WASHING

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(1) RESEARCH AND TECHNOLOGY

Mission and tasks of the European Community

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Information on the scientific and technical research programmes

of the European Community.

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Text of a Speech

The European Community supplements and coordinates national research activities under its own extensive research programmes in the fields os science and technology (2).

On the basis of the European Treaties relating to coal and steel (ECSC) and the peaceful uses of atomic energy (EURATOM), a comprehensive (3) European research and technology policy has been developed over a period of more than 30 years.

Europe is poor in raw materials but rich (4) in the creativity and achievement motivation of its citizns. A high standard of science and technology in industry and agriculture forms the basis of Europe's economic strength and competitiveness.

The rapid progress of science and technology throughout the world is also compelling (5) Europe to strengten its research activities.

In view of the high financial commitment called for by intensive research, efforts must be made to avoid the unnecessary duplication of activity and to make appropriate use of the available resources. (6) Europe provides a suitable framework for such an approach. The financial resources devoted to (7) Community research can frequently prove more effective than the independent spending of the individual Member States.

The research programmes with which the Community is primarily concerned (8)

- necessitate financial, staff and technical expenditure which the individual Member States can only meet with difficulty,
- involve projects, e.g. (9) environmental protection, which can only be meaningfully undertaken on a trans-frontier basis,
- or contribute to the establishment of the European internal market (10) (e.g. the development of uniform standards).

Three different organizational forms are available for the execution of the research programmes which are drawn up in response to a Commission proposal:

(11) **1. The Community's own research**

Own research covers the work of the Communities' Joint Research Centre which has a staff complement of approximately 2 300 and research facilities and establishments in (12) Ispra, Italy, (13) Geel, Belgium, (14) Karlsruhe (FRG) and (15) Petten, Netherlands.

(16) **2. Contract research**

This is carried out in universities, research centres and industrial enterprises on the basis of share-costs contracts.

(17) **3. Concerted action**

In this case, the Commission essentially acts as the coordinator of national research projects (harmonization, exchange of information, etc.).

(18) **Health**

An example of successful joint research of direct benefit to human beings is provided by:
(19) The St Marien Hospital at Düren in the Federal Republic of Germany : here, deaf patients (20) become aware of the sounds of their environment for the first time. The deaf are able to hear as a result of a specially (21) developed microchip which can replace damaged auditory nerves.

Community medical research is not confined to Europe. (22) There must be greater commitment to such research in third-world countries.

The supply of drinking-water represents a major problem in almost all tropical countries. (23) Watering places and rainwater collecting basins are often the breeding grounds for germs, with the result that (24) bilharziasis, malaria, frequently fatal diarrhoea and other tropical diseases are rife.

Within the framework of European aid measures, the causes of such diseases are studied and (25) rudimentary technical resources developed, such as the watering-place fly trap in the present case.

In addition (26) to research designed to promote the development of tropical agriculture, the combating of tropical diseases is a crucial element in Community aid to the third world.

(27) **Agriculture**

The surpluses of a number of agricultural products constitute one of the problems facing European agriculture. Agricultural research must therefore be orientated towards alternative forms of land use and the development of products (28) which are still imported in large quantities (e. g. fodder). There is also a need, given constantly rising producer costs, to develop more rational production, processing and conservation techniques.

Community research projects in the agricultural sector are concerned both with the special problems of Northern farming regions (29) and with the particular features of the Mediterranean countries (Italy, Greece). In the latter case, for example, vast areas can only be used as barren pasture land.

Chemical and biological soil analyses reveal that, depending on the site (30), organic fertilizer increases nutrient nitrogen release from humus, whereas (31) intensive cultivation without the addition of organic substances breaks down the soil structure to individual grain level.

(32) In a effort to produce an inexpensive high-quality fodder, tests involving white clover are being conducted. The latter could play a significant role as a source of protein. (33) Inspection of a test plant to determine the rooting capacity of various plants. (34) Specially cultivated forage plants with multiple shoots- in this case a lupin- help to increase the crop yield. (35) A plantation of young trees for walnut production: research designed to provide greater cover from the indigenous flora for the vegetable fats requirement.

The European agricultural research programme (36) also covers (37) scientifically based stock-rearing and poultry farming and keeping. The aim is to promote the most economically appropriate form of foodstuffs production and further to improve product quality.

(38) **Environment**

Europe's highly developed industrial structure makes environmental protection imperative. (39) Clean technologies, problems of waste management and the handling of toxic production residues call for R & D activities. If the complex relationships which characterize environmental problems are to be clarified, their causes must be scientifically established before solutions are worked out.

(40) There are a number of environmental problems (the destruction of forests, pollution of waters) which, by their very nature, are not confined to individual countries. Research must therefore be carried out on a trans-frontier basis. One of the central areas of activity within the Community's environmental protection programme concerns the provision of data which will make it possible to draw conclusions of relevance to technology and industry.

(41) Here, water is analysed for the presence of heavy metals. (42) Atmospheric impurities are detected with the aid of the most precise photochemical measuring methods. (43) Coal-fired power stations require desulphurization plants which are both economic and highly efficient. "Acid rain" has become a problem for Europe. (44) Ways of desulphurizing flue gas will be investigated in this test plant.

(45) Climatological data are essential for a greater understanding of overall conditions and long-term planning in the agricultural, environmental research and industrial sectors. (46) The investigation of various phenomena is assisted by aerial and satellite photography. The presence of volcanic ash in the atmosphere or methods of cultivation are examined with regard to their consequences for the climate.

(48) Photographs of a poplar plantation in Italy taken frome a great height with a special camera ; infra-red photography makes possible checks which could not be carried out using conventional photography.

(48) The technique of remote sensing from a satellite, aircraft or - as in this case - a special balloon provides important reference data for environmental protection and climatology.

(49) Highly developed industrial nations like those of Europe produce vast quantities of waste. Among the main advantages to be derived from the large-scale re-use of these wastes are:

- fewer problems with waste repositories,
- energy saving,
- raw materials saving.

The schematic diagram shows the raw materials and products which can be obtained from the various types of waste. (50) A reprocessing plant which operates with the aid of an air classifier (51) enables waste to be sorted on the basis of size, weight and constituent materials.

The use of organic wastes to produce (52) biogas (methane) shows how rational environmental protection methods contribute to energy production and demonstrates that the laws of the market can also be exploited in order to provide such protection.

(53) A special form of energy generation has been adopted in Lyon, France. In a special reactor, old car tyres are transformed into a product resembling fuel oil. Only the steel plies remain to be scrapped. With the aid of this process, 600 000 t/year of fuel oil could be produced throughout Europe.

(54) **Energy**

If the efficiency of European industry is to be maintained, its energy requirement must be secured. In addition to the exploitation of geothermal energy and (55) the development of wind-energy facilities, (56) solar energy is becoming increasingly important.

For example, the entire energy requirement of the village of (57) Aghia Roumeli on Crete (Greece) is met from such a solar power plant. The plant is one of 15 Community photovoltaic pilot projects, implementation of which has enabled the European industry to hold its own on the world market.

A further example (58) is provided by a residential dwelling in Freiburg, Federal Republic of Germany, where the entire energy and electricity supply for heating and warm water is obtained from solar cells and solar collectors.

Energy policy, which gives high priority to environmental considerations, must also take account of energy-saving opportunities.

The Netherlands Institute for Dairy Farming Research (59) has successfully

developed a heat exchanger which pre-cools milk from 35 to 20°C while simultaneously preheating the feedwater boiler, with a resultant energy saving of 34%.

Other energy-saving projects (60) are in progress. In Italy, for example, where the flue gases from cast-steel production are used for steam and current generation, and in England (61), where the use of strip casting in aluminium sheet production enables large amounts of energy to be saved for rolling operations.

A great deal of effort and money is being invested in the study (62) of controlled nuclear fusion in an effort to achieve large-scale production on which Europe canrely in the future.

Nuclear fusion is the basis of solar energy. Compared with traditional types of atomic power generation it has the advantage of unrestricted fuel availability.

(63) In view of this fact, experimental work with JET (Joint European Torus) commenced in 1982. (64) Electrically charged gas (plasma) is heated to above 100 million °C in a magnetic annular chamber until the atomic nuclei melt. The facility is located at Culham, UK.

Plasma physics processes and large-scale nuclear fusion facilities are also being investigated and tested (65) in other Community countries (e.g. at the Max Planck Institute int the Federal Republic of Germany or (66) at Frascati in Italy).

It will, however, be many years before nuclear fusion becomes economically viable. This means that, for the foreseeable future, nuclear fission energy will remain one of our indispensable energy sources, (67) so that its safety, reliability and availability must continue to be monitored.

Operating incidents in nuclear power plants - including the most unlikely event - are simulated at Ispra. (68) The following possibilities are examined individually or in combination under the most realistic conditions attainable: minor leaks in the cooling system, major coolant loss due to pipe breakage, the interruption of coolant circulation caused by the non-operation of the coolant pumps as a result of power failure or technical faults, or the inability to discharge heat because of turbine failure. This enables conclusions to be drawn as regards necessary safety measures, for all plant parts, from the emergency cooling system to the emergency

power supply. Nothing must be left to chance.

(69) The test reactor at the Petten Establishment of the Joint Research Centre in Holland is used for materials testing. (70) This picture provides an example of the so-called "Tscherenkow Effect", an intense reactor-core glow.

In the periodic table of the elements, actinium is followed by a number of artificial radioactive elements (71) which are produced during nuclear fission. These are the so-called actinides. They include plutonium, which is the fuel for "fast breeder" reactors. (72) A special scientific unit set up by the Community is concerned with the study of these elements.

By contrast with nuclear fusion, nuclear fission gives rise to radioactive waste which must be safely removed and stored.

(73) In a laboratory 230 metres underground at Mol in Belgium, conditions for the final storage of radioactive wastes are investigated. Brilling methods earth pressure and the corrosion of various materials are examined.

(74) Radioactive materials must also be disposed of when old reactors or other nuclear facilities are dismantled. Although nuclear power plants have a long operating life, consideration must already be given to demolition methods and the problems associated with final shutdown.

(75) In this device, a so-called DECO loop, aggressive chemical décontamination processes are tested (separation of radioactive and non-radioactive parts).

(76) Low-activity scrap metal is prepared for re-use in an electric arc furnace. The increased use and handling of radioactive substances in the industrial and medical sectors necessitates radiation protection measures. (77) European researches have determined and correlated the types of radiation burden to which the human organism is subject from various irradiation sources.

Human beings are exposed to radiation at all times and in all places. (78) Radionuclides, that is radiant atoms, are naturally present in the body, foodstuffs, building materials and the atmosphere. Television sets and, in particular, medical equipment (e.g. X-ray machines) are a source of artificial irradiation. Industrial sources are responsible for only 1% of total irradiation (79). Irradiation levels are measured in phantom models

by means of dosimetry.

(80) Changes in the chromosomes (81) and (82) the lung tissue of animals (83) due to radioactivity. (84) Clouding phenomena in the eyes of mice provide information on the effect of various radioactive rays and enable important insights to be gained with a view to the further development of radiation protection measures in the Community.

(85) **Raw materials**

The Eruopean Community is dependent on imports from non-member countries for its raw-materials supplies. (86) Consequently, opportunities for increased self-supply and new technologies for the exploitation of Community deposits must be investigated.

(87) Remote sensing (satellite photography) provides basic information on ore and mineral deposits in the Community.

Flotation provides an example of a procedure (88) for the exploitation of minerals. Usable and unusable substances are separated in water to which reagents have been added.

(89) Explosions are caused in order to plot seismic waves, which allow conclusions to be drawn as to the condition of the earth's crust.

(90) **Industry - Information technologies**

Europe must maintain its competitiveness. (91) In this connection, a constant stimulus to innovation is provided, in particular, by comparison with other industrial countries such as the US and Japan. (92) Only by using the most advanced technology can an industry withstand competition and cost pressure.

(93) The microchip has brought about an "electronic revolution" in all branches of technology which is still far from complete. Further development and constant improvements in microelectronics constitute a central task of European research. (94) Software and information technologies must also be improved. Continuing international cooperation in research makes it possible to develop uniform technical standards and to avoid the creation of technical barriers to intra-Community trade.

As a logical consequence of these considerations ESPRIT, the European strategic programme for research and development in information technologies has been in existence since February 1984 (95). Flanked by other research programmes, ESPRIT represents a central element in European progress.

(96) **Industry - Steel research**

Research and technological development in respect of steel production and use constituted the first area of European research cooperation. Although past experience in this fields provides encouragement for further action, it also shows that research results and technical developments have not always triggered the desired industrial modernization.

Thus, the current Community R & D programme is essentially concerned with attempts to increase productivity whilst simultaneously saving energy and to improve the quality and extend the uses of steel.

Examples of the success of this research:

(97) A device designed to feed inexpensive coal dust instead of expensive coke into the hearth of a blast furnace.

(98) A rim machining unit in an automated hot wide-strip mill, in which the hot slabs are trimmed to a predetermined size.

(99) An "Auger scanning spectrometry" device which enables the most precise chemical analyses to be conducted on steel surfaces with the aid of an electron beam.

(100) **Industry - Biotechnology**

Biological technologies have been known to man from ancient times. (101) Yeast bacteria play an important role in the production of alcoholic drinks and baking. (102) Microorganisms habe been used for many years in sewage plants. Bacteria can also be used for mineral and ore extraction.

Research into microbiological technologies is now of crucial importance throughout the world and, therefore, in Europe. (103) For example, genetic changes in hereditary vegetable material can lead to the cultivation of

plants which are disease-resistant even if untreated with pesticides. Biogenetic processes are also used in the manufacture of medicinal products, for example in insulin production.

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(104) It has only been possible in this document to describe some of the extensive range of scientific and technical research activities conducted within the Community. Nevertheless, even this selection reveals that future tasks and problems can only be solved at Community level.

Cooperation at many levels between research workers and technicians is of direct benefit to the Community - the community of all Europe's citizens.