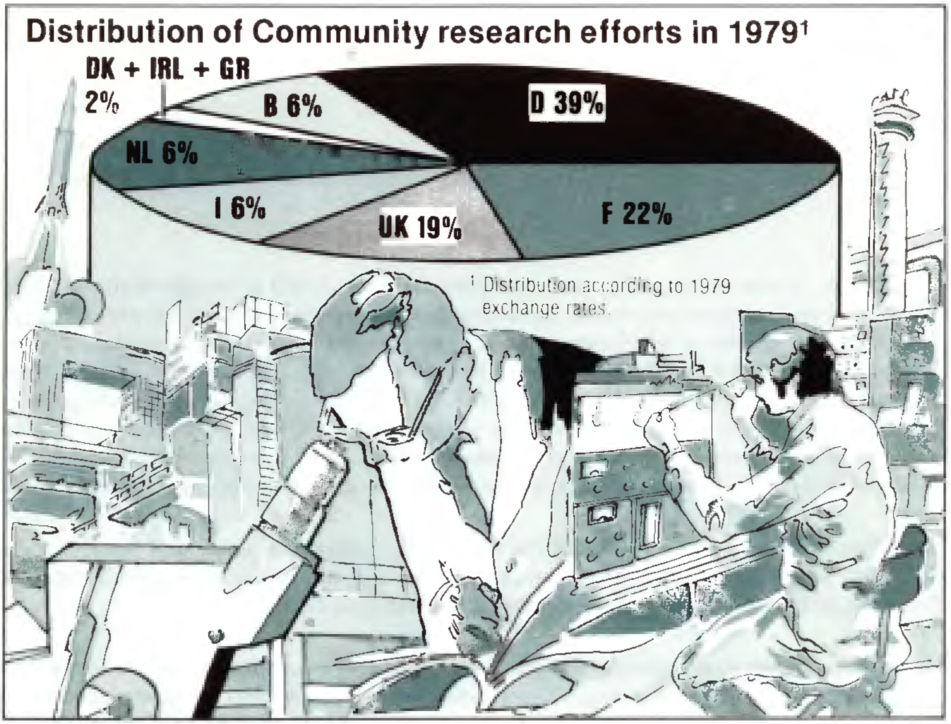
In recent years the Community's research policy has given an impetus to the process of European unification. The European Community has become a focus of hope and expectation that the technological challenges of the future will be mastered. This new awareness has not come out of the blue but from many years of painstaking effort in many areas of research and in a multitude of research projects both large and small.

In the field of energy, the cooperation has had mainly a catalytic and stimulating effect, as shown by the fruitful collaboration which has developed between European research bodies. Community research in solar energy has led to successful cross-frontier cooperation between industrial firms.

The world's largest experimental installation in the field of thermonuclear fusion research, the Joint European Torus (JET), started operating at Culham in June 1983. This project was launched in 1978 as part of the European fusion research programme, with a construction phase of five years and an estimated construction cost of 184.6 million ECU at 1977 prices. Both the construction deadline and the cost estimate were adhered to, already a significant achievement, and as early as December 1983 JET producted results unequalled anywhere in the world.

The first programme of medical research has shown that coordination of research activities provides the basis for efficient cooperation.

In agriculture, outstanding results have been obtained in veterinary medicine and soil fertilization; much the same applies to environmental research, especially in such priority areas as the removal of toxic and other pollutants.



The importance attached in all Member States to the Central Bureau for Nuclear Measurements and the Community Bureau of Reference underlines the benefits of specialized Community projects.

Another yardstick for the importance of the Community's research policy is the publication and dissemination of research results. To date there have been more than 20 000 publications. Every year the Commission publishes some 60 volumes of detailed results of research carried out under contract. The monthly journal *Euro-abstracts* prints summaries of reports on research results, the full text being available on microfilm.

The research work financed by the Community generates about 100 inventions per year; some 160 of the Community's inventions are still protected by patent and it is estimated that the contractors hold patents on several hundred more inventions.

Europe has taken up the new challenge.

Community research, development and demonstration activities

		1983	1984	1985	1986	1987	1988	1989	Ref. doc.
1. Agriculture and fisheries									
1.1. Agriculture									
Agricultural research	CSA-CONC ◄	19.7/5.1			30				L358-83
Ligno-cellulosic by-products for animal feeding	CONC				0.65				L103-84
1.2. Fisheries									
Fisheries	CSA			5					COM(80)420
2. Industry									
2.1. Industrial technologies									
Community Bureau of Reference	CSA			25/18					L26-83
Nuclear measurements and reference materials	JRC ◄	48			64/(1)				L3-84
High-temperature materials	JRC ◄	16.6			28/(1)				L3-84
Basic technological research (Brite)	CSA				135/26				COM(83)350
Steel research	ECSC	15.3	12	*	*	*			L368-83
Pilot/demonstration projects in steel industry	ECSC ◄			30					C81-83
Textile	CSA ◄	3.9							L367-81
Applications of new technologies (Brite)	CSA				35/7				COM(83)350
Foodstuffs – COST 90bis	CONC			0.87					L353-82
Foodstuffs – COST 91bis	CONC				0.78				L151-84
2.2. Information technologies									
Data processing – 1st part	CSA ◄			24					COM(83)658
Data processing – 2nd part	CSA ◄		30						L126-84
Microelectronics	CSA ◄		40						L376-81
Esprit	CSA	11.5			750				L67-84
Eurotra	CSA			16/8					L317-82
2.3. Biotechnologies									
Biomolecular engineering	CSA ◄		15/5						L305-83
Biotechnology	CSA					88.5/26			COM(84)230
3. Transport									
Aids to coastal navigation	CONC		2.11						L378-82
4. Raw materials									
Raw materials	CSA ◄		54/19						L174-82
5. Energy									
5.1. Nuclear fission									
Reactor safety	CSA ◄	6.3/3			81.3/17				COM(83)299
Reactor safety	JRC ◄	174.5			192/(1)				L3-84
Reactor development and advanced technologies		0.9	0.93	*	*	*			C185/1
Management and storage of radioactive waste	CSA ◄		43/10			92/15			COM(84)231
Radioactive waste management	JRC ◄	23.1			49/(1)				L3-84
Fissile materials control and management	JRC ◄	23.1			45/(1)				L3-84
Nuclear fuel and actinide research	JRC ◄	60.7			66/(1)				L3-84
Decommissioning of nuclear installations	CSA ◄	4.7/3			12.1/3				L36-84
Utilization of HFR reactor	JRC ◄	54.6			59/(1)				L3-84
5.2. Fusion									
Controlled thermonuclear fusion – general programme	CSA ◄			301/105					L157-82
Controlled thermonuclear fusion – general programme	CSA				443/105				COM(84)271
Fusion technology	JRC ◄	28.8		46.5/(1)					L3-84
Controlled thermonuclear fusion – JET	CSA			319/165					L157-82
Controlled thermonuclear fusion – JET	CSA				347/165				COM(84)271
Specific credits foreseen for projects of European significance	JRC {			12.5(2)/(1) (3)					L3-84 COM(84)271
5.3. Non-nuclear energies									
Energy (non-nuclear)	CSA ◄	105/34		379/63					COM(83)311
Production and utilization of hydrocarbons	CSA			35/6					COM(84)273
Solar systems testing methods	JRC ◄	26.5		22/(1)					L3-84
Habitat energy management	JRC			17/(1)					L3-84
Alternative energy sources, energy saving, substitution	D		215						L196-84
Liquefaction and gasification of solid fuels	D		50						L196-84
Coal research	ECSC	19.5	19	*	*	*			
6. Development aid									
S/T for development	CSA			40/9					L352/82
Development of indigenous S/T research in developing/countries	CSA				60/9				C180-83
7. Health and safety									
Radiation protection	CSA ◄	59/64				94/60			COM(83)301
Medical and public health research	CONC ◄			13.3/9					L248-82
Effects on the health of workers in occupational hazards	ECSC ◄			9					C307-81
Ergonomics and rehabilitation in coal and steel industries	ECSC ◄		13						COM(80)143
Industrial hygiene in mines	ECSC ◄			11					COM(83)343
Safety in mining	ECSC ◄			12.5					C195-82
Control of pollution in the iron and steel industry	ECSC ◄		15						C147-79
Safety in steel industry	ECSC ◄		1						E/423/83
8. Environment									
Protection of the environment	JRC ◄	34			49/(1)				L3-84
Environment and climatology	CSA-CONC ◄		49.3/16						L71-84
Application of remote sensing techniques	JRC ◄	18			29/(1)				L3-84
Industrial risk	JRC				21/(1)				L3-84
Clean technologies and measurement methods (AEC)	D	1.5		6.5					L176-84
Sea protection		0.8	0.5	*	*	*			C75-84
9. Improving efficacy of S/T potential									
Stimulation (experimental phase)			7/3						L181-83
Stimulation					40/12				COM(84)215
10. Horizontal activities									
FAST	CSA ◄	4.4/1.0			8.5/12				L293-83
Scientific and technical education and training	CSA ◄		8.8/6						L101-81
Utilization of R&D results					(4)				COM(83)18
Programme preparation and evaluation		1.95	2.1	*	*	*			C213-83

(1) JRC's staff for the whole programme: 2 260 agents.
(2) Decided but not affected credits.
(3) Tritium laboratory (Commission's proposal as project of European significance).
(4) 1.5% of the overall annual R&D budget.

CONC : Concerted action (Including COST).
CSA : Cost shared action.
D : Demonstration action.
ECSC : European Coal and Steel Community action.
JRC : Joint Research Centre action.

The figures which appear in the columns show, respectively, the sum, in million ECU, allocated to the activity and the staff numbers where this is given in the decision (million ECU/staff).

* : Annual budget appropriations.
(dark bar) : Programme decided by the Council.
(light bar) : Programme proposed by the Commission.

37-38

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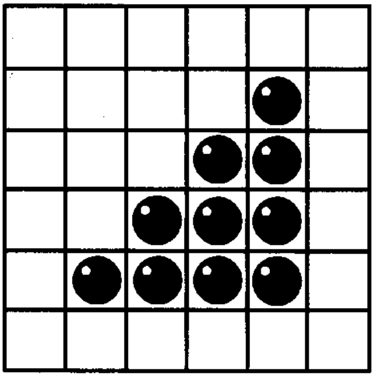

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