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SCIENTIFIC AND TECHNICAL RESEARCH AND THE EUROPEAN COMMUNITY

PROPOSALS FOR THE 1980s

Communication from the Commission to the Council

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Scientific and technical research and the European Community

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The challenge

1. The Commission, as it has already emphasized in its response to the 30 May mandate,¹ has shown its willingness to confront the challenges of the 1980s.

It is clear that due recognition must be given to the part which scientific research and technological development can play in any strategy for regeneration, arising from its capacity to anticipate the long term and because of the inescapable links between growth, technological innovation and social change.

Towards a common R&D strategy

Community activity up to now

2. The Member States of the Community have long recognized the importance and value of joint action in science and technology. The Council therefore approved Community involvement in the whole field on 14 January 1974,² and the Commission was given the task not only of progressively coordinating national policies but also of undertaking R&D programmes itself where there was a Community interest.

On the basis of this, after the phase of developing various specialized research activities under the auspices of Euratom and the ECSC, the Commission has progressively defined and carried out a series of research programmes. In adopting this pragmatic approach to what it has devised, put forward and carried out, the Commission has treated each proposal on its merits. The overriding consideration was that each should contribute to the establishment of the various appropriate Community sectoral policies (particularly energy, raw materials and the environment).

It is in this way that, since 1974, the Commission has been able to create a sophisticated mechanism for evolving R&D activities, and for carrying out, evaluating and exploiting them. Its use of this mechanism has given rise to an extra dimension of European scientific and technical cooperation in many sectors. Community R&D is clearly here to stay: several

thousand researchers from all the countries in the Community are working together now and for the foreseeable future in pursuance of Community objectives in the major sectoral programmes.

The budget devoted to these R&D activities has grown steadily from 70 million ECU in 1974 to more than 300 million ECU in 1980. The finances are distributed as follows:

Priority areas	% of the total R&D budget
1. Energy	72.0
2. Raw materials	2.3
3. Environment	8.4
4. Agriculture	1.1
5. Industrial sectors	9.7
Total 1+2+3+4+5	93.5
6. Other	6.5
Total (R&D budget 1979)	100.0

Although it might appear that Community R&D spending has built up rapidly, it should be said that it is still relatively feeble compared to what Member States spend on their own programmes (about 1.5%), to what Member States devote to international cooperation (about 16%) and to the general budget of the Community (about 1.8%).

The value of the Community's experience

3. Given that both the available resources and the areas covered have been limited, it is remarkable that most of the work undertaken has led to significant results. In some cases Community work has had a worldwide impact.

Taking energy as an example, the work done in the field of new and renewable sources served as a stimulus and catalyst for national efforts. This was especially true of solar energy, where the work laid the foundation for cooperation between industrial companies and for fruitful collaboration between European laboratories. This provided Member States with the chance to acquire a scientific and technical capability in the field more quickly than if they had been limited to isolated or dispersed initiatives.

¹ Supplement 1/81 — Bull. EC.

² Except for areas covered by military or industrial secrecy.

The same combination of catalysis and promotion can be seen at work in the environment sector, where Community R&D activities in support of selected priorities, such as the examination of the effects of pollutants like lead in petrol, have been a direct stimulus to national efforts in the field. They have also led to coordination which now applies, directly or indirectly, to 20% of the research undertaken in Member States.

In the case of raw materials it was the national experts themselves who proposed a major extension of Community involvement, ranging from metals and minerals (locating seams, methods of extraction and treatment) to recycled materials such as paper and board.

Again, with steel, the Community can take the credit for many measures which have reduced production costs and improved product quality.

Fusion is another case in point. It is a fine example of the benefits of joint working for long-term benefits; in JET the Community will have a facility which will keep it on a par with the United States, the Soviet Union or Japan.

Programmes dealing with nuclear fission, such as reactor safety, the management and storage of radioactive waste products, control of fissile materials and radioprotection, make up a joint response to problems which Member States have in common. The quality and scope of the programmes together with the availability of major experimental installations means the Community is well placed for international cooperation. This has been underlined by treaties signed with the IAEA, the United States and Canada.

Other programmes have proved their worth in spite of their restricted scope. The first medical research programme demonstrated the effectiveness of joint action focused on subjects such as the extracorporeal oxygenation of blood, and cellular ageing. The agricultural research programme, in its turn, has had considerable success in the field of animal health and soil fertility.

The recognition earned by the Central Bureau for Nuclear Measurements and the Community Reference Bureau (BCR) emphasizes the need to undertake specific actions (such as on reference materials and techniques) and to provide a public service for laboratories and European

industry so far as norms and standards are concerned.

Community activities of a more general character which should be mentioned include:

- actions to do with information and with scientific and technical documentation, particularly in the context of the Euronet/Diane network;¹
- the training of researchers and measures to promote their job mobility (which applies particularly in the context of the fusion programme).

As a final point one should note:

- cooperation with European non-member States in the framework of COST.

Although the levels of quality and effectiveness which Community research has attained up to the present are widely recognized, factors such as Europe's falling behind its main competitors, the scale of the problems to be faced and the urgent need to make the best use of its financial resources compel the Community to set its sights considerably higher.

The need for an overall approach

4. It is the experience which past achievements have brought to the Commission which gives it both the right and the justification to suggest a new stage in the progress of European R&D. It must be said that the pragmatic approach, which has, up to now, been a matter of undertaking successive research programmes in separate sectors, has not been particularly helpful in enabling the Community to make the best use of the whole range of its resources (financial, fiscal, regulatory, support for innovation) with a view to achieving specific socio-economic objectives. In particular the approach has made it difficult to articulate certain actions and integrate them into an overall strategy. Whatever the value and effectiveness of the programmes and the coordination which the Community has carried out to date in the field of science and technology, it would seem that they are no longer adequate to make a sufficient response to the challenges which confront

¹ Community telecommunications network specially designed for the diffusion of scientific and technical information (it gives more than 2 000 users direct access to 120 data bases and data banks).

the Community or to rally national efforts in the light of that response. Better than any amount of theorizing, a table

brings out the fact that Europe's deficiencies in this field are not due to any lack of manpower or resources.

1980¹

	Total gross spending on R&D (million ECU)	Public spending on R&D (million ECU)	Total R&D spending as % of GNP	Total R&D staff	Scientists and engineers	Population (millions)
EUR 9	39 500	19 405	2.0	1 100 000	370 000	260
Japan	15 160	6 560	2.0	619 000	363 000	113
USA	43 370	22 030	2.3	1 520 000	659 000	230

¹ Comparison based on data collected by the statistical working group of CREST and the scientific services of OECD and UNESCO.

If Member States, despite the importance and worth of the scientific effort they can muster, seem frequently poorly prepared to respond in isolation to the scientific needs which have arisen or are about to surface through the changes in European society, this is mainly due to the fact that their potential for R&D and for technological innovation is weakened by the following factors:

- the slowness of public research — particularly in the universities — to adapt its structures to changing circumstances;
- Member States are each trying to tackle too many of the same topics — this leads to dissipation of effort;
- there isn't a favourable climate for pursuing research bearing simultaneously on several sectors of activity or for the exploitation of the results of both fundamental and applied research;
- lack of sufficiently close relations between public research and industry.

These factors reduce the effectiveness of the European research system and mean that, often, the response offered by science to the demand (whether from industry, government or society at large) is inadequate. At the same time there are clear gaps in the research continuum, where some activities are considered to be too much like applied research by the universities and too much like fundamental research by industry. The validity of this diagnosis is confirmed by the need felt by some large industrial companies to get their basic research carried out in institutions outside Europe.

These circumstances call for the setting out of an overall strategy, the general conception and guidelines to be agreed between all parties, which would constitute the framework in which the objectives and priorities for Community research and development activity could be established in clear continuity with actions already undertaken.

Guiding principles and the objectives of a common strategy

5. Working closely with Member States the Commission intends to set out the identifying features of this next stage in the light of two guiding principles:

- getting the best out of Community activities while ensuring that they are integrated into an overall strategy,
- exploiting to the full the benefits conferred by the European dimension.

Getting the best out of the Community's experience

6. The Commission expects to be able to develop its action along the lines laid out in its report on the 30 May mandate, aiming particularly at new possibilities of growth and an improvement in the employment situation. This will mean building on the evaluation work which has already been done in connection

with common R&D activities and upon the results of the FAST¹ programme in order to:

- consolidate and strengthen some of the existing programmes,
- select guiding themes for choosing R&D actions to pursue in the longer term.

Adapting ongoing or forthcoming activities

7. Over and above its scientific value, joint R&D activity must be seen in terms of what it can contribute to the Community's overall strategy, and the way it can underwrite various Community activities.

Seen in this light a number of new priorities and orientations could be applied at once to ongoing or forthcoming programmes.

- In the energy sector it would be possible to strengthen the research connected with economizing on energy or to do with alternative fuels. This could be achieved in such a way as to ensure more coherence between Community scientific activity in this field and the Community's policy objectives (management of resources, energy, employment).
- At the same time the links between environmental research, energy research (e.g. coal) and agricultural research (e.g. agricultural waste) would be reinforced.
- Activities aimed at supporting certain traditional industries which are now in difficulties would be extended so as to be of real help in making the changes which are necessary and to give a fillip to their competitiveness (e.g. steel, textiles and clothing).
- Steps would be taken to encourage the greatest practicable exploitation of the bases of modern biology and the development within Europe of applications where the US and Japan have gained a lead (taming genes and what they can produce).
- In an attempt to improve Europe's competitiveness in the medium and long term more will have to be done in the realm of new technologies for information handling, communications and automation. To this end the Commission will suggest the rapid implementation of an

¹ Forecasting and assessment in the field of science and technology.

R&D programme firmly aimed at the long term, with the object of increasing Europe's capacity to produce microprocessors and optoelectronic equipment designed to transmit, handle and process information.

- An improvement in the Commission's capacity to analyse and evaluate likely developments in the future would be made so that priorities for the Community can be assessed in a consistent way. For this reason it is suggested that a regular and systematic review of the strengths and weaknesses of the Community's scientific and technical potential be undertaken by a structure for 'perception and evaluation'.

Priority themes for an even more significant R&D action

8. The effectiveness of Community action is bound up with the extent to which it is formulated in terms of jointly agreed general objectives.

Agricultural research should, as a matter of priority, be encouraged to make a contribution to alleviating the problems experienced by the common agricultural policy. On the one hand it should help to relieve some of the shortages which Europe suffers (oil, proteins, wood, tobacco) and at the same time contribute to reducing the surpluses. On the other hand it ought to open up new markets for certain food products or even energy sources. Lastly, it should lead to the identification of new production techniques which are less costly in terms of input and less damaging to the environment.

This renewed research effort in agricultural research should preferably be directed towards those areas which have benefited the least to date from technological innovation. Top of the list of these is the Mediterranean region, which needs a real technological renaissance. The development of agricultural research is also consistent with the desire of the Commission to make the best possible use of the resources already available to it before seeking any more.

It is most important that industries of strategic importance which are undergoing drastic changes, such as the chemical and motor vehicle industries, continue to be generators of wealth, foreign currency and employment for Europe. To this end it is important that Com-

munity research programmes be undertaken with the object of coordinating efforts already made and increasing their effectiveness, especially where they correspond to wishes expressed by the industries themselves.

The Community, in the spirit of the Lomé Convention and in the framework of cooperation agreements made with Mediterranean countries, could make a much greater contribution with its science and its technological potential to the pressing problems (nutrition, energy, health) of a large number of southern hemisphere countries. As well as actions such as remote sensing, wide-ranging programmes are needed from this point of view (agricultural research, research into nutrition and renewable sources of energy).

Through this research programme, the principal objective must be the development of the national and regional capacities of the associated countries in the field of scientific research.

In this context, the Commission intends to give deeper thought to a more general issue: mastering the relationship between technological progress and social change. The move towards a new world energy order, the battle against inflation and unemployment, the problems of coming to terms with modernization and change, call for just as much innovation in the social sphere as in the technological. It is clearly necessary to be much more aware both of the preconditions and the likely societal impacts before, for example, introducing robots into factories, electronic office technology into administrative organizations, computers into schools and information technology into the home. It is plainly not enough simply to develop the technology; one must be careful to pave the way for its acceptance.

Exploiting the benefits conferred by the Community dimension

9. Whilst it might well be said that the Member States can no longer afford to spend enough to achieve their ambitions, it is equally true that the Community to which they belong needs to develop ambitions to match the resources it could deploy.

The Community is both a large-scale organizational framework and a market in which Euro-

pean R&D activities as a whole can be put to the most effective possible uses.

Research and development call for a scale of investment in the medium to long term which is often substantial. In a period of budgetary constraints and high rates of interest, one is entitled to ask how it is possible to bring about the necessary conditions of stability and continuity. The Community must be given the means to achieve this aim through binding undertakings made by the Council. The Community is uniquely well placed to take the lead in joint activities carried out at the least cost for each participating Member State (e.g. nuclear safety, new energy sources, the environment), or to promote activities of a scope which one Member State on its own could scarcely contemplate (e.g. thermonuclear fusion). The Commission should also make it its business to do all that is necessary to make sure the Community's overall scientific and technical capacities do not run the risk of suffering from any damaging weaknesses or defects.

The Community must see that preparations are made for actions in the long term, and ensure that they are properly integrated with what is being done in the medium term (e.g. new technologies of information, biotechnology, as well as their long-term consequences for Community policies).

The Community should become the forum for a regular review process which would enable Member States to hammer out the preferred options, and to choose the approach (i.e. national, international or Community) most suitable for implementing scientific and technical actions of joint concern and which contribute to Community solidarity. In order to ensure a satisfactory outcome to this discussion the Commission will obviously have to provide an evaluation of Community-level actions, as part of furnishing the necessary assurances that funds are being well spent, that the quality of scientific work is high and that the objectives which have been set are being fulfilled.

Even if, from time to time, Community action costs more than it might have done had it been carried out exclusively at a national level, it is clearly almost always far more fruitful in terms of scientific results and socio-economic impact. By setting out research actions in the context of an overall strategy, the Community can ensure

their continuity from the economic point of view (the market), the industrial point of view (innovation) or the regulatory point of view (financial incentives, standards, competition). This is how the best can be made of R&D action at the earliest stage.

Finally, alongside the work that needs to be done on behalf of developing countries the Community ought to play a greater part in international cooperation, both in respect of the major trading partners (such as the US and Japan) and international organizations such as the ESA, EMBO and ESF.¹

The Community, because of its size, has considerable negotiating strength. It ought to make more use of this *vis-à-vis* major third countries. (The case of fusion is a good case in point, where a sharing out of work and risk between Member States and various other countries has been possible.)

So far as international scientific and technical organizations are concerned, the Community could not only play a part in the development of their work but also support or promote actions which would make theirs more complete in terms of interest to the Community. Thus in the case of the ESA, the Commission considers that the activities of this Agency need to be reinforced on the basis of an objective examination and analysis which the Community could make.

Defining the common R&D strategy and getting it off the ground

The basic theme — A general framework programme

10. What the Commission intends to develop is an overall framework programme embracing all Community research, setting out against the options put forward for the Community as a whole those actions and initiatives which are already being undertaken on the basis of the three treaties and those which are likely to be carried out in the future. Building upon this basis the Member States and the Community institutions will be able to:

- discuss national policies and bring them together¹ (making the necessary choices between national, international and Community-level action);
- rearrange priorities to take account of changes in the medium and the long term;
- decide what *joint* actions and initiatives should be selected.

The framework programme will need to be regularly revised and readjusted to take account of observed changes. In this way the Community will have at its disposal exactly the sort of concertation mechanism which has been missing up to now, amounting almost literally to a control panel for Community R&D. This will give an overview making it much easier to plan activity in a dynamic and responsive as opposed to a rigid and inflexible way. The existence of the mechanism will make it possible to take account of the necessarily varied time spans of R&D programmes — something which is inevitable given their specialized nature. Some, for example thermonuclear fusion, need a much longer programme than others do. And some of the 'service'-type activities (notably scientific and technical information and documentation, and the Community Reference Bureau) are by definition almost permanent.

At the same time intersectoral programming guidelines, spelling out the main priorities, could more easily be put to those responsible for individual R&D programmes. They in turn could thus make sure that the necessary adjustments were made in their activities.

New projects which proved to be necessary could be more convincingly justified and above all more effective if they were more closely linked to the Community's overall objectives in this way.

Methods

11. The implementation of a common R&D strategy calls for the optimum use of the Community's scientific and technical instruments. To this end it will be necessary to:

¹ European Space Agency, European Molecular Biology Organization, European Science Foundation.

¹ After all, it is not worth trying to bring policies together if the context in which they are going to unfold has not been clarified in advance.

- give preference to the development of scientific and technical activities which are both of interest to, and to the ultimate benefit of, the Community, in national centres where they are being undertaken now or where they could be undertaken, which is to say give assistance to laboratories, whether public, semi-public or private, where work is being carried out which is of interest to the Community;
- give a boost to those centres of collective research which would be capable of developing programmes of interest to the Community. The sort of intervention proposed would be intended to strengthen, widen and coordinate national activities.

In thus seeking to optimize the scientific and technical potential of the Community, the adoption and regular review of clearly stated strategic priorities, based on recognized mutual interest, would make it possible to give an initial boost or lend support to certain actions where only a few Member States take an active part, with a beneficial effect for all. At the same time particular attention should be paid to the actions and instruments of the Community itself.

Community actions and instruments

12. When talking about consolidating the Community's accumulated experience it is not intended to imply that current actions will simply carry on as before. New 'centres of gravity' will have to be considered. Again, the Commission will see whether some of the work which is being done might not be drastically revised or even abandoned altogether. The internal coherence between programmes will be closely studied from time to time with a view to tightening up existing linkages as often as it proves to be necessary, particularly those with other Community actions.

The Joint Research Centre is already being examined with a view to a programme adjustment of this kind. Without wishing to prejudge the outcome of this review, one might venture to map out some of the major future lines of action for the JRC, namely:

- to concentrate the work now being done on nuclear fission questions (which now predominate) on the priority areas concerning the acceptability of this form of energy — for

example, the handling and storage of radioactive waste, the safety of reactors and the control of fissile materials;

- to develop short- and medium-term scientific and technical support activities as a back-up to the system for formulating and implementing priority Community policies, and to involve the JRC much more closely with the management of all the various types of research action and pilot projects — for example, the study of how hothouses could make better use of solar energy for heating and ventilation;

- to establish a long-term research activity where the CCR will be pre-eminent — for example, in the field of fusion technology;

- make the Ispra Establishment freely available for scientific and technical activities of benefit to developing countries, either for training purposes (courses, trainee posts, etc.) or for developing research projects biased towards their particular needs (e.g. remote sensing from the air, new forms of energy) and in which they could play a part;

- improve the links between the JRC and the national research environment — in particular industry — by giving preferential treatment to research contracts placed by outside bodies. As a first stage at least the idea would be to include some form of financial incentive, such as charging only the direct costs of the research, the overheads being met by the JRC.

Increasing the scope of activities

13. The policy of individual programmes which has been followed up to now — comparable in many ways to the basic policies followed by national technical ministries — is circumscribed by its own limits. In order to be sure that the Community's potential is fully realized, the Commission feels that this way of working must be made stronger and more well rounded by introducing a strategy geared to stimulating the efficacy of European science and to developing specific major projects of particular interest to the Community.

Stimulating the efficacy of science

All efforts to promote R&D must depend on people, on teams, and on the creative potential,

or the potential for exploiting research results, which they embody. The pool of scientific and technical knowledge subsists in them and can only be renewed by them. So it would be a good thing for the Community to put its weight behind research exchanges and schemes to enhance team mobility, and to give a boost to those 'advanced' teams within the Community specializing in various aspects of research from the most fundamental to industrial innovation. It would also be necessary to do something about halting the decline of scientific publications in Europe. It is more and more the case that reviews of other countries are the medium for European results. This cannot be healthy for European scientific research.

Developing scientific and technical projects

To keep abreast of the tide of worldwide scientific innovation it is necessary to be able to formulate and implement specific projects in a manner which is genuinely flexible and speedy, projects which:

- respond to changes in world competition (e.g. space),
- serve to demonstrate technical feasibility and economic viability (e.g. aquaculture),
- hold out the prospect of particular scientific or technological benefits by virtue of likely spin-off effects (e.g. labelling micro-organisms to safeguard industrial property rights in the field of genetic engineering).

The implementation of this sort of 'policy of stimulation and of projects' would make it possible to make better judgments of opportunities and of which multiannual actions to pursue, judgments which would be based on tangible experiments. Such actions would, as appropriate, be integrated into the general framework programme. The policy would equally well make it possible to carry out those projects of major interest which arise from time to time out of work done as part of the multiannual programmes but which, by virtue of their cost or the way they would have to be implemented, cannot be considered in that context.

Efforts joining together activities related to programmes on the one hand and to stimulation on the other would guarantee coherence between the various Community initiatives,

and would be the manifestation of a permanent willingness to adapt programmes in the light of changing scientific and socio-economic circumstances.

More generally, the necessary corollary to the implementation of a common R&D strategy of this kind will be:

- the strengthening and systematization of the way in which Community R&D results are evaluated,
- the development of a policy aimed at making the most of these results, diffusing and exploiting them.

Structures and procedures

Assessing, adopting and carrying out the common strategy

14. The Commission feels that it would be desirable for the Council of Ministers (research) to meet on a regular basis, at least twice a year, in order to guide choices and make the necessary decisions.

Consultation at the scientific level

15. With a view to benefiting from the help it could receive in the preparation of its proposals and making sure that the necessary but complicated linkages are established, the Commission intends to:

- equip itself with a mechanism capable of perceiving and judging the scientific and technical needs of the Community. As a first stage it could be built up around CERD (the European Research and Development Committee), the scope of whose terms of reference would be expanded, and by making use of the existing FAST team, which would be strengthened and made more permanent;
- arrange that it can call for *ad hoc* advice from a team of scientific and industrial advisers of high quality and world standing, giving the Commission the benefit of direct advice from the best experts from all countries of the Community.

