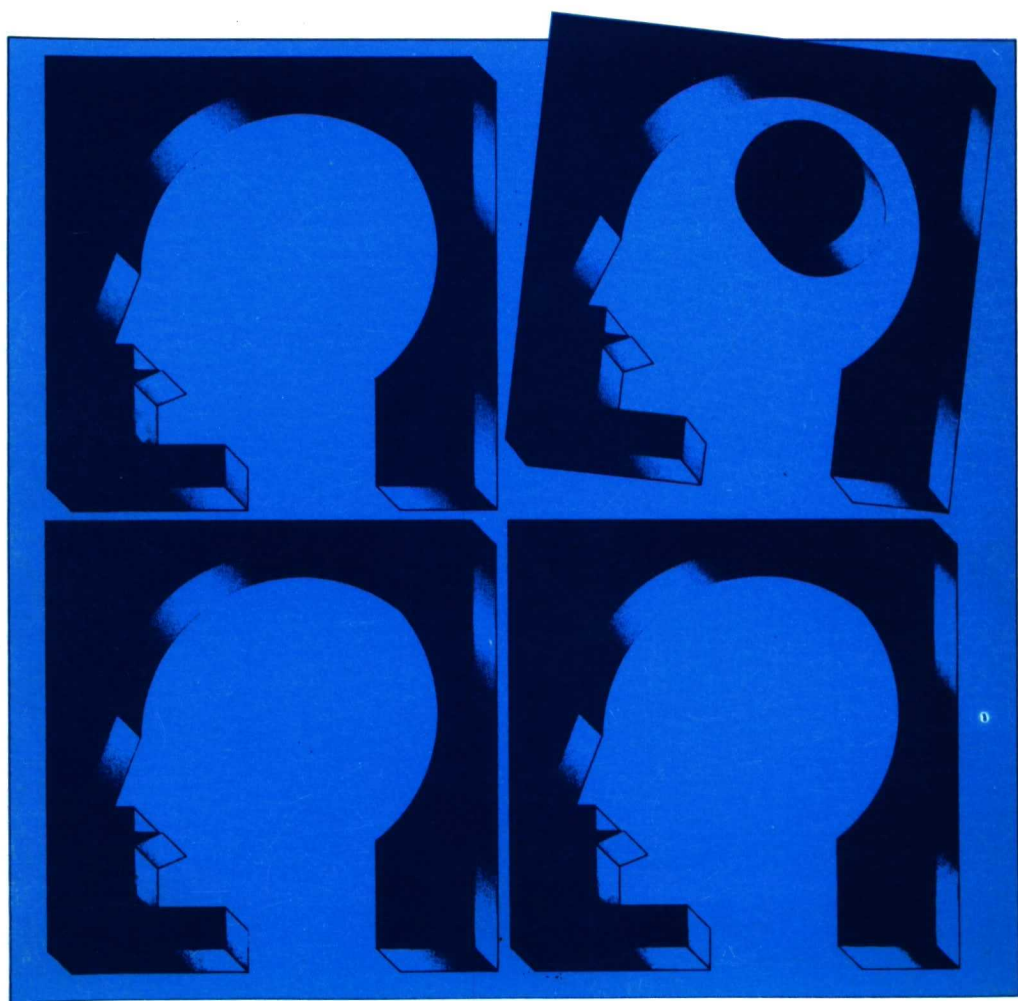


# Outlines of Science Policy in Spain

(1984)



# **OUTLINES OF SCIENCE POLICY IN SPAIN**



**MINISTERIO DE EDUCACION Y CIENCIA**  
**SECRETARIA DE ESTADO DE UNIVERSIDADES E INVESTIGACION**  
**Dirección General de Política Científica**  
**Comisión Asesora de Investigación Científica y Técnica**

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# ORGANIZATION OF SCIENCE POLICY IN SPAIN

As in other Western countries, in Spain the origin of early organized public activity in the field of science policy goes back to the first decades of this century, when the Board for Furthering Studies (1924), (la Junta de Ampliación de Estudios), and its alternative at that time, the Higher Council for Scientific Research (1939), (el Consejo Superior de Investigaciones Científicas), were created. Later, the first two bodies with aims of seriously planning science and technology were to appear, namely the Advisory Commission for Scientific and Technical Research (1958), (la Comisión Asesora de Investigación Científica y Técnica), in the Ministry of the Presidency, (Ministerio de la Presidencia), and the Government Delegation for Science Policy (1963), (la Comisión Delegada del Gobierno de Política Científica), set up by the Ministry of Finance, the Home Office and the Ministries of Public Works, Agriculture, Industry, Commerce and Education and Science. (Ministerios de Hacienda, Gobernación, Obras Públicas, Agricultura, Industria, Comercio, Educación y Ciencia).

However, these instruments of the Science Policy did not evolve sufficiently over the years to be able to cope with the challenges and aims of technological development or with international commerce which was becoming increasingly more dynamic and more competitive. Differing economic and political circumstances in Spain in the last few decades have made it even more difficult for the scientific structures to adapt to the progressive changes taking place in its own society and in the outside world that it mixed with.

Nevertheless, in recent years great steps have been made with a view to changing the course of events in this sphere, principally with regard to interministerial coordination. In the very near future these steps will lead to a Law for Promotion and Coordination of the Scientific and Technical

Research, being passed on the first two levels of science policy, which are those most in need of serious revision and modernization.

Constitutionally, Spain is organized as a quasi-federal State, consisting of seventeen Autonomous Communities whose Statutes recognize the exclusive responsibility of each Community to further research in those fields which are of particular interest to each individual Community. On the other hand, Article 149.1.15 of the Constitution recognizes that "general promotion and coordination of scientific and technological research is the exclusive concern of the State". As a result of this legal clause, some Autonomous Communities (Andalucía, Aragón, Asturias, Cataluña, the Valencian Community and the Basque Country) have already begun to structure their own institutions for the first and second levels of science policy, and to elaborate a programme of research and technological development for their own territorial areas.

To show how the different areas of central science policy are structured and developed at the present time, the classic lines will be followed: Planning, Coordination, Management and Realization of Science and Technology.

The financial resources assigned to Research and Development in Spain in 1983 are estimated to be as follows:

National R & D Expend.	R&D/GDP	R&D Personnel (FTE) (**)	Researchers/ Active Population	R&D Expend./ Researcher	Financing %	
Million \$ p.p.a.	%	number	x 1000	x 1000 \$	Priv.	Pub. (*)
650,0	0,45	15,020	1,1	43,6	20	80

(\*) Public Enterprises are included.

(\*\*) Full Time Equivalent.

# PLANNING

## Definition of priorities

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Establishing any system of priorities is always a difficult task, which, because of the great needs to be covered and the lack of resources available, generally produces dissatisfaction, especially in times of economic crisis. Spain is at the moment in a situation which is characterized, amongst other factors, by the following :

- a) substantial external debt
- b) a high degree of public spending
- c) worrying unemployment figures
- d) the need to reorganize productive sectors which have a large labour force
- e) development of the productive sector based on massive imported technology
- f) an import/export ratio of products and technology of 1.6 million dollars
- g) resources allocated to Research and Development which are way below what should correspond to the level of economic, industrial and cultural development

Within this framework, the decisions on scientific and technological objectives beyond the large traditionally explicit global options (Education, Health, Energy, etc.) must answer various primary needs, selectively and hierarchically. Amongst others we have: the creation of the future scientific, technological and industrial infrastructure, the development of new products and the improvement of the present ones, and maximum exploitation of material resources.

To this end, a scheme of work has been established in which the different national strategic scientific and technological areas have been analysed, and continue to be analysed along two lines (prospective and technological forecast).

The following criteria are taken into account in the realization of the task:

- a) **Social criteria :**
  - improvement of the quality of life

- improvement of working conditions
  - improvement of scientific structures
- b) **Criteria of economic interest (presence in the markets):**
- imports
  - balance of payments
  - exports
- c) **Criteria of economic interest (technological payments):**
- transfer of technology
  - companies investment in Research and Development
- d) **Companies willingness to accept innovation:**
- participation in public funds for Research and Development
- e) **Register of patents**

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### **Analysis of the situation**

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Although science policy is motivated by more than economic growth alone, for example, by the improvement of society and the quality of life, the model of growth in Spain combines what the qualified scholars define as “the progress of the structure and organization of science and original technology”, although the two primary patterns of growth are working simultaneously (simple and the accumulation of fixed capital) in which scientific and technological research are dispensed with.

Once the first phase of industrialization in Spain was completed, the phase of industrial expansion entered and at present it is marked by great competition in the markets, but it is not backed by the necessary development of research and innovation. This has led the country to a dependence on exports which is largely subject to the decisions of the foreign “mother” companies who are now, in many cases, leaving no options but to slow up initiatives and to rationalize antiquated industries which underwent disproportionate expansion as a result of excessively optimistic forecasts which were not thought out carefully enough, and which now find themselves in the position of having to reorganize themselves, a process which involves substantial investment and, even worse, a drop in employment.

Thus, it is necessary to plan a strategy of balanced growth, based on industrial innovation and on scientific and



technological research, the fundamental stimuli of development, without forgetting the limitations imposed by the market, or the quality and dimensions of the scientific and productive structures that the country possesses.

One of the greatest efforts being made in order to effect the critical analysis of the present situation is the gathering of information which will enable us to obtain an exact and accurate understanding of it. To this end, the National Institute of Statistics, (el Instituto Nacional de Estadística), the body responsible for the elaboration of statistics for national resources allocated to Research and Development, and the Directorate General for Science Policy (Dirección General de Política Científica) and the Ministry of Industry and Energy have set up a system of coordinated interinstitutional cooperation, which helps to avoid duplication in the collection of data and facilitates a rapid flow of information between them.

At this time there are already computerized data banks for :

- Centres for the promotion, administration and realization of research.
- Principal work schemes of 37.000 researchers (15.020 full time equivalent), mainly from the public sector.
- An inventory of scientific personnel, containing the curricula of their research activity.
- Bibliometric studies of the scientific activity of organizations and researchers.
- An inventory of companies that have R&D activity.
- Budget data.

Moreover, a study has been made on the distribution of research personnel, according to scientific fields of up to six digits of the UNESCO nomenclature, comparing it to that of personnel in training (post-doctoral fellowships) and their work prospects in the different institutions of the science and technology system.

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### **Analysis and elaboration of budget**

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As will be seen later, when dealing with the organization of science in Spain, there is a proliferation of different level organizations which function without coordination and whose respective tasks overlap at various points, thus creating a network that is difficult to understand.

Each of these organizations depends on a different administrative body, which means that, besides it not always being clear where the expenses are to go and what they are for (studies, projects, subsidies, contracts, teaching, research, services, etc.), their budgets cannot always be easily identified with R&D activities.

However, difficulties of this type are common to the budgetary structure of almost all the countries which, until recently, did not consider the functions of scientific policy as a separate and important part of general government policy.

In Spain, where a system of mixed economy (social economy of the market) is constitutional, State planning is carried out through its general budget (organized by programmes), research being one element of this, as is contemplated in the budgets of each ministerial department.

There is an Economic Planning Committee (Comisión de Planificación Económica - Comité de Inversiones Públicas) which, after being suitably informed by different Ministries as to their objectives and the resources needed for R&D, works out a proposal for the distribution of investment funds to the different departments, offices and executory centres of the sectors, with a view to adapting the expenditure in the best possible way for the realization of the objectives proposed. However, it must be admitted that, in practice, the situation is not quite so clear-cut, since, on the one hand, this committee does not possess sufficient executive power to ensure that departments keep to their original plans, and, on the other hand, the institutions responsible for administering the funds (the Directorates General of each sector, CAICYT, CDTI, FIS, etc.) also carry out advisory functions which affect the impartiality which would be desirable between the programming body and the financing body.

# COORDINATION

Interministerial coordination is one of the root problems in the correct planning of science policy everywhere. Unfortunately, up until now, this has evolved in rather naive and embryonic fashion. A look at some of the best-known international systems reveals models for every taste<sup>1</sup>.

Clearly, there is no one model to suit every country, since the particular nature of the politics, organization, finance, culture, etc. of each has a great bearing on the "workability" of the most suitable structures.

In the case of Spain the proposed Law for Promotion and Coordination of the Scientific and Technical Research which was mentioned earlier is directed towards the creation of an Interministerial Commission for Scientific Research and Technological Development in charge of the preparation of the National Plan of Scientific Research and Technological Development; an Advisory Council and a General Council for Science and Technology.

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## Science Administration

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This is closely related to what was said in the previous paragraph.

In Spain there are, in point of fact, eleven Ministries with a significant role in the field of research and development, although the Ministry of Education and Science and the Ministry of Industry and Energy account for more than 70% of the said activity. (See Table 1). Each of these take their proposals directly to the Council of Ministers (Consejo de Ministros) and have complete autonomy to administer their resources in accordance with their own programmes.

(1) Jacques Spaey et al. "Development through Science". UNESCO-MEC 1970.

**TABLE 1:  
DISTRIBUTION OF R&D EXPENDITURE AND PERSONNEL. 1983 (\*)**

INSTITUTIONS	R&D Expend. (M. Pta.)	%	R&D Personnel (FTE)	%	R&D Expend./ Researcher
<b>Public Sector</b>					
Min. Agriculture, Fishing and Food	5.395	5.5	976	6.6	5.5
Min. Foreign Affairs	920	0.9	—	—	—
Min. Culture	150	0.15	10	—	—
Min. Defence	6.892	7.28	341	2.3	20.2
Min. Education and Science	38.141	40.2	10.645	72.1	3.6
Min. Industry and Energy	28.637	30.2	735	5.0	36.9
Min. Justice	198	0.2	29	0.2	6.8
Min. Public Works	4.995	5.3	438	3.0	11.4
Min. Presidency	665	0.7	89	0.6	7.5
Min. Health and Consumer Protection	3.926	4.1	583	4.0	6.7
Min. Transport, Tourism and Communications	312	0.3	46	0.3	6.8
<b>Public Enterprises</b>					
CTNE, RENFE, etc.	4.365	4.5	814	5.4	5.3
Foundations and other non-profit private Institutions	2.192	2.2	315	2.0	14.6
	96.788	100	15.020	100	6.4

(\*) According to what they themselves stated.

Each Ministry transfers its funds directly to its own executory centres, pays its staff and gives the subsidies and contracts to the private bodies which are most closely connected with its own field.

Figure 1 shows the present administrative organization. In the diagram there are three fund-administering bodies (CAICYT, CDTI, and FIS) which work horizontally, although they depend in administrative terms on the Ministries of Education and Science, Industry and Energy, and Health and Consumer Protection, respectively.

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### **Directing bodies of Science Policy**

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The main body responsible for the planning of science policy in Spain is the Government Delegation for Educational, Cultural and Scientific Policy, (la Comisión Delegada del

Gobierno para la Política Educativa, Cultural y Científica), which at the present time is constituted by the Ministries of Presidency, Education and Science, Culture and Finance. This Delegation has the Advisory Commission for Scientific and Technical Research (la Comisión Asesora de Investigación Científica y Técnica), CAICYT, as its advisory body which is connected with the executory research institutions and which, moreover, has the task of managing and promoting research by means of research programmes, projects and plans in the public and private sectors (although its proposals must always be passed by an Interministerial Programming Committee (Comité Interministerial de Programación) which presents them to the Council of Ministers.

However, the financial resources available for distribution by the CAICYT (8,100 million pts.), together with those of the CDTI (4,000 million pts.) and the FIS (3,000 million pts.) constitute no more than 15% of the national resources for R&D, which means that the possibilities of carrying out a global science policy are fairly limited.

On the other hand, the Directorate General for Science Policy (Dirección General de Política Científica) of the Ministry of Education and Science, and the Directorate General for Industrial Innovation and Technology (Dirección General de Innovación Industrial y Tecnología) of the Ministry of Industry and Energy also take on planning tasks; the former manages the General University Fund (el Fondo General Universitario) and the Training Plan for Research Personnel (el Plan de Formación de Personal Investigador).

On a purely formal level and until it was revoked, the law which founded the Higher Council for Scientific Research (Consejo Superior de Investigaciones Científicas) of 1939 gives this multidisciplinary research institution the power to plan and coordinate science and technology in Spain, a job that it clearly does not do.

Encouragement and financing of scientific and technological research in Spain is carried out through general and specific courses of action designed to stimulate research.

# RESEARCH MANAGEMENT

## General measures

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It is worth mentioning:

- The creation of a Technological Service Network (by agreement between the CDTI and the Autonomous Communities) in order to provide information and advisory services for the companies in each community.
- Encouragement in the form of tax deduction for companies: a deduction of 15% of the investment companies make in R&D.
- Fees applied directly to offices and sectorial technological research centres for carrying out research and development projects and programmes. (Cement, Coal, Iron and Steel, Non-ferrous metals and production of electricity).

Since the subjects of study must satisfy all the companies in each sector, they are normally directed towards the study of raw materials and procedures, to the detriment of research on new products or new industrial processes.

- Validation and standardization of products, procedures, equipment and systems, through the Spanish Institute of Standardization (Instituto Español de Normalización-IRANOR)
- Legal protection of investments through the patents and makes of the Registry of Industrial Property (Registro de la Propiedad Industrial)
- Programmes of the National Sectorial Plans (Planes Nacionales Sectoriales)
- Training of technical and research personal in Spain and abroad at the postgraduate level (about 2.700 a year)
- Tax deduction on imported material and scientific equipment for research purposes.

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## Specific measures

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Since the system of fees in no way gives incentive for important discoveries or inventions to be made, but rather only leads to services merely rendered, it is necessary to set up other mechanisms which will give incentive and stimulus to the research activity of private and public institutions in a competitive climate.

Through the different financial and managerial research bodies help, in the form of subsidies, is made available to research centres, Industrial Research Associations, Autonomous, Scientific Publishers, etc.

At the same time these bodies carry out contracted research tasks:

- Projects financed by "lost funding" in Public Research Centres (CAICYT and FIS).
- Coordinated Plans with companies where 50% of the cost is contributed as a loan without interest if the proposed objective is successfully achieved and is considered to be "lost funds" if it is not.
- Plans which are concerted-coordinated with companies and "lost fund" contribution of the expenses incurred through collaboration with a public research body.
- Actions of capital-risk in the field of technological innovation (CDTI).
- Projects with the company sector for technological development with proportional financing and variable financial interest.
- Research awards and assistance in specific areas of science and technology.

# REALIZATION OF RESEARCH

The institutions that carry out research in Spain are either public (administration bodies, universities and public enterprises) or private institutions (non-profit making associations and foundations and private enterprises). The former are generically called Public Research Institutions (Organismos Públicos de Investigación) and they can be classified as follow:

## **a) Public Research Institutions of a general nature :**

- Higher Council for Scientific Research (80 Institutes covering a wide range of scientific and technological areas) with their own centres which collaborate and coordinate with other institutions and public bodies.
- Universities (30 State)
  - Classical (25)
  - Polytechnics (5)
- University Research Institutes (belonging to the Universities, or to these and some other Institution and working in collaboration with the University by agreement).

## **b) Public Research Institutions (by sectors)**

- Industry and Energy (The Geological and Mining Institute of Spain and the Nuclear Energy Board).
- Agriculture and Fishing (National Institute for Agricultural Research and the Spanish Institute of Oceanography).
- Transport and Communications (The Spanish Institute of Meteorology and the Transport Research Institute).
- Public Works (Centre for Research and Experimentations).
- Defense (The National Institute for Aerospace Technology and the Division for Research and Development of Defense).
- Health and Consumer Protection (The National Institute of Health).

With regard to the Research Centres of public companies, it should be mentioned the laboratories and divisions of the



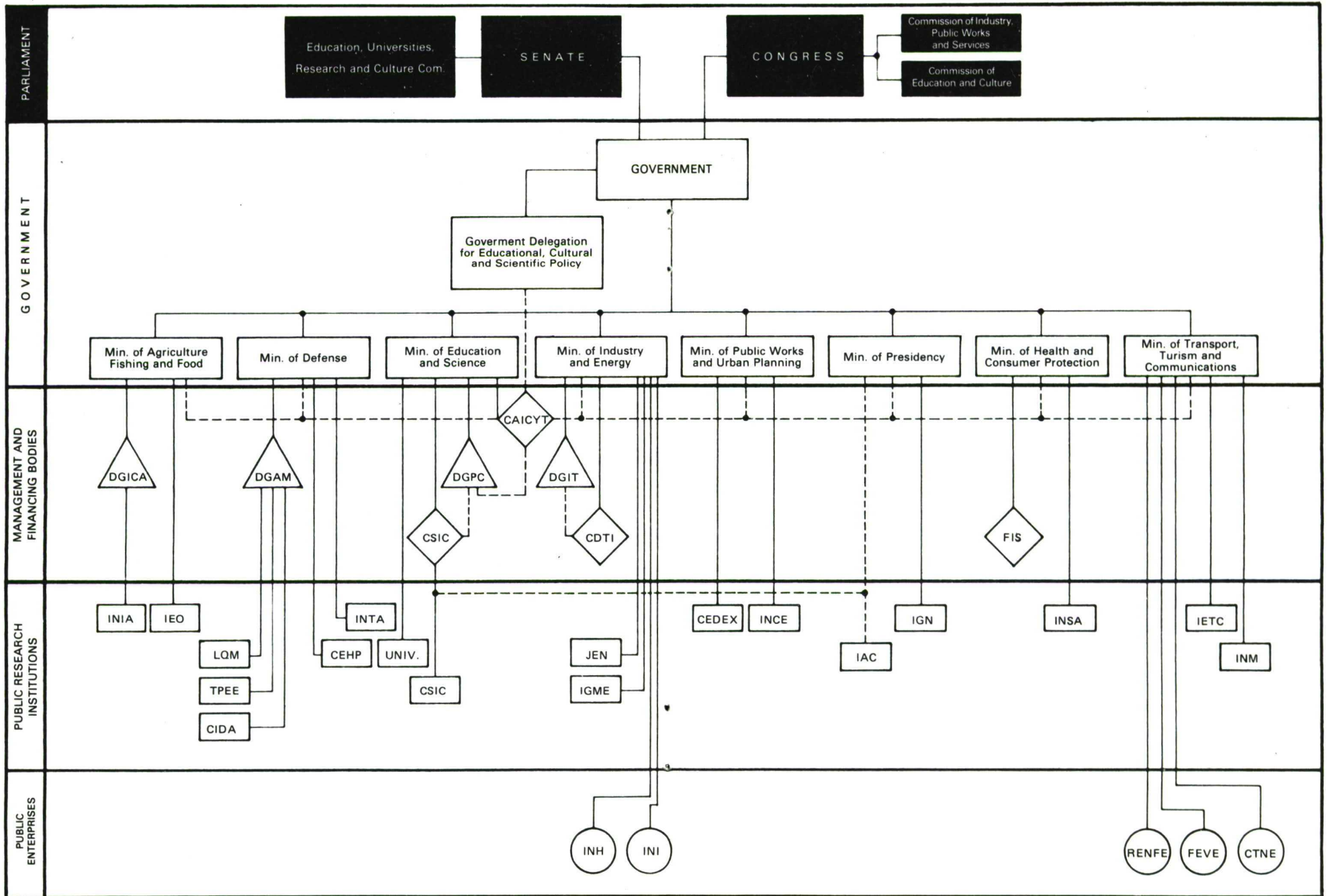


Figure 1. The key to the abbreviations used appear on page 29.

INI, INH and the nationalized companies (RENFE, FEVE and CTNE).

In the private sector there are important Research Centres, for instance, at the University of Navarra and the Chemical Institute in Sarria, at chemico-pharmaceutical and electronic material firms, industrial cooperatives and associations.

The common features of nearly all these centres are their ageing staff, a certain attitude of inertia towards remodelling, a certain refusal to accept more advanced lines of research and the lack of continuous and effective follow-up to and evaluation of results.

# INTERNATIONAL COOPERATION

## Bilateral Cooperation

- Directorate General for International Technical Cooperation (Min. Foreign Affairs).

At the present time the Directorate General for International Technical Cooperation (Dirección General de Cooperación Técnica Internacional) coordinates international scientific and technical cooperation activities, in which each Ministry, Institution or Body develops its own policy of cooperation.

- Directorate General for Cultural Relations (Dirección General de Relaciones Culturales) — they take part when cultural agreements include scientific cooperation (Min. Foreign Affairs).
- Institute of Iberoamerican Cooperation (Instituto de Cooperación Iberoamericana) (Min. Foreign Affairs).
- Hispano-Arabic Institute of Culture (Instituto Hispano-Arabe de Cultura) (Min. Foreign Affairs).
- General Technical Secretariates (Secretarías Generales Técnicas) Sub-Directorates General for International Cooperation of each Ministry.

Besides programmes of scholarships and assistance for the training and perfecting of research personnel in foreign centres, the Ministry of Education and Science also carries out the following activities of bilateral cooperation :

- a) **Integrated actions with France, Portugal and the United Kingdom, consisting of carrying out joint research projects with Spanish and the respective foreign research teams.**
- b) **Scientific evaluation of cooperative activities in basic science, established within the framework of the Complementary Agreement nº 7 of the Hispano-North American Agreement for Friendship, Defence and Cooperation.**

In order to make the best use of the funds available for the two type of cooperative projects a series of complementary activities were established which also provide some stimulus towards scientific and technological cooperation between the two countries.

**TABLE 2**  
**BILATERAL COOPERATION**  
**1984**

UNESCO Code	UNESCO Scientific Field	Integrated Actions*			Hispano-North American Agreement**
		France	United Kingdom	Portugal	
12	Mathematics			3	
21	Astronomy & Astrophysics			3	3
22	Physics	1	3	4	5
23	Chemistry	5	4	2	9
24	Life Sciences	7	6		10
25	Earth and Space Sciences		1	2	3
31	Agricultural Sciences				1
32	Medical Sciences	7			1
33	Technological Sciences	6		1	1
52	Demography	1			
53	Economic Sciences	1	1		
55	History			1	
57	Linguistics			1	
59	Political Science	2			
63	Sociology	1		3	
	<b>TOTAL NUMBER</b>	43	15	20	33
	<b>EXPENDITURE MILLION PESETAS</b>	9.3	11.6	7.5	282.3*** (1,764,923 \$)

\* Joint Research Projects.

\*\* Hispano-North American Agreement for Friendship, Defence and Cooperation, Complementary Agreement nº 7 (Cooperative activities in basic science).

\*\*\* Research projects only. Short visits exchanges and seminars amounted to 9.5500.560 (59.691 \$), 35.504.000 (221.900 \$) and 6.079.200 (37.995 \$) pesetas, respectively.

These complementary activities are:

- Workshops
- Exchanges of research staff (scholarships)
- Short visits to promote scientific and technological activities.

The applicants for these activities are: the institutions directly, research teams and individuals preferably involved in cooperative projects that are actually being carried out or under study.

Moreover, the applications must be backed by public or private non-profit making institutions (associations or foundations) of an academic or scientific nature.

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## **Multinational cooperation**

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- Directorate General for International Organizations and Conferences (Dirección General de Organizaciones y Conferencias Internacionales).

At the present time the Directorate General for International Organizations and Conferences from the Ministry of Foreign Affairs, coordinates multilateral cooperation activities within the framework of different International Organizations.

There are various governmental and non-governmental organizations in whose Committees, Working Groups, cooperative Programmes and Projects Spanish scientists and engineers are involved.

The most world-known and representative Organizations are as follow:

### **GOVERNMENTAL**

#### **Universal**

- United Nations Educational, Scientific and Cultural Organization (UNESCO).
- Food and Agriculture Organization (FAO).
- World Health Organization (WHO).
- United Nations Industrial Development Organization (UNIDO).
- World Meteorological Organization (WMO).
- United Nations Development Programme (UNDP).
- International Atomic Energy Agency (IAEA).
- United Nations University (UNU).

#### **Regional**

- Organization for Economic Cooperation and Development (OECD).
- European Economic Community (EEC).
- Council of Europe (CE).
- Economic Commission for Europe (ECE).
- North Atlantic Treaty Organization (NATO).
- International Energy Agency (IEA).
- European Molecular Biology Organization (EMBO).
- European Space Agency (ESA).
- European Organization for Nuclear Research (CERN).
- International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM).
- Economic Commission for Latin America (ECLA).

- Organization of American States (OAS).
- Commission of the Cartagena Agreement (JUNAC).
- Permanent Executive Secretariat of the "Andrés Bello" Convention (SECAB).

#### **NON-GOVERNMENTAL**

- International Council of Scientific Unions (ICSU).
- European Science Foundation (ESF).
- Science and Technology for Development Programme. Vth Centenary (CYTED-D).

Public Institutions (Universities, Public Research Institutions and Public Enterprises) and Private Institutions (Research Associations, Foundations and Companies) are the main executors of the Spanish international cooperation in science and technology.



# **CONCRETE ACTIONS IN SCIENCE POLICY**



Apart from other more far-reaching courses of action which it is hoped will be taken on a global or normative level, the current Administration has undertaken a series of steps directed at strengthening programming and coordination between the Advisory Commission for Scientific and Technical Research (CAICYT), which depends on the Ministry of Education and Science, and the Centre for Industrial Technological Development (CDTI), dependent on the Ministry of Industry and Energy.

Firstly, the present Spanish Administration has defined the science and technological innovation policies as elements which form part of a whole; a Science and Technology System, in which the two elements are viewed in terms of the integration of the set of complementary activities (essentially the promotion of research and experimental development and the promotion of technological innovation, including activities connected with engineering, design, patents and commercialization) to the general economic policy and specifically aimed at favouring the country's technological development. The Science and Technology System is viewed from the angle of demand, in such a way that it is directed at satisfying the requirements of social demand: it recognizes the strategic importance of innovation as a decisive element in getting over the crisis.

Secondary, the courses of action of the CAICYT and the CDTI have been clearly defined for those cases where overlapping previously occurred.

The Government, and more exactly the Ministry of Education and Science, through the Directorate General for Science Policy and the CACIYT, is providing a new approach to the promotion and support activities for research in Spain.

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## TRAINING OF RESEARCH PERSONNEL

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As far as the **Training of research personnel** is concerned, in the Research Personnel Training Scheme of 1985 fellowships for research personnel appointed to Universities or to the Higher Council for Scientific Research have been convened in accordance with a general programme that includes at least 50% of fellowships, in which the criteria for selecting the candidate are, amongst other things, his academic report and the suitability of his subject of research to institutional programming. The rest of the budget covers a complementary programme whose object is to carry out research projects in priority areas, in accordance with the criteria and proposals formulated by different Ministries. The selection criteria for this second programme are the scientific interest of the project, the viability of carrying it out, its suitability for institutional programming and as a priority area, the candidate's academic merit and the scientific activity of the Department where the research is to be carried out.

This approach to fellowships by priority areas has also been reflected in the application procedures for fellowships abroad for people who have completed the basic phase of research training and who have a Doctorate.

The following constitute some of the priority areas: biotechnology, microelectronics, aquaculture, materials science, high energy physics, food technology, artificial intelligence and computer science, social sciences, recovery and preservation of the national heritage (archeological, artistic and documentary).

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## RESEARCH PROJECTS AND CONCERTED RESEARCH PLANS

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As far as the development of **Research Programmes and Projects** is concerned, CAICYT's activity is in the area of pure and applied research, whereas the CDTI covers technological development (new products or new processes). The CAICYT employ three main formulae to promote Research and Development: Research Projects, Concerted Research Plans and Special Programmes.

The **Research Project** introduced by the CAICYT in 1964



tries to finance free research, by means of a competitive system in which quality is the main criteria for selection.

The Research Project works as a strategic element in as far as it takes in what the community has to offer, and only if priorities have been established does it have the influence of an indirect programming element on scientific or technical activity. Up until now, this has not happened in Spain, and so its role in scientific and technological policy has been rather limited.

These Projects are selected by means of Panels of Experts, in which scientists and technologists of recognized prestige take part: these consider the results of an evaluation process carried out by Peers (two or three per project depending on whether opinions were unanimous or whether there was discrepancy).

**Concerted Research Plans** are Research Projects put forward by private or public enterprises to be financed: this is also competitive and, if the Plan is passed, the Administration takes part with a regime of financial support (up to 50% or 80% of the financing of the Plan, depending on whether it is a Concerted Plan or a Coordinated-Concerted Plan with a Public Research Institution) and it also controls and supervises it in order to ensure the correct administration of public funds and to ensure that the Plan is successfully carried out. This type of research has priority since, whether or not priorities were decided upon when the competition became public, what is offered through this scheme is an offer of applied research, which, because of its connections with the interests of the world of production, permits classifications by socio-economic objectives, within the purest orthodoxy in the planning of research and development. Consequently, the formula of Concerted Plans constitutes an indirect instrument of programming and planning in scientific and technological policy.

March 1984 saw a new philosophy of Concerted Plans, using the same formal instruments which had existed until then. On the one hand, this philosophy contemplates coordination between the CAICYT and the CDTI, and, on the other, it establishes some priorities with the following objectives: decrease in technological imports; increases in technological exports; creation of posts by means of the incorporation of scientists and technologists in companies to carry our work related to Research and Development.

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## SPECIAL AND MOBILIZING PROGRAMMES

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The formula of **Special Programmes** is the one which is most suitable in the attempt to set up a system of programming and planning. When it was created in May 1981, it was centred on the "Special Programme of Research and Development" as a coordinated and systematized whole of Research and Development Projects aimed at achieving certain established objectives; generally speaking, this was a national science priority in a policy that was directed towards the country's economic and social progress.

In 1983 an interesting new way of defining priorities and of carrying them out was undertaken. These controlled measures have one thing in common. Not only do they require an initial evaluation of the proposal or a follow-up of the results that the controlled action comprises, but also an overall evaluation of the Plan. In 1983 the CAICYT devoted a large part of its activity to this end, which led it to four Special Research and Development Programmes: "Exploitation of Energy from Biomass and Agroenergy", "Development of Aquaculture in Spain", "Improvement of the Infrastructure of Rail and Urban Transport", "Microelectronics", and two **Mobilizing Programmes**: one in "High Energy Physics" and one in "Biotechnology". The Mobilizing Programme, like the Research and Development Programme, defines a subject of priority interest, but, unlike the latter, it does not establish any concrete socio-economic or developmental objectives; it mobilizes all resources in order to promote a coordinated action where there is a variety of objectives to be reached.

The Microelectronics Programme considers the creation of a top quality National Centre of Microelectronics Research and Development, which is, moreover, in accordance with what is suggested in the National Electronics and Informatics Plan.

The Aquaculture Programme finances Research Projects and Concerted Plans directed at developing courses of action with regard to certain species of fish; it has proposed the creation of an information and documentation centre for aquaculture, in collaboration with the Higher Council for

Scientific Research and the National Institute for Agricultural Research and has started a Training Scheme for Higher Aquaculture Technologists.

Three new Special Programmes: one in "Food Technology" one in "Materials Science" and one in "Pharmaceuticals" are envisaged starting in 1985.

The Mobilizing Programme in High Energy Physics was set up in order to promote the maximum scientific and technological return which is a result of Spain's recent reincorporation in the European Centre for Nuclear Research (CERN).

The Mobilizing Programme in Biotechnology contemplates the creation of a National Biotechnology Reference Centre, whose mission would be to support Spanish research from this sector, as much at the level of pure research as at the level of applied research, facilitating interaction between public and private enterprises and providing a top-quality scientific point of reference.

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## OTHER ACTIONS IN SCIENCE POLICY

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The CAICYT also assigns a certain number of resources to support the research activities of the **Research Associations** (which comprise the efforts of small and middle-sized enterprises) and to subsidize scientific publications, conferences or other activities related with science policy.

Moreover, in order to promote the contact of the Spanish Scientific Community with researchers of recognized prestige, the CAICYT offers places for foreign scientists or for Spaniards resident abroad who have been given leave of absence or who have a Sabbatical Year at their place of work and who wish to spend no more than a year in a Spanish Research Centre. Economic conditions include a salary of an amount which depends on the conditions of the leave of absence and the category of the applicant and an allocation to the receiving laboratory for consumable material.

Moreover, the Directorate General for Science Policy from the Ministry of Education and Science, aware of the fact that development of research in Spain involves, amongst other

things, the reincorporation of Spanish researchers who are working abroad, offers post-doctoral fellowships for the reincorporation of researchers who are doing important research which could be applied or continued in Spain, within the Research Personnel Training Scheme.

**TABLE 3**  
**ACTIONS IN COURSE IN 1984**

UNESCO Code	UNESCO Scientific Field	Fellowships*		Research Projects **	Concerted Research Plans**
		Spain	Abroad		
11	Logic			1	
12	Mathematics	69	30	42	
21	Astronomy & Astrophysics	11	4	9	
22	Physics	147	54	138	
23	Chemistry	284	49	201	
24	Life Sciences	286	49	328	6
25	Earth and Space Sciences	86	7	115	
31	Agricultural Sciences	63	8	177	10
32	Medical Sciences	194	50	169	6
33	Technological Sciences	233	31	186	68
51	Anthropology	10	4	8	
52	Demography	6	1		
53	Economic Sciences	85	21	18	
54	Geography	39		7	
55	History	250	26	58	
56	Juridical Sciences & Law	112	18	16	
57	Linguistics	80	6	23	
58	Pedagogy	20	5	3	
59	Political Science	44	4	4	
61	Psychology	69	7	28	
62	Sciences of Arts & Letters	63	6	4	
63	Sociology	46	7	7	
71	Ethics	4			
72	Philosophy	64	4	1	
	<b>TOTAL NUMBER</b>	2265	391	1543	90
	<b>EXPENDITURE MILLION PESETAS</b>	1620	270	4165.1	1216.2

\* In the Research Personnel Training Scheme, Ministry of Education and Science (Directorate General for Science Policy).

\*\* Financed by CAICYT.

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## KEY TO THE ABBREVIATIONS USED ON PAGES 16 AND 17 (Figure 1)

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### MINISTRY OF AGRICULTURE, FISHING AND FOOD

- DGICA = Directorate General for Agricultural Training and Research  
(Dirección General de Investigación y Capacitación Agrarias)
- INIA = National Institute for Agricultural Research  
(Instituto Nacional de Investigaciones Agrarias)
- IEO = Spanish Institute of Oceanography  
(Instituto Español de Oceanografía)

### MINISTRY OF DEFENCE

- DGAM = Directorate General for Armament and Materials  
(Dirección General de Armamento y Material)
- LQM = La Marañosa Chemical Laboratory  
(Laboratorio Químico de La Marañosa)
- TPEE = Army Precision Workshop and Electronics Centre  
(Taller de Precisión y Centro Electrónico del Ejército)
- CIDA = Navy Research Centre  
(Centro de Investigaciones de la Armada)
- INTA = National Institute for Aerospace Technology  
(Instituto Nacional de Técnica Aeroespacial)
- CEHP = El Pardo Hydrodynamic Experiment Centre  
(Canal de Experiencias Hidrodinámicas El Pardo)

### MINISTRY OF EDUCATION AND SCIENCE

- CAICYT = Advisory Commission for Scientific and Technical Research  
(Comisión Asesora de Investigación Científica y Técnica)
- CSIC = Higher Council for Scientific Research  
(Consejo Superior de Investigaciones Científicas)
- DGPC = Directorate General for Science Policy  
(Dirección General de Política Científica)
- UNIVERS = Universities  
(Universidades)

### MINISTRY OF INDUSTRY AND ENERGY

- DGIT = Directorate General for Industrial Innovation and Technology  
(Dirección General de Innovación Industrial y Tecnología)
- CDTI = Centre for Technological and Industrial Development  
(Centro para el Desarrollo Tecnológico e Industrial)
- JEN = Nuclear Energy Board  
(Junta de Energía Nuclear)

- IGME = The Geological and Mining Institute of Spain  
(Instituto Geológico y Minero de España)
- INI = National Institute of Industry  
(Instituto Nacional de Industria)
- INH = National Institute of Hydrocarbons  
(Instituto Nacional de Hidrocarburos)

## **MINISTRY OF PUBLIC WORKS AND URBAN PLANNING**

- CEDEX = Centre for Research and Experimentation  
(Centro de Estudios y Experimentación)
- INCE = National Institute for the Quality of Building  
(Instituto Nacional para la Calidad de la Edificación)

## **MINISTRY OF THE PRESIDENCY**

- IAC = The Canary Islands Institute of Astrophysics  
(Instituto de Astrofísica de Canarias)
- IGN = National Geographic Institute  
(Instituto Geográfico Nacional)

## **MINISTRY OF HEALTH AND CONSUMER PROTECTION**

- FIS = Health Research Fund  
(Fondo de Investigaciones Sanitarias)
- INSA = National Institute of Health  
(Instituto Nacional de la Salud)

## **MINISTRY OF TRANSPORT, TOURISM AND COMMUNICATIONS**

- IETC = Institute of Research into Transport and Communications  
(Instituto de Estudios de Transportes y Comunicaciones)
- INM = National Institute of Meteorology  
(Instituto Nacional de Meteorología)
- RENFE = Spanish National Railways Network  
(Red Nacional de Ferrocarriles Españoles)
- CTNE = Spanish National Telephone Company  
(Compañía Telefónica Nacional de España)
- FEVE = Narrow Track Rail  
(Ferrocarriles de Vía Estrecha)



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