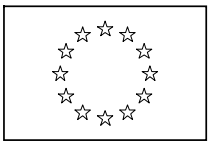

COMMISSION OF THE EUROPEAN COMMUNITIES

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REPORT FROM THE COMMISSION

JRC ANNUAL REPORT 1999

CONTENTS

FOREWORD

The Joint Research Centre (JRC), one of the Directorates General of the European Commission, carries out research and provides technical know-how in support of European Union (EU) policies. Its status as a Commission service, which guarantees independence from private or national interests, is crucial for pursuing this role.

JRC implements its mission through specific research programmes decided by the Council upon advice from the European Parliament falling under the European Union Framework Programmes for research and technological development. The work is funded by the Budget of the European Union with additional funding from associated countries. The work of the JRC includes customer-driven scientific and technical services for specific Community policies, such as those on the environment, agriculture or nuclear safety. It is involved in competitive activities in order to validate its expertise and increase its know-how in core competencies. Its guiding line is that of 'adding value' where appropriate, rather than competing directly with establishments in the Member States.

Eight institutes around Europe

The JRC has eight institutes, located on five separate sites, in Belgium, Germany, Italy, the Netherlands and Spain. Each has its own focus of expertise.

The Institutes are:

- The Institute for Reference Materials and Measurements (IRMM)
- The Institute for Transuranium Elements (ITU)
- The Institute for Advanced Materials (IAM)
- The Institute for Systems, Informatics and Safety (ISIS)
- The Environment Institute (EI)
- The Space Applications Institute (SAI)
- The Institute for Health and Consumer Protection (IHCP)
- The Institute for Prospective Technological Studies (IPTS)

Controlling programme and quality

The JRC headquarters are in Brussels, with the Programmes Directorate serving as a link between the Institutes and the policy-makers. The Directorate co-ordinates the research performed by the Institutes and helps to ensure its quality by interacting with the international scientific community and industry. An important role of the Directorate is to promote technology transfer of the JRC's own research results both to create industrial added value and to support the Community's policies in science and technology.

The JRC employs about 2500 staff under different schemes and has a budget of about € 300 M a year stemming from the research budget under the budget of the European Union and from competitive activity income. Each of the eight Institutes produces its own Annual Report, where readers will find more comprehensive information. The JRC also publishes numerous technical reports and contributes to scientific journals, presents papers frequently to conferences, and organises workshops, seminars and conferences to disseminate its scientific output. Further information can be found on the JRC web site: www.jrc.org.

INTRODUCTION

1999 has been a significant year in the evolution of the European Union (EU) with the appointment of a new Commission and, for the Joint Research Centre (JRC), with Mr Philippe Busquin appointed as the Commissioner responsible for Research.

In the first six months of 1999, the JRC launched and pursued a wide range of initiatives to develop its mission as a research centre in support of EU policies. This involved an independent external audit of its scientific skills and resources, the introduction of project management and Total Quality Management, preparation of a new JRC staff policy with a recruitment plan and a training programme, and a specific task force on JRC knowledge management.

New Work Programme established

During 1999, the JRC went through its first year of the European Commission's Fifth Framework Programme (FP5) on RTD (research and technological development). The first half of the year was devoted to defining the JRC Work Programme for the period 1999 to 2002, according to the needs of the Commission services. This involved an intense dialogue with the customer Directorates General (DGs) to determine priorities and tailor JRC activities accordingly.

Adopted on 16 April 1999, the JRC Work Programme allocated resources of € 1020 M for more than 100 projects, structured in support of the four main themes:

Serving the citizen;

Enhancing sustainability;

Underpinning European competitiveness; and

The Euratom Work Programme.

The customer/contractor relationship with the various DGs is established through the signing of memoranda of understanding. On the basis on these, the JRC performs services in support of EU legislation and policy through its various laboratories such as the European Laboratory for Air Pollution, the European Chemicals Bureau, and the Major Accident Hazards Bureau. To strengthen communication with its customers, the JRC organised an inter-service workshop with European Commission DGs in October, presenting ten selected areas of current work. Emphasis was given to the progress made so far and to discussions on new priorities and future activities.

As an integral part of its activities, the JRC, whenever feasible, has set firm bases for co-operation with external organisations. The new Work Programme was presented at a seminar held in Ispra in March 1999. More than 100 leading R&D managers from throughout the EU were invited to discuss the content of the programme and to forge links with each other and with the JRC.

More strategic approach adopted

During the year, the JRC has developed a more strategic approach in its role as a partner and initiated several high level agreements with large scientific and industrial communities on new networks and research collaborations.

The JRC also pursued specific activities towards integrating the Central and Eastern European dimension in its work.

New technology transfer activities were added, following up on those that started last year. These exploit the scientific results of the JRC and testify to its innovation potential. A pilot training scheme in entrepreneurship was organised during spring 1999 at the Ispra site for 20 scientists on fixed-term contracts, as a result of which three spin-offs are being developed.

Highlights of the year

All Institutes have participated in various activities to increase the visibility of the JRC to the research community and the general public. JRC staff won several prestigious prizes during the year. Highlights include:

- As part of the implementation of the Air Quality Framework Directive, the Environment Institute (EI) organised two inter-comparison exercises for SO_2, NOx, O_3 and CO with the participation of 18 national reference laboratories. This was intended to harmonise the calibration procedures in the Member States and to control the accuracy of the national reference standards. Recent knowledge on air pollution and more efficient technical and political strategies for its control were presented during the 'Air Quality 2000 Conference' organised by EI in May in Venice, and attended by 550 participants.
- The Third World Congress on 'Alternatives and animal use in the life sciences' held in Bologna, Italy, and organised by the European Centre for the Validation of Alternative Methods (ECVAM), involved 800 scientists from all over the world. *In vitro* methods are now available for all levels of monoclonal antibody production – e.g. used for vaccine production and in the quality assessment of immunobiologicals and hormones. They have been endorsed by the ECVAM scientific committee (ESAC) as a replacement for animal production systems.
- Simplified methods have been developed to determine the presence of polychlorinated biphenyls (PCBs), in support of the Belgian laboratories' efforts to address the dioxins problem and the recent contamination of Belgian food and foodstuff.
- Activities on migrations during food processing focused on the assessment of nickel and chromium releases from steels, which are used in the large-scale production of glucose syrups, by means of an electrochemical thin-layer activation facility (ETLAF).
- IRMM produced the world's first reference materials for the detection of genetically modified organisms (GMOs) in 1999 and continues to provide reference materials for the different types of GMOs that are fully released and used for food production.
- A patent has been applied for to cover an innovative model based on genetically-engineered neuronal cell lines for pharmaco-toxicological testing, which will permit the elucidation of mechanisms on neurological disorders or neuromuscular diseases.
- A software repository to archive the products supported by the Commission's initiative on multimedia in education. The Prometheus Information Services was set up to promote education and training throughout European society.
- The Boron Neutron Capture Therapy (BNCT) facility at the High Flux Reactor (HFR) in Petten has been upgraded with the purchase and installation of components for the liquid argon system. Newly drafted standard operating procedures guarantee smoother and more reliable operation of the facility, improving thus overall performance.
- The first on-site laboratory for nuclear safeguard analysis at the reprocessing plant in Sellafield (UK) was inaugurated in October 1999. A high degree of automation was required to achieve a throughput of 1000 samples per year.

OBSERVATIONS OF THE BOARD OF GOVERNORS

The year 1999 has been a year of change for the JRC. First of all a new Commission has been installed and the JRC especially welcomed the new Commissioner for Research, Mr. Busquin. The new mission of the JRC was approved as were the JRC specific programmes and its multi-annual work programme. The Board notes the efforts carried out by the JRC management to fulfil its new mission and to adapt the new programme activities according to the needs of its main customers, i.e. the various Commission services. The Board further appreciates the initiative of the Director General to carry out a scientific audit to ensure that the JRC scientific resources match the new objectives. The Board further acknowledges the managerial measures put in place over the year to improve the efficiency of the JRC.

The JRC Specific Programmes 1999-2003 were approved by the Council on 25 January 1999.

The objectives of the JRC activities were detailed in a multi-annual work programme, the development of which the Board has closely followed, and it was formally approved by the Commission on 16 April 1999. The Board is pleased to express its satisfaction with the efforts carried out by the JRC management to assure, following a systematic consultation process with the Directorates General of the Commission, the efficient use of JRC resources in support of EU policies, and the appropriate flexibility of its programme to be able to adjust to new priorities and needs of the Union Policies. The Board equally notes the efforts to reassure a good collaboration with industry and research organisations leading to the signature of several Memoranda of Understanding.

The Scientific Audit exercise was carried out to evaluate the JRC scientific resources, the strengths and weaknesses, and the scientific feasibility to implement the new JRC multi-annual work programme plans. The Board expects that the results of this audit will provide adequate input to the JRC 5-Year Assessment exercise. The Board further expects that necessary measures will be taken to implement the recommendations of the Audit and will follow the process with interest. This evaluation should help the JRC in facing the challenges of the new century in support of the policy-making process and contribute to the design of a longer term JRC scientific strategy.

The Board notes the development of the JRC technology transfer initiatives, welcomes the implementation of a training course in entrepreneurship and endorses the plans for an incubator at ISPRA and for a TT fund.

The Board notes the managerial efforts in relation to better external communication. It further welcomes the introduction of quality systems, Total Quality Management (TQM) for the whole of the JRC. The Board encourages the TQM initiative and emphasizes the importance of a systematic long-term approach for its implementation.

The Board acknowledges the JRC's performance in competitive activities and looks forward to continuous updating on this matter, especially regarding the use of competitive activities as strategic tools to validate**,** enhance and extend the JRC skills and competencies in areas related to its Work Programme.

In line with its opinion and with the outcome of the Council (Research) of 2nd December 1999, the Board welcomes the initiative taken by the Commission and supports their position that immediate action should be taken on decommissioning of obsolete nuclear installations. In this respect it welcomes the Commission’s undertaking to develop a properly funded and structured long-term plan for decommissioning.

With respect to the High Flux Reactor in Petten, the Board notes the new HFR Supplementary Programme, approved by the Council for the years 2000-2003. The HFR plays an important

role in some of the technologies of European research, notably with regard to medical research, materials and nuclear safety.

Finally, the Board wishes to encourage the inclusion, in further JRC management reports, of how the JRC complies with the Council Resolution on "Women and Science", of 20 May 1999 and with the European Parliament Resolution on the integration of equal opportunities in the Community policies, of 9 March 1999.

The Board wishes to express its thanks to the Commissioner, Mr. Philippe Busquin, for the efforts made since he took on the challenging responsibility for Research as a Member of the new Commission.

THE JOINT RESEARCH CENTRE IN 1999

A new work programme in support of EU policies

Mission

The mission of the Joint Research Centre is to provide customer-driven scientific and technical support for the conception, implementation and monitoring of European Union policies. As a service of the European Commission, the JRC functions as a centre of science and technology reference for the EU. Close to the policy-making process, it serves the common interest of the Member States, while being independent of special interests, private or national.

To carry out its mission, the JRC has a unique combination of facilities and expertise transcending national boundaries. Moreover, through its networks, it stimulates collaborative research and broadens its knowledge base.

The Council of Ministers and the European Parliament endorsed the mission of the Joint Research Centre with the adoption in January 1999 of two specific programmes under the Fifth Framework Programme (FP5):

I. The specific 1998 to 2002 programme for research and technological development, including demonstration, to be carried out by means of direct actions for the European Community; and

II. The specific 1998 to 2002 programme for research and training, to be carried out by means of direct actions for the European Atomic Energy Community

[Council Decisions 1999/174/EC and 1999/176/EURATOM.]

These decisions stipulate that the Commission draws up a multi-annual Work Programme for the next four-year period detailing the objectives, priorities and execution plans for the implementation of the two specific programmes. The Work Programme was adopted with a Commission decision on 16 April 1999. It is organised according to the scientific and technical objectives of the JRC's specific programmes and operates within their resources: € 739 M for the European Commission programme and € 281 M for the Euratom programme. The Work Programme is project-oriented and is based on detailed project plans for a total of 101 projects.

The preparation of the project plans followed a thorough consultation process inside the European Commission. Each project was presented to the user DGs in a workshop held in 1998. This was followed during early 1999 by high-level exchanges between the JRC and Commission services. User feedback on specific RTD priorities, project deliverables and timetables was thus incorporated into the programme. The process culminated in a formal inter-service consultation and the adoption of the programme by the Commission.

JRC Work Programme projects were structured to support the main themes of FP5:

I. Serving the Citizen

- I.1 Consumer protection
- I.2 Medical and Health Protection
- I.3 Benefiting from the Information Society
- I.4 Safety of the Citizen: Man-Made Hazards and Natural Hazards

II. Enhancing sustainability

- II.1 Integration of Environmental Protection in other EU policies
- II.2 Pollution
- II.3 Global Change
- II.4 Energy and Transport
- II.5 Agriculture, Rural Development and Fisheries

III. Underpinning European competitiveness

- III.1 Employment, Technology and Industrial Competitiveness
- III.2 Normative Support to the International Trading System
- III.3 Innovation and Technology Transfer
- III.4 Enlargement, Pre-Accession and International Co-operation

IV. Euratom Work Programme

- IV.1 Nuclear Fission Safety
- IV.2 Control of Nuclear Materials and Nuclear Safeguards
- IV.3 Decommissioning and Waste Management

A considerable part of the programme is devoted to direct services of EU regulations, such as the activities carried out by the European Chemicals Bureau (ECB), the Integrated Pollution Prevention and Control Bureau (IPPCB) and the European Laboratory for Air Pollution (ERLAP).

Two horizontal characteristics are present in the JRC Work Programme:

- Forward-looking insights into modern technology trends (such as life sciences and the information society) and socio-economic issues – including employment, EU enlargement and the Mediterranean area;

- Networking with other RTD actors in the EU to produce standard references (methods, data, materials and measurements) and guarantee the transparency of the internal market and international trade.

The format of the Work Programme and the procedure chosen for a close interaction with the Commission services constitute major changes from previous practice. The programme is set up in a matrix form to show how it supports various policies, and to promote inter-disciplinary activities and collaboration between the various JRC Institutes.

To make it more flexible, the multi-annual Work Programme is translated into 'annual' work programmes that are revised by the JRC and the Commission DGs once a year, based on evolving needs and new priorities.

Table 1 presents the institutional research activities carried out by the eight JRC Institutes within the Work Programme.

Table 1: JRC institutional research activities

JRC WORK PROGRAMME LINES	**IRMM**	**ITU**	**IAM**	**ISIS**	**EI**	**SAI**	**IHCP**	**IPTS**
I. SERVING THE CITIZEN								
I.1. Consumer Protection								
Control of quality and safety of food and related items (development, validation and harmonisation of analytical methods)							x	
Contamination of nutrition and consumer products due to material release (COCO)							x	
Reference materials for agricultural, food and consumer products	X							
Reference measurements for agricultural, food and consumer products and data bases	x							
Sampling for Information on Genetically Modified Organisms (SIGMO)						x		
Support to the implementation of the Community policy on biotechnology, including the detection of Genetically Modified Organisms (GMO) in environmental and in food samples							x	
Environmental integrity and human health					x			
Endocrine disrupters; development and validation of methods							x	
The validation of alternative methods							x	
I.2. Medical and Health Protection								
Boron Neutron Capture Therapy for the treatment of cancer and other diseases – BNCT			X					
Alpha-Immunotherapy		x						
Medical Imaging and Therapy using Radio-Tracers – MITRA							x	
Reliability of bioMEdical Devices (REMED)							x	
Functional systems for health and consumer protection							x	
Biomedical CRMs for clinical diagnostics	x							
Medical Radiographic Equipment Characterisation (MERECH)			X					
Telematic systems for the EU pharmaceutical regulatory activity (ETOMEP)							x	
Life science and impact on society								x
I.3. Benefiting from the Information **Society**								
Electronic business								x
Consumer protection Laboratory for the study, testing and monitoring of Electronic Payment and Electronic Commerce (LEPEC)							x	

JRC WORK PROGRAMME LINES	IRMM	ITU	IAM	ISIS	EI	SAI	IHCP	IPTS
Dependability of information technology initiatives				x				
Networks, multimedia and education				x				
Medical and health telematics				x				
Statistics support: European statistical laboratory				x				
S&T Support to implementation and monitoring of anti-fraud policy				x				
I.4. Safety of the Citizen: Man-Made Hazards and Natural Hazards								
Safety and emergency management systems for man-made and natural hazards				x				
European Pressure Equipment Research Council (EPERC)			X					
Hydrogen DAmage Prevention through NETworking (HYDANET)			X					
Chemical products, risk assessment							x	
Civilian de-mining						x		
Information systems in civilian de-mining				x				
ECCAIRS: European Co-ordination Centre for Aircraft Incident Reporting Systems				x				
Computational mechanics applied to structural safety				x				
Structural crash safety enhancement of vehicles and road equipment by precision impact tests				x				
Research in support to the implementation and validation of the EUROCODES; research for structural diagnostics with optical methods, vulnerability assessment, strengthening / repair techniques for civil and cultural heritage structures under earthquakes (SEISPROTEC)				x				
Natural Hazards						x		
II. ENHANCING SUSTAINABILITY								
II.1. Integration of Environmental Protection in other EU Policies								
Environment and society. Part 1								x
Integrated assessment and decision support				x				
The European landscape: Geo-information for development and environmental monitoring						x		
II.2. Pollution								
Environment and society Part II. The European Integrated Pollution Prevention and Control Bureau (EIPPC)								x
Water Quality - as a contribution to LEPE (European Laboratory for Water Pollution)					x			
Impact of Waste Emissions on Soils (IWES)					x			
Coastal monitoring and management						x		
Integrated air quality assessment					x			
Support to air quality monitoring using space techniques						x		

JRC WORK PROGRAMME LINES	IRMM	ITU	IAM	ISIS	EI	SAI	IHCP	IPTS
Radioactivity Environmental Monitoring (REM)					x			
Reference materials for pollution control	x							
II.3. Global Change								
Energy and sustainability: Part 1 (Global Change)								x
Global Environmental Information Systems (GEIS)						x		
Atmospheric processes related to regional and global changes					x			
II.4. Energy and Transport								
Energy and sustainability: Part 2 (Energy Systems)								x
Photovoltaic and solar thermal electricity (SOLAREC)					x			
Advanced Electricity Storage (ADELS)					x			
Hydrogen fuel: Sustainable and safe production, storage and safety (HYDRA)					x			
Best Available Technologies for Environmental Friendly and Efficient Energy (BATEEE)					x			
Efficient Power Generation (EPG) / Advanced fossil fired power plant			X					
Efficient Power Generation (EPG) / Gas turbines			X					
Safety and Reliability of High Temperature Systems (SAFTS)			X					
Reference measurement for neutron - materials interaction	x							
Neutron reference measurements for environmental protection	x							
Reference measurements for neutron data standards	x							
Transport and mobility: Regional and global aspects								x
European Reference Laboratory on Waste Incineration and Vehicle Emission (ERLIVE)					x			
Technologies for Emission Abatement in Transport and Non-road Sectors (TEMAT)			X					
Clean transport technology - Air transport (ECRIT-air)			X					
II.5. Agriculture, Rural Development and Fisheries								
The MARS Project (Monitoring Agriculture with Remote Sensing)						x		
Advanced statistics for clearance of accounts				x				
Animal Tagging (the IDEA project)				x				
III. UNDERPINNING EUROPEAN COMPETITIVENESS								
III.1. Employment, Technology and Industrial Competitiveness								
The 'Futures' project								x
European S&T observatory, the high level economist group								x

JRC WORK PROGRAMME LINES	IRMM	ITU	IAM	ISIS	EI	SAI	IHCP	IPTS
Building the information society								x
III.2. Normative Support to the International Trading System								
BCR and industrial certified reference materials	x							
Metrology in chemistry and traceability	x							
Chemical reference methods and measurements for normalisation and certification	x							
Radionuclide metrology	x							
III.3. Innovation and Technology Transfer								
Knowledge and skills: Perspectives for Europe								x
Space Co-ordination Group (DG JRC – Brussels)								
Applications on the synergy of satellite telecommunications, earth observation and navigation (ASTRON)						x		
The Centre for Earth Observation (CEO)						x		
Technology assessment and validation, demonstration, partner search and transfer (DG JRC - Brussels)								
III.4. Enlargement, Pre-Accession and International Co-operation								
Enlargement: Building linkages on prospective activities								x
International comparability of chemical measurements	x							
Mediterranean and regional perspectives								x
GI and GIS: Harmonisation and interoperability						x		
European Science & Technology Observatory (ESTO)								x
IV. EURATOM								
IV.1. Nuclear Fission Safety								
European Network for Inspection Qualification (ENIQ)			X					
Ageing Materials Evaluation and Studies (AMES)			X					
Network for Evaluation of Structural Components (NESC)			X					
Safety of Nuclear Fuel		x						
Basic Actinide Research		x						
Partitioning and Transmutation		x						
Exploitation of Neutron Data	x							
Spent Fuel Characterisation in View of Long-Term Storage		x						
Study of Severe Accidents				x				
IV.2. Control of Nuclear Materials and Nuclear Safeguards								
Safeguards Research and Development at Ispra				x				
Safeguards Research and Development at Karlsruhe		x						
Metrology and Quality Assurance for Nuclear Safeguards	x							
Support to Euratom Safeguards Directorate				x				
Support to the International Atomic Energy Agency (IAEA)				x				
Measurement of Radioactivity in the Environment		x						

- ***Working for Commission services***

The JRC Work Programme is structured according to the priorities of the Commission DGs. The interactions with the customer DGs were ensured through several bilateral meetings and formalised via co-operation agreements in the form of Memoranda of Understanding. These MoUs provide a framework for the operational interfaces between the two services, the mutual obligations for consultation and sharing of information, and for monitoring and reporting on progress and deliverables of the JRC projects.

In 1999, the JRC signed MoUs with DG Enterprise, DG Environment and DG Education and Culture. Negotiations are well advanced for a MoU with DG Health and Consumer Protection.

- ***Clusters – A new inter-institutional approach***

Interdisciplinary attitude

The JRC has established a series of programme clusters to group projects that contribute to a well-identified scientific, technological or social issue. The aim is to foster an interdisciplinary approach by bringing together research teams from the various JRC Institutes, raise the profile of the JRC and strengthen the interface with its customers. Clusters can act as the point of reference on the issues under consideration. So far, clusters have no budgetary implications.

The following clusters have been established at the JRC during the first part of 1999:

- Electronic commerce*:* focus on dependability and consumers' aspects in electronic commerce (IHCP, ISIS and IPTS).

- Emissions and related impacts on human and environmental health*:* focus on emission processes, clean technologies in transport and for waste incineration, emission characteristics in relation to health effects (EI, IAM, IHCP and IPTS).

- Global change*:* modelling carbon sinks and monitoring carbon in the atmosphere and biosphere, clean technologies, and implications for energy policy (SAI, IPTS, EI, IAM).

- Food*:* focus on food safety, antifraud measures, support to biotechnology directives and development of standards for reinforcing industrial competitiveness (IHCP, IRMM, IPTS).

- Agri-environment*:* geospatial information, integrated assessments and verification of agri-environment measures (SAI, EI, ISIS, IPTS).

- Management of ageing reactor life*:* safety of nuclear power plants, implications of enlargement, enhancing industrial competitiveness (IAM and ISIS).

The cluster experiment will be pursued during the coming year and an internal evaluation of its performance and impact will be produced by the end of 2000.

- ***Non-nuclear research activities***

The non-nuclear part of the JRC programme is steadily growing, and now constitutes about 73% of the overall activities.

In accordance with the JRC mission, the work is focused on research topics relevant to important policy drivers, namely the concerns of the citizen for health and safety, sustainability and competitiveness.

Details of the work are given in the sections dealing with the work of the JRC institutes.

- ***Nuclear research activities***

Institutional programme

The JRC has its origin in the Euratom Treaty, though the portion of the budget devoted to nuclear energy has now fallen to 27%. In response to the changed political and industrial context for nuclear energy in Europe, a strategy for the JRC Euratom Programme has developed emphasising the following issues:

- Safeguards activities, which involve equipment development and qualification, elaboration of reference materials and methods, and training of inspectors; and

- Research for operational safety of ageing nuclear plants; research on actinides, in view of fuel cycle safety studies.

The corresponding projects are conducted in four of the JRC Institutes, namely in the IRMM, ITU, IAM and ISIS–the ITU is the main institute responsible for JRC nuclear activities.

The High Flux Reactor (HFR)

Implementing a Euratom agreement

The Commission operates the High Flux Reactor (HFR) at Petten in accordance with the 1961 Euratom/Netherlands agreement. The JRC carries out research at the HFR for the European Atomic Energy Community on the basis of four-year supplementary research programmes.

The HFR reactor is regulated between the Netherlands, Germany and France, with each partner guaranteeing a percentage of the finance required. A new four-year programme (2000 to 2003) was approved by the Council of Ministers (Research) on 2 December 1999.

The HFR programme remains active in the area of the safety of the existing reactors as well as for the development of safer reactors and of new fuels.

HFR is also being increasingly used to support medical activities. The HFR produces isotopes for more than 60% of the ten million medical diagnoses executed each year in Europe. The quality and reliability of its operation make HFR indispensable for the European pharmaceutical companies in this field. And the reactor's location allows its medical products to be rapidly directed to European medical centres – which is vital given the short life of most currently used isotopes.

An association of European centres working on a new treatment for encephalic cancers based on the Boron Neutron Capture Therapy (BNCT) techniques is also using HFR. The HFR also supports other medical-related research such as production of new isotopes, development of other technical BNCT-applications and new alpha-immunotherapy products, and studies on the materials for medical prosthesis.

Decommissioning of nuclear installations

Dealing with obsolete facilities
Within the Euratom Treaty, site agreements concerning nuclear plants were signed during 1960-62 between the Community, Germany, Belgium, Italy and the Netherlands. In the two latter cases, national nuclear installations were transferred to the Community and infrastructures for nuclear development were put in place. Some of these installations are still in use today. Others have been stopped, in some instances more than 20 years ago, and have mostly become obsolete.

The JRC has established a long-term action plan for decommissioning its nuclear facilities. The plan is divided into three parts:

1. Management of waste resulting from the JRC's activities since 1960 to the present-day; this phase also includes the safe conservation of obsolete installations and the improvement of facilities needed for the manipulation, decontamination, treatment and storage of solid and liquid wastes.

2. Dismantling of shut-down facilities, such as reactors and laboratories; this procedure will generate new waste which also needs to be processed.

3. Evaluation of the resources necessary for the future dismantling of nuclear facilities still in operation, such as the cyclotron at Ispra, the hot cells at the ITU in Karlsruhe, and the HFR at Petten.

This programme was noted by the Council on 20 May 1999 and formally approved on 2 December 1999 (COM(1999) 114 final).

- ***Co-ordination of space activities***

Since 1997, the European Commission has undertaken specific actions to co-ordinate Europe's space efforts and the policies of the EU. In view of this, the Director General of the JRC has been mandated to streamline the activities and the contacts of the Commission services internally as well as externally, notably in relations with the European Space Agency (ESA).

The Co-ordination of Space Activities Unit, reporting directly to the JRC Director General, organises, runs and supports the inter-service Space Co-ordination Group (SCG) as well as the Commission's Space Advisory Group (SAG), which brings together the Commission Services, Member States' space experts, the ESA, Eumetsat and WEU (Western European Union). The SAG is the consultative body to facilitate the political debate and reach consensus on the way forward. The unit stimulates the debate through studies and policy papers.

In June 1999, the Commission adopted the working document '*Towards a coherent European approach for Space'* [SEC(1999)789], prepared by the Co-ordination of Space Activities Unit under supervision of the Director General and with the help of the Space Co-ordination Group. As a direct result of this Commission paper, 'space' was put on the agenda of an EU Council of Ministers for the first time – at the 2 December 1999 Research Council.

The Co-ordination of Space Activities Unit also issued the following documents in 1999:

- *Joint Report on the Synergy between the European Community and the European Space Agency (SAG/99/1)*;
- *Global Monitoring for Environment and Security (SAG/99/3)*;
- *Compendium of Space-technology application Projects in the 4th Framework Programme (EUR 18971)*;
- *Conclusions of the Industry High-Level Panel Space (May 1999).*

Opening up to the pre-accession countries

An ad-hoc meeting with delegates from the 11 pre-accession countries held in Ispra on 19 March 1999 endorsed a JRC strategy in the context of these countries' recent association with FP5. The strategy consists of five elements:

1. Setting-up joint research projects and thematic networks, with particular reference to the EU programme calls;
2. Promoting the transfer of the JRC share of 'acquis communautaire', which is available in its various bureaux and networks implementing EU legislation – particularly in the environment field;
3. Providing access to JRC experimental facilities, which, in many cases, are unique in Europe;
4. Hosting visits by scientists and grant-holders from pre-accession countries; and
5. Organising conferences, visits and information days in the pre-accession countries and disseminating information on the JRC.

In line with this strategy, the JRC has set up several research consortia with organisations from pre-accession countries in specific areas and has organised specific workshops on enlargement-related issues.

International Relations

In March 1999, the JRC made a presentation to the Council on the consequences of its new mission on its international relations. The Research Group welcomed unanimously the new strategy according to which JRC will focus its international activities on the priority areas of the Workprogramme and on a limited number of countries, in particular CIS, USA and Japan.

In this context, the Director General conducted missions in Japan and Korea in the spring and visited USA in the fall. During the latter, an agreement was signed with the US Nuclear Regulatory Commission on nuclear safety. It was also decided to formalise the existing co-operation between the JRC and US/FDA through an implementing arrangement with the Joint Institute for Food SAfety and Nutrition (JIFSAN) and to enlarge the scope of the present collaboration on nuclear safeguards with the US/DoE to include nuclear technologies through a separate new agreement. A similar decision was taken in Tokyo with JAERI.

Further to the signature of the Argentina/Euratom agreement, the JRC signed an agreement with the Argentina- Brazil Agency for Accounting and Control of Nuclear Materials

(ABACC) in the field of nuclear safeguards, which covers all possible co-operation between the two unique safeguards systems.

With Russia, in the framework of the TACIS programme, the implementation of on going projects on nuclear safeguards continued, but with a new emphasis on plutonium management. In the field of nuclear safety, JRC involvement increased significantly when the "Service Commun Relex" (SCR) requested a complete review of the 14 large « on-site projects » and the organisation in Ispra of the first TACIS Technical Workshop between the Commission, the Russian authorities and the industrial partners from both Russian and European sides. The success of this Technical Workshop (TTW), which took place in June, confirmed the role of the JRC as was also stressed by the Russian Authorities during the 99 TACIS Supervisory Group.

The JRC as a partner in networks

Maintaining quality and independence

Community policies are complex and multi-faceted, covering an increasing range of issues. The resources and skills required for knowledge support are greater than those the JRC has or may have in future. Therefore, to provide independent scientific and technical expertise, the JRC should be in a position to tap into external 'competence pools' and still make sure that the results comply with the required standards of quality and independence.

The JRC will increasingly share the responsibilities of providing knowledge with the Member States. Several agreements along these lines are already being negotiated with national research organisations such as TNO (the Netherlands organisation for applied scientific research) and DERA (the UK Defence Evaluation and Research Agency).

Memoranda of Understanding (MoU) have also been signed with the European organisations such as the European Environment Agency (EEA) and the European Agency for the Evaluation of Medicinal Products (EMEA). The EEA agreement covers scientific and technical co-operation on the environment, with particular emphasis on issues such as climate change, the monitoring of chemicals and their effects on the environment, and the protection of Europe's natural resources, space and land. The EMEA agreement is for the development and improved use of various telematics initiatives in support of the pharmaceuticals regulatory policy.

In its relations with industry, the JRC approach is to favour representative groupings of industries rather than individual companies so as to preserve its independence in support of European competitiveness. In 1999, negotiations started with European industrial networks such as EUCAR (car industry) and CONCAWE (oil industry) for joint work on emissions from vehicles.

During the year, the JRC carried out a review of all its projects relevant to standardisation in support of the co-operation agreement signed in 1998 with the European standards committee CEN. A special issue of the *IPTS Report* was also dedicated to standardisation. A joint seminar on life cycle analysis with the CEN technical committees responsible was held in June and there was also a JRC-CEN workshop on environmental standards

In co-operation with Mediterranean Partner Countries, several JRC projects address critical issues for the socio-economic development of the Euro-Mediterranean region – such as water, energy, and land use and food resources. The work is carried out as direct support to the Euro-Med intergovernmental committees for science and technology, and industrial co-operation

through the responsible Commission services. Among the concerns addressed in a first batch of expert workshops held in 1999 are the development of human resources, diabetes mellitus, food production (with IHCP) and technology and remote sensing for agriculture (with SAI).

Competitive activities

Target set at 15%

The Council decision on the specific programme of the JRC indicates that, under FP5, the JRC will continue its efforts to develop competitive activities. The Board of Governors has tentatively fixed a target of 15 % for the years 1999 to 2002. This is somewhat less than in the previous programme and consistent with the alignment of the core business of the JRC in support of EU policies.

Competitive activities include competitive work linked to the European Commission, shared cost actions with external research organisations and third party work for European industry. The aim of JRC participation is primarily to maintain a high level of professionalism through exposure to demanding clients, benchmarking with external partners, or to acquire new competencies through collaboration. Project selection is based on the criteria of coherence (complementing institutional activities) and added value – providing specific expertise or 'European scope'.

The JRC only contributes if the requested project or service is linked to its mission. It respects the subsidiarity principle and therefore will not offer services that are better supplied at a national level.

During the first year of implementation of FP5, all Institutes participated in the first calls for proposals for shared cost actions and were present in more than 250 submitted projects. As of 1 November 1999, results were not fully available, but there were indications that more than 80 proposals will be successful.

Technology transfer

Measures undertaken within the European Technology Transfer Initiative (ETTI), and funded outside the JRC institutional budget, include a curriculum in entrepreneurship, an 'extended incubator' to foster the growth of spin-off companies and facilitate access to JRC laboratories, and the implementation of a seed capital fund – the Technology Transfer Fund.

The entrepreneurship training was designed for JRC researchers on short-term contracts. It was tested in a pilot programme with 20 researchers selected from 35 applicants. 18 workshops (200 hours of training delivered by professionals from Member States) taught basic management skills and covered all phases of business planning, from feasibility studies via financing to practical steps for start-up. Three of the participants are currently preparing business plans for spin-off projects.

Successful exploitation of technology involves protection of the intellectual property of results, assessment of a technology's potential and identification of interested partners. In 1999, 11 patent applications were filed and a further 12 were prepared. The technology transfer portfolio, which includes about 50 documented technologies, has been maintained and updated. Contacts and discussions to sign several licence agreements have been actively pursued.

Private finance for seed funding

The concept of private finance investing 50% of its capital as seed funding to exploit projects stemming from the JRC was developed in 1999. The capital of the fund (target € 20 M) is to be invested not only in the creation of new companies but also in technology transfer to existing companies. Several expressions of interest were received following an extensive consultation with more than 100 fund operators. Negotiations have been started with a candidate company selected through an open call.

A project plan was completed for a facility for 'incubation' and 'technology transfer' – the European Centre for Innovation and Spin-Offs (ECIS). The incubation function helps selected spin-off projects from the JRC with consultancy and training in writing a business plan and in preparing the practical steps for start-up before legally creating a new company. The technology transfer function serves to identify, host and consult innovative SMEs (small and medium-size enterprises) in Member States for technology transfer from the JRC. Funding for ECIS was agreed with DG Regional Policy at the end of 1999, with the centre to be operational by mid 2000.

The JRC also co-ordinates the European Technology Transfer Network (ETTN), a pilot project for the former DGs III, XIII and XXIII on using information and communication technologies to promote technology transfer to SMEs in geographically remote locations. Its objectives are to speed up trans-national technology transfer and to make SMEs more competitive through facilitating access to pools of expertise. Intermediary organisations play a key role in identifying the demands of SMEs. More than 300 SMEs are involved and trans-national technology transfer actions have started. Detailed information is available on the ETTN site at http://ettn.jrc.it.

Public research spin-offs

The JRC was part of a consortium selected in a new FP5 proposal to promote spin-offs from public research. Approximately 60,000 European researchers are represented with partners including CEA (the French atomic energy commission), CERN (the European laboratory for particle physics), CNRS (the French national centre for scientific research), CSIC-CNM (the Spanish national centre for microelectronics), and DERA (the UK Defence Evaluation and Research Agency). The objectives are to apply the partners' expertise and international networks to support spin-off projects and to assist in creating a showcase of excellence.

Communications

The JRC communication strategy, initiated in 1998, was pursued in 1999 to raise the profile of JRC activities throughout the media and among important target audiences, as well as the general public. The extensive coverage of the JRC by different media, and especially in the written press and radio/TV broadcasts, produced significant and positive results.

Specialist Information and Public Relations Unit created

Integration of communications activities into mainstream JRC policy and scientific work has been achieved by the creation of a specialist Information and Public Relations Unit, responsible for the overall co-ordination of the JRC's communication strategy.

Increasing visibility

In the past year, the JRC both organised and participated in a number of events – including conferences, seminars and scientific workshops. Such activity has helped to increase the visibility of the JRC to international scientific audiences and the general and specialist press. This visibility has been helped by the several prizes won during the year by JRC staff.

The JRC had a large information stand at the European Commission 'FP5 Launch Event' at Essen in Germany in February 1999. The event was used to initiate press action at different levels.

The JRC was present at the '2nd World Conference for Science Journalism' in Budapest, in July. Over 146 science writers from 29 countries met to discuss the role of science journalists in reporting on science. The JRC had an exhibit where information material, posters and press information files were displayed.

More than 550 people from industry, research organisations, and national and international authorities took part in the 'Air Quality 2000 Conference' in May. This was jointly organised by the JRC, DG Environment and the Fondazione Mangeri in Venice.

Another important international event, which gathered about 800 scientists, was organised by ECVAM and held in Bologna, Italy between 29 August and 2 September 1999. The 3rd World Congress dealt with 'Alternatives and animal use in the life sciences'.

The JRC presented its FP5 Work Programme to research partners, authorities and Commission colleagues during the 'Science and Technology Support to European Policies – Toward a New Partnership' international seminar, in March at the JRC Ispra site. A specific event linked to the seminar targeted the associated countries and enabled the representatives of the PECO (central and eastern European) countries to learn more about JRC activities.

JRC staff won several prestigious prizes in 1999. These included:

- Elke Anklam and Joerg Stroka (IHCP), who were named as Associate Referee of the year by the Association of Official Analytical Chemists;
- Aloïs Sieber (SAI), who was made an IEEE Fellow for contributions and leadership in microwave remote sensing; and
- Maurice Whelan and Colin Forno (ISIS), who won the Metrology for World Class Manufacturing Award 1999 – Innovative Metrology in the UK for work on optical interferometry.

Range of publications

Several new publications, both general and scientific and aimed at different target audiences, were launched during the year, including:

- *Letter from the JRC*, sent to European policy makers.
- *JRC in (month)*, internal monthly newsletter for JRC staff on all sites.
- The *Joint Research Centre* brochure provides a general overview of JRC activities
- The *Serving the citizen* brochure focuses on JRC activities directly serving European citizens
- A corporate video on the JRC, including a general presentation and individual pieces featuring each Institute.
- A new electronic publication called 'viewcard' (a CD-ROM) featuring the JRC's activities.

Large number of visits

The different JRC sites received many visitors, including leading personalities from the political and scientific communities. The visit of the Philippe Busquin to the Ispra site in October 1999, just after he took on responsibility for DG Research and the JRC, was the starting point for the Commissioner's tour of all the JRC sites – the next being a visit to the IAM in Petten in December.

Many journalists visited the JRC to interview personnel and film various projects. About 60 TV programmes and news magazines in Member States ran features about JRC projects. Ten press conferences and briefings for the media were organised.
The JRC received more than 10,000 visitors at its different sites for various events, including meetings, conferences or visits to laboratories by industry, universities and other interested parties.

The JRC in figures

- ***Staff***

The Staff of the JRC (M-male, F-female) is composed of the following categories:

Statutory Staff	**1998 M**	**1998 F**	**1999 M**	**1999 F**
Officials	557	131	566	135
Temporary agents on 5-year renewable contracts	781	192	671	186
Temporary agents on 3-year non-renewable contracts	89	73	102	71
Auxiliary staff (1-year contracts)	125	99	182	55
TOTAL	**1552**	**495**	**1521**	**447**

Of the above-mentioned total, about 1600 staff members can be considered as scientific staff out of which about 400 are employed on short term contracts (1-3 years).

As the needs in qualified personnel of the JRC have evolved during the years, the budgetary authority has increased the number of the senior scientific staff (A- grade) in order to increase staff having qualifications at University level. This modification which was implemented in early 1999 permitted the recruitment of A- grade temporary staff. In 1999 the implementation of the new Commission staff policy for staff financed on the research budget (NPPR) was continued. In this policy a flexible portion of temporary agents (35% of the statutory staff on 5-year contracts, 25% on 3-year contracts) complements a stable foundation of officials (40% of the statutory staff). During the year the number of statutory staff members who left the JRC (retirement or end of contract) was considerably increased (up to 172). This tendency will continue during the years to come. Staff recruited at the early stages of the JRC life, arrive at the age of retirement and will be replaced by high level scientists. In 1999, 92 new statutory staff members were recruited.

- ***Equal Opportunities***

In 1999, the JRC continued implementing the Commission's equal opportunities policy with the aim of encouraging the recruitment and promotion of a greater number of women, taking account also of the Commission's "women in science" initiative. Responsibility for promoting this policy at the JRC was entrusted to an official directly attached to the Director General.

Staff Distribution*

	1997 M	**1997 F**	**1998 M**	**1998 F**	**1999 M**	**1999 F**
DG and programme management	32	29	30	27	24	31
Institute for Reference Materials and Measurements	157	32	156	33	135	31
Institute for Transuranium Elements	163	27	160	27	159	33
Institute for Advanced Materials	257	34	156	10	143	21
Institute for Systems, Informatics and Safety	240	47	214	36	194	40
Environment Institute	166	74	160	51	148	41
Space Applications Institute	109	38	102	39	102	37
Institute for Health and Consumer Protection	-	-	100	50	97	46
Institute for Prospective Technological Studies	30	13	28	14	32	11
Administration	328**	98**	72	58	68	70
Ispra Site Infrastructure	-	-	275	25	237	31

* Officials and temporary agents.

** Combined administration and Ispra site infrastructure.

- ***Visiting scientists, seconded experts, trainees, grantholders***

	1998 M	**1998 F**	**1999 M**	**1999 F**
Visiting scientists	44	3	15	2
Post-Graduate grantholders	70	42	52	31
Post-Doc grantholders	71	22	70	27
Trainees	87	83	65	77
Seconded national experts	17	5	20	5
TOTAL	**289**	**155**	**222**	**142**

- ***Budget***

Budget and expenses - institutional activities

The available credits to the JRC are sub-divided in staff expenses, means of execution (maintenance of buildings and equipment, electricity, insurance, consumables, etc.) and operational credits (scientific acquisitions). The credits come from the institutional budget, made available directly form the European budget to the JRC, from associated countries and from competitive activities. On the institutional budget the following sums were committed:

(in mio euro)	1997	1998	1999
Staff expenses	155	160	157
Means of execution	48	51	59
Operational appropriations	44	48	46
TOTAL (rounded)	**247**	**259**	**262**

The increase in commitments in 1999 is explained by an extraordinary investment of 8 Mioeuro for a new installation at Ispra. 3.8 Mioeuro were engaged for decommissioning.

- ***Competitive activities***

In early 1999, each JRC institute developed a business plan for competitive activities throughout FP5. Efforts were focused on strategic participation in the indirect actions of FP5 and in response to the first calls for proposals the JRC submitted some 270 proposals, of which more than a third were selected for funding. The 2.8 M€ figure for shared-cost actions reflects income from previous FP4 contracts rather than new activity.

The 'competitive support' budget line, which enabled other Directorates-General to financially support competitive activities is no longer continued under FP5. The income of 4.3 M€ thus refers to on-going projects from the Fourth Framework Programme. Third Party Work to a value of 26,4 M€ was carried for a range of clients in 1999 and other competitive activities resulted in 5 M€.

	Inscribed in 1999 accounts
Shared-Cost Actions	2.8*
Competitive Support	4.3
Competitive Activities outside the FWP	5.0**
Third Party Work	26.4
TOTALS	**38.5**

* The figures for shared cost actions only indicate the additional external funds obtained, "Matching funds" from the JRC's budget are not included.

** Not including the activities related to the HFR reactor.

Publications

Institute	EUR reports	Conferences*	Articles**	Special Publications	TOTAL
General Management	5	4	2	42	**53**
IRMM	11	127	49	2	**189**
ITU	1	121	63	1	**186**
IAM	17	37	26	10	**90**
ISIS	20	178	45	44	**287**
EI	27	171	62	13	**273**
SAI	22	128	44	60	**254**
IHCP	16	119	60	28	**223**
IPTS	24	11	7	15	**57**
TOTAL	**143**	**896**	**358**	**215**	**1612**

* Conferences include oral and poster presentations and proceedings

* * Articles include also conference papers published in periodicals

Scientific audit of the JRC institutes

With the approval of the 1999 to 2002 JRC Work Programme, the Director General launched a special, forward-looking evaluation exercise – called the ***Scientific Audit*** – to ensure an effective scientific framework for execution.

The purpose of the audit was to find out whether the JRC was sufficiently well equipped, materially and intellectually, to tackle the tasks assigned to it in FP5. Independent external experts of high repute, covering a broad range of the JRC competencies and activities, were to perform the exercise. Advice was to be given on areas where the JRC's present scientific resources appear to be adequate, need to be strengthened, or are of lower priority for the new programme. Views on the JRC's longer-term scientific strategy were also to be addressed.

The Scientific Audit took place over the June to October period using the model of Visiting Groups, one for each Institute, and including 30 external experts overall. The forward-looking nature of the exercise has resulted in a series of recommendations, which the management of each Institute has incorporated in its medium and long-term plans.

Preliminary overall conclusions of this exercise, common to the JRC as a whole, can be summarised as follows:

- The new JRC mission has been well received and is supported by management and staff. Networking with Member States' laboratories, an essential element linked to the mission, is strongly encouraged.

- The science base underpinning the mission is vital and must be kept strong. Attention is needed to the balance between services and research.

- A modest but significant participation in joint actions with industry is encouraged, as well as technology transfer efforts.

- The importance of clusters for inter-institute collaboration is emphasised. Efforts should be made to strengthen their operation.

- The JRC's effort in supporting nuclear technology is recognised and encouraged; however its sustainability depends on maintaining the current level of funding.

- A JRC recruitment strategy should be further developed to support the long-term scientific strength and viability of the organisation.

In implementing the new mission, this Scientific Audit will strengthen the quality of the JRC's output at the outset of the present Work Programme period. It will also facilitate the performance of the statutory 1996 to 2000 Five-year Assessment – a more traditional evaluation exercise needed to support the planning of the next Framework Programme, FP6. Plans for the organisation of this evaluation, with a final report due by the end of June 2000, were well under way towards the end of 1999.

Total Quality Management

In 1999, the JRC began work on a structured programme for quality improvement, designed to implicate staff members at all levels. This involved a series of initiatives, including a Project Management Manual, a total quality strategy, a business plan and implementation of a reporting system and new administrative procedures.

The basis of the JRC Total Quality Management approach is the use of self-assessment. The new quality initiative requires comprehensive, systematic and regular review of JRC activities and results, identifying strengths and areas for improvement and the implementation of relevant actions to stimulate a continuous improvement process for enhanced performance and higher staff satisfaction.

At the heart of the JRC approach is the European Foundation for Quality Management (EFQM) model. This is based on best practice, supports sustainable growth, and uses nine criteria – leadership, people, policy and strategy, partnership and resources, processes and the results in terms of people, customers, society and key performance.

Looking towards the future

In 1999, the JRC initiated a process of reflection to set up a strategic plan for its future activities. This process will focus on the JRC scientific profile, modes of operation, relations with customers, financing and internal organisation, and involves an internal dialogue as well as consultations with external partners. The 'building blocks' resulting from this action will be integrated into an overall strategic plan for the JRC to guide its operation beyond the implementation of the current Framework Programme.

The plan addressed four main questions:

1. What should the future scientific profile of the JRC be?

2. What type of relations should it have with its main customers, the Commission services and the European Parliament?

3. Which partnerships should it foster?

4. What type of organisation should it develop to ensure flexibility and efficiency?

During the final part of the year, the scientific element of the strategic plan involved the JRC in internal brainstorming sessions, complemented by the external Scientific Audit. The aim was to present the main orientations for the JRC's future scientific profile by the end of 1999. Eight areas were identified as likely to receive increased attention by policy-makers in terms of science and technological support:

- Global change;
- Water;
- Food safety and quality;
- GMOs;
- Emissions and health effects;
- E-commerce and dependability of information technology systems;
- Environment and security; and
- Nuclear safety and safeguards.

Early in 2000, a series of external consultations will be set up to discuss these orientations with selected partners from the research community and industry. A final document on the future profile of the JRC, including both scientific and management aspects, will be drawn up before the summer 2000.

Parallel to the internal strategy exercise an external process was launched. In November 1999, Commissioner Busquin decided to set up an external panel, the so-called High Level Panel. It is chaired by the Viscount E. Davignon, former Vice President of the European Commission and it has the mandate to reflect on the following issues and formulate recommendations:

In which areas should the JRC concentrate its activities, taking into account areas in which it has achieved scientific excellence and credibility, as well as the policy priorities and responsibilities of the Commission ?

What consequences would this entail in terms of work organisation and staffing priorities ? How should human and financial resources be adapted in response to changing policy priorities ?

The JRC mission is to support the policy making process of the EU while maintaining its scientific integrity. What are the operational consequences? What impact will this have on its relationship with the European Parliament, the various Agencies or Scientific Committees?

What are the needs, conditions and methodologies of setting up partnerships or networks with Centres of Excellence in the Member States, including possibly international co-operation ?

The JRC is currently advised by a Board of Governors. How should current arrangements be adapted to take account of changing relationships with Centres in Member States, stakeholders and the EU institutions, taking into account the status of JRC as a Commission Directorate General ?

On which basis should the financing of JRC's activities be organised? (Research Framework Program, relations with DG's, own financing, revenue from "commercial activities")

The Panel is furthermore asked to make recommendations designed to integrate the JRC in the Commission's Initiation towards a European Research Area.

SCIENTIFIC ACTIVITIES OF THE INSTITUTES IN 1999

Institute for Reference Materials and Measurements (IRMM) (GEEL)

Institute Director	***Manfred GRASSERBAUER***
1. Management support	Michael-Francis FAHY
2. Reference materials	Jean PAUWELS
3. Analytical chemistry	Adela RODRIGUEZ FERNANDEZ
4. Isotope measurements	Philip TAYLOR
5. Neutron physics	Hermann WEIGMANN
6. Informatics and electronics	Richard ROSS
7. Commercialisation of materials and reference methods and scientific liaison	Doris FLORIAN

Mission

The IRMM mission is to promote a common European measurement system in support of EU policies, especially internal market, environment, health and consumer-protection standards. IRMM's prime objectives are to develop and perform specific reference measurements, to produce certified reference materials, to organise international measurement evaluation programmes, to establish trans-national databases, and to carry out pre-normative research.

The Institute for Reference Materials and Measurements is the measurement institute of the European Commission – analogous to the national measurement institutes of the Member States. In this function, it directly supports the Member States by providing reference materials and measurements. The activities of the IRMM are structured around two main areas:

- Reference materials for quality assurance in production of foodstuffs and environmental monitoring; and
- Reference measurements and neutron dosimetry in support of food safety, to determine trace nuclear impurities in food materials and to provide experimental data for the improvement of the neutron database.

World first in GMO detection

The IRMM produced the world's first reference materials for the detection of genetically modified organisms (GMOs) in 1999 and continues to provide reference materials for the different types of GMOs that are fully released and used for food production.

Bovine Spongiform Encephalopathy (BSE)

In the area of bovine spongiform encephalopathy (BSE or 'mad cow disease'), the IRMM prepared over 14,000 samples and evaluated the results of four candidate BSE diagnostic tests. It was found that three of these tests could identify animals clinically affected with BSE.

Throughout 1999, the IRMM continued to provide support to EU policies in areas such as food safety, environmental and health protection, nuclear safeguards, neutron measurements and specialised training in measurement sciences.

Expanded network agreements

The IRMM collaboration network was expanded with new collaboration agreements signed with the Laboratory of the Government Chemist (GB), the Slovak Institute of Metrology, the Central Science Laboratory (GB) and the Bureau International des Poids et Mesures (BIPM) (FR). The official representation of the European Commission in the European Organisation of Metrology (EUROMET) was transferred to the IRMM.

The infrastructure at the IRMM was improved through restructuring the Analytical Chemistry unit, overhauling the 7MV Van de Graaff accelerator, constructing new laboratory and office space in the Isotopic Measurements unit, revamping the Management Support Unit and expanding the unit for Commercialisation and Scientific Liaison. Nuclear decommissioning at IRMM commenced and made substantial progress, project management was introduced and implemented, a new staff training procedure was implemented as well as significant headway towards the implementation of Total Quality Management (TQM).

- ***Reference materials***

The IRMM further extended its tasks and responsibilities for the storage, stability control, distribution, sales administration and re-certification for Bureau Communautaire de Référence (BCR) certified reference materials. At present, the IRMM holds 500,000 samples in storage and the revenue from reference materials sales exceeded € 1 M in 1999.

Fighting BSE

An important step forward was made in the fight against BSE [Decision 96/49/EEC]. Co-ordinated by the Health and Consumer Protection DG [Contract No. 14366] and in collaboration with expert institutes in the Member States, the IRMM prepared over 14,000 samples for and evaluated the results of, four candidate BSE diagnostic tests. The resulting statement from the Commission's scientific steering committee speaks for itself: 'three of these tests can identify animals clinically affected with BSE'.

Further projects address the issues of heat-treatment procedures for BSE decontamination and the detection of animal meal in vegetarian feeding, the evaluation of newly developed post-mortem tests (e.g. prions in blood), the set-up of a sample bank for BSE negative samples, the production of reference materials to calibrate BSE post-mortem tests and the evaluation of tests to detect and distinguish between BSE in cattle and scrapie in sheep.

Dioxin, furane and polychlorinated biphenyls (PCBs) [EC Directive 26/94 and requested by CEN-TC 264W61]

In light of this year's dioxin episode, sales for polychlorinated biphenyl (PCB) and dioxin reference materials increased dramatically – in some cases by over 200%; more than 120 units of the PCB Certified Reference Material (CRM) 350 were sold in 1999 compared with a mere 17 in 1998. In collaboration with the Belgian ministries, the IRMM has also initiated a proficiency testing campaign for laboratories engaged in analysis of PCBs in food. Preparation of a new range of reference materials for detecting PCBs in pork fat was initiated in order to have the certifications completed by the end of 1999. Additionally, it is planned to provide new reference materials for animal feed, egg yolk powder, milk powder and pork meat.

New Charpy CRMs for impact toughness [Research DG/EN 10045-2/ASTM E-23]

The Charpy impact test is widely used to measure the resistance of a material to brittle fracture – crucial in determining the performance of any type of mechanical structure, from pressure vessels to bridges. The IRMM is a major supplier of certified reference materials essential for calibrating test machines. Four orders were placed for Charpy specimens and as a result, new 30 Joule, 80 Joule and 120 Joule master batches were certified. Sales of Charpy specimen reference materials approached some 1,000 units in 1999. Additionally, the IRMM successfully participated in an international evaluation exercise and negotiations are presently ongoing on how to achieve international harmonisation for these important measurements.

Preparation of feasibility samples

20 samples of MURST-ISS-A3 PCBs in Antarctic krill were dispatched to the Istituto Superiore de Sanità (ISS), Rome for work on the detection of PCBs in krill. For fish bile, 190 ampoules of plaice fish bile and 121 ampoule of flounder fish bile were prepared and dispatched. Two series of diluted honey samples were produced (about 1200 ampoules) and also dispatched to ISS.

Clinical reference materials

Multi-enzyme reference materials are used as markers for various disorders such as brain damage, cardiac and/or hepatic diseases. The IRMM and the International Federation for Clinical Chemistry (IFCC) have established a new set of standard operating procedures (SOPs) and the certifications of four enzyme materials at 37^{o}C were completed successfully.

Selected certifications

Certifications were completed for major and trace elements in bovine liver [Directive 83/90/EEC and Regulation (EC)194/97] with significant progress being made on reference materials for wholemeal and for sulphur and total glucosinolate [Regulation 1470/68 and 1864/90] in rape seed. For trace elements in sediment, four materials were re-certified in March 1999. Homogeneity control studies are continuous and the certification of Aflatoxin in whole milk powder made significant progress [Council Directive 74/63/EEC and Commission Directives 91/126/EEC and 97/8/EC].

Reference materials for GMOs

Following EC Directive 258/97 on novel foods, the IRMM has produced the world's first reference materials for the detection of GMOs. At present, 10,000 certified reference materials for the detection of GMOs in soya and maize are being produced and certified at the IRMM. In collaboration with the IHCP in Ispra, two evaluation tests – a DNA polymerase chain reaction (DNA/PCR) test and an enzyme-linked immunoassay (ELISA) test – have been successfully completed.

The IRMM is continuing to provide reference materials for different types of GMOs that are fully released and used, either directly or indirectly, for food production. For example, the production of reference materials containing different GMOs for Bt-11 and PMON 810 maize is underway. Additionally, the IRMM and the IHCP have the expertise and means to create the first ever specimen bank for GM materials – a strategy that is presently under discussion.

Isotopic reference materials (IRMs)

An Iron spike isotopic reference material (IRM) was prepared and ampouled, 'mother' solutions were prepared for the Boron IRM, and isotope ratios were checked. For the ^{50}Cr IRM and ^{nat}Cr spikes, three solutions were prepared and ampouled, measurements were finalised and the certificates were written. The preparation and ampouling of a ^{202}Hg spike IRM was completed and for the Cl spike IRMs, both ^{37}Cl and ^{nat}Cl solutions were prepared and ampouled. Additionally, two new tasks were launched for the production of S and Zn spike IRMs. Work on Primary Isotopic Gas Standards (PIGS) made significant progress with tasks completed for sulphur, krypton, carbon via CF_4, normal carbon and oxygen.

Nuclear safeguards

A range of spike isotopic reference materials was produced and certified for the Energy DG, including a natural uranium spike material, a new plutonium-240 spike and a uranium-235 spike. A series of uranium hexafluoride starting materials was purchased and characterised for future mixing requests. A series of uranium oxides was produced which will be used for the production of uranium-doped glasses for the International Atomic Energy Agency (IAEA) support programme. Parallel to these activities, a month's training for four Russian technicians from the metrology laboratory of the Bochvar Institute, Moscow, took place at the IRMM (under the Tacis programme). Swipe samples for DG Energy were received, and selected samples were analysed in the HADES underground laboratory.

Neutron dosimetry

Materials were produced for the nuclear energy industry and research institutions operating test reactors. These dosimeters are used for neutron fluence rate measurements in the reactor, for safety surveillance purposes and for optimising reactor performance. 62 units were sold in the first half of 1999.

- ***Reference measurements***

Achieving international equivalence

Addressing the issue of achieving international equivalence of chemical measurements in support of international trading systems, the first ever BIPM Key Comparison in the area of chemical measurements has been successfully completed with the IRMM as the co-ordinating laboratory. IMEP (International Measurement Evaluation Programme) rounds -9 (trace elements in water) and -11 (metals in car exhaust catalysts) were completed with over 235 participant laboratories from over 40 countries. New IMEP rounds were launched – IMEP-13 (metals in polymer) and IMEP-14 (metals in sediment). The latter was requested by the Consultative Committee on Amount of Substance (CCQM) of the BIPM (the international weights and measures institute) to be used in an inter-comparison study.

Primary isotopic measurements

Carbon and oxygen isotope ratio measurements are a particularly cost-effective means to identify food adulteration and examine environmental issues. The CEN European prestandards ENV12141 (oxygen-18/oxygen-16 ratios in water from fruit juice), ENV12140 (carbon-13/carbon-12 ratios in sugars from fruit juice), the EC Regulation EC/822/97 (oxygen-18/oxygen-16 ratios in water from wine) and the forthcoming legislation specifying the carbon-13/carbon-12 ratio in pulp and sugars, would benefit from absolute reference values for their proper enactment. The IRMM has integrated this need into the eighth round of its International Measurement Evaluation Programme (IMEP) and, as such, this round is being used as a pilot project for the European Accreditation of laboratories (EA). Results have been obtained from participating laboratories and it has already been demonstrated that the worldwide reference values for carbon used until now have had a bias/error of some 1.5 %.

Antibiotics in food

This year, the IRMM embarked on a new project in support of food safety and in fulfilment of the EC Directive 70/524/CEE (and Regulation 2821/98), which involves the development of reference methods for two families of antibiotics, namely macrolides and quinolones. All commercially available standards have been ordered and the experimental work is about to commence in collaboration with the Department of Veterinary Medicine at Liège University.

Radionuclides in food

The IRMM is developing a reference method to determine trace nuclear impurities in food materials using an ICP-MS (inductively-coupled plasma mass spectrometer), following a separation by extraction chromatography. Matrix effects, column capacity and elution profiles have been examined closely and a new separation method based upon extraction chromatography has been developed. Alpha spectrometry analysis and a detailed study of the sorption selectivities of thorium, uranium, plutonium and americium from water (to start with a simple matrix) followed.

Metal-binding proteins in food

For the authentication of milk, the ability to analyse the presence and quantities of metal-binding proteins is of importance. In March 1999, the IRMM, in collaboration with DG Agriculture and DG Health and Consumer Protection, was asked to develop such a method. Eight caseins and whey proteins have already been identified.

Avogadro project

New differential isotopic measurements for silicon tetrafluoride demonstrated and confirmed that the IRMM molar mass measurements on the Japanese Shin-Etsu material were, without doubt, measurements of the highest quality.

Neutron reference measurements

Neutron reference measurements are performed to provide experimental data for the improvement of the neutron database according to the demands specified in the Organisation for Economic Co-operation and Development (OECD) high priority request list. New neutron reference measurements were completed using the IRMM's two versatile neutron sources – the 150 MeV Linear and 7 MV Van de Graaff accelerators.

In the context of the development of accelerator-driven systems, measurements were completed for ^{207,208}Pb and Bi(n,γ), ^{208}Pb(n,n'), ^{99}Tc(n,p) and (n,α) cross sections. For waste transmutation studies measurements were completed for ^{99}Tc(n,T), (n,γ) and ^{237}Np(n,T), (n,γ) cross sections. For Doppler broadening at low temperature, measurements were completed for U(metal), UO_2, NpO_2 and Hg_2Cl_2. Activation cross sections for 30 short-lived products were measured at 16-21 MeV and additional measurements were carried out for actinides as well as cross section measurements for neutron absorbing materials. For shielding applications progress was made for measurements of the fission fragment properties of ^{238}U(n, f), ^{56}Fe(n,n') and Al(n,n') cross sections. Finally for Neutron data standards, measurements were completed for the fission fragment properties of ^{238}U(n, f) and data analysis completed for the ^{10}B(n, α) branching ratio.

Institute for Transuranium Elements (ITU) (Karlsruhe)

Institute Director	***Roland SCHENKEL****
1. Management support	Jean-Pierre MICHEL
2. Hot cell technology	Jean-Paul GLATZ
3. Materials research	Hans-Joachim MATZKE
4. Nuclear fuels	Didier HAAS
5. Nuclear chemistry	Lothar KOCH
6. Actinides research	Gerard LANDER
7. Nuclear safety and infrastructure	Werner WAGNER

* Appointed in 2000.

Mission

The mission of the ITU is to protect the European citizen against risks associated with the handling and storage of highly radioactive elements. ITU's prime objectives are to serve as a reference centre for basic actinide research, to contribute to an effective safety and safeguards system for the nuclear fuel cycle, and to study technological and medical applications of transuranium elements.

There was a considerable change of emphasis in that all the Institute for Transuranium Elements research projects were thoroughly discussed with the European Commission DGs in charge of the conception, monitoring or implementation of EU policies. The 'Radioactivity in the Environment' project is a direct result of this in-depth consultation and co-operation process. The new ITU research and development programme (1999 to 2002) now comprises seven research projects:

- Alpha-immunotherapy
- Basic actinide research
- Safety of nuclear fuel
- Spent fuel characterisation
- Partitioning and transmutation
- Radioactivity in the environment
- Nuclear safeguards

The ITU continued to carry out contractual work at the request of its various customers – including SIEMENS, British Nuclear Fuels, COGEMA, the Commissariat à l' Energie Atomique, Swedish Nuclear Fuel and Waste Management Co, and the Central Research Institute of Electric Power Industry (CRIEPI).

During March 1999, the review audit for the ISO 9001 certificate was successfully concluded. A so-called 'Delta-audit' took place simultaneously in order to check the conformity with the new ISO 9001-2000, which is under preparation. The conclusions of the Delta-audit were translated in measures to improve and expand the ITU quality management system.

- ***Alpha-immunotherapy***

The objective of this project is to develop, test and validate a new type of drug against different cancers. This new concept is based on a suitable alpha-emitter, a cancer-specific carrier such as an antibody or a peptide, and a chelator to combine the nuclide with the carrier.

A major objective of this project was the establishment of a large production capability for actinium-225.

Generators for clinical trials

For large-scale production of actinium-225 from radium-226, one of the ITU hot cells was refurbished for the preparation of radium targets at the Curie level, for the handling of irradiated targets from the FZK cyclotron and to perform the subsequent separation of actinium. This new facility permits the production and distribution of sufficient amounts of actinium/bismuth generators for clinical trials in the EU and elsewhere.

About 1gram of antibodies, sufficient for planned phase 1 trials of non-Hodgkin lymphoma, were chelated with bismuth-213 at the ITU. These conjugates are used for the pre-clinical experiments at the German Cancer Research Centre at Heidelberg and the clinical trials are expected to start early in 2000.

For certain evaluations and assessments of the effectiveness of alpha-immunotherapy, the short half-life of bismuth-213 (45 minutes) is a great disadvantage. This concerns parameters such as the stability of the conjugate, its behaviour under certain conditions and bio-distribution studies. With the support of the cyclotron at Forschungszentrum Karlsruhe (FZK), a production capability of an isotopic mixture of bismuth-205 and -206 (half-lives 14 and 7 days respectively) was developed. This mixture has already been used in bio-distribution experiments at the Heidelberg Cancer Centre.

- ***Basic actinide research***

The management of highly active wastes is an issue of major public concern. Important programmes in this field are in progress in the Member States including new and innovative fuel cycles – such as partitioning and transmutation. A prerequisite for such fuel cycle activities is the availability of the basic physical, chemical and material science reference data on actinides and new actinide-containing fuels, products and waste streams.

Some activities in basic actinide research are aimed at developing understanding of the electronic structure of elements and compounds of actinides. This approach includes actions ranging from the preparation and purification of the elements to the study of single crystals by sophisticated physical techniques, some of which involve the use of intense synchrotron, neutron, or muon beams. Theory plays an important role in interacting with experiment to explain results and suggest new avenues of investigation. The effort has two other notable characteristics:

- It involves much collaboration with universities and other research institutions, with some personnel coming to Karlsruhe to perform experiments in the ITU multi-user facility, and

- The group has a large number (12 in 1999) of students and postdoctoral grantees who spend two to three years with the Basic Actinide Group.

Single crystals

Single crystals of materials are necessary to measure many important properties. The mixed oxides containing uranium and plutonium are of considerable interest in actinide science. A vapour transport method has been perfected recently at the ITU to allow the growth of single crystals of these mixed oxides, such as the fuels used in reactors. Previously, such crystals haven been grown of neptunium dioxide (NpO_2).

New crystal phase

Americium (Am) shows an unusual – and new – crystal structure between 7 and 16 GPa (1 GPa = 10kbar of pressure, i. e., 10,000 times the atmospheric pressure). In collaboration with Oak Ridge National Laboratory in the USA and using the unique capabilities at the European Synchrotron Radiation Facility in Grenoble (FR), this new structure has been established on a sample of less than 5 micrograms of high-purity americium metal. A volume collapse of around 7% occurs at 16 GPa where the overall volume is only 65% of its ambient volume. These results are critical in understanding the equation-of-state of americium, and in making comparisons to the latest theories that attempt to predict the cohesive energies and atomic volumes of the actinide elements.

New results of synchrotron experiments to examine the magnetism of neptunium dioxide have resolved a long-standing puzzle in actinide science.

- ***Safety of nuclear fuel***

The safety of nuclear fuel is of prime concern for operators of nuclear power reactors and fuel-fabrication plants, for national and international regulatory authorities and, of course, the citizen. The ITU undertakes vital research into factors that limit higher burn-up, such as mechanical and chemical fuel/cladding interaction and enhanced fission gas release. Studying the phenomena occurring during the irradiation of nuclear fuel improves both the safety and efficiency of the nuclear fuel cycle.

Final reports were established on the reactor meltdown examinations under the PHEBUS project, specifically on the examination of the molten bundle and the behaviour of aerosol deposits in the primary circuits. A new decontamination cell was commissioned. This is an important achievement in view of the refurbishment of the infrastructure of the ITU.

Faster measurement methods

A new instrument was constructed consisting of a miniature integrated array photodiode and a diffraction grating. A full thermal spectrum can be recorded in a few milliseconds. The spectrum can then be analysed to obtain the temperature of the emitting surface. The method of temperature evaluation is very accurate and can be extended to coloured materials with pronounced absorption bands. The instrument is very compact and easy to operate and allows accurate measurements under difficult conditions, e. g., for materials with a high evaporation rate.

Volatile plutonium trioxide

During Knudsen-cell effusion measurements on plutonium dioxide, a trioxide molecule was observed. This molecule, which is very volatile, is formed after adsorption of oxygen and is released at temperatures above 1800 K. A laboratory experiment showed that oxidation of plutonium dioxide produces amounts of plutonium trioxide which may be relevant for airborne dispersion of plutonium in reactor or fuel-fabrication accidents.

- ***Spent fuel characterisation for long-term storage***

Safety-related data on the corrosion and dissolution behaviour of fuel under realistic conditions are of utmost importance for long-term storage of irradiated fuel. After about 500 years of storage (i. e., the guaranteed lifetime of the containers), the fuel's radioactivity will be largely due to alpha-decay. Alpha-radiolysis will therefore be a key parameter in determining the dissolution behaviour of the fuel.

The studies on the effects of alpha-radiolysis on the dissolution behaviour of spent fuel continued, and were extended to the case of higher fuel surface areas exposed to water. In parallel, the property changes caused by the accumulation of alpha-decay damage in the structure of the fuel were also investigated. For both activities, uranium oxide samples containing different concentrations of short-lived actinides were used. At present, new specimens are fabricated with uranium-233 as source of alpha-radiolysis.

The influence of plutonium oxide rich agglomerates on the dissolution mechanisms of mixed oxide fuels was also investigated.

- ***Partitioning and transmutation***

The ITU is participating in a European effort to study ways of reducing the potential long-term hazard of highly active nuclear waste, and is exploring alternative waste management options. The ITU's contribution to this European collaboration is essentially in the area of partitioning, i.e., the effective separation of long-lived radionuclides, and the fabrication of fuels for 'transmutation' or 'incineration' of these long-lived actinides and fission products.

Experimental data gathered is compared with theoretical predictions and serves to establish reference information to evaluate the potential benefits/drawbacks of such a waste management concept.

Separating actinides from lanthanides

The improvement of the separation of actinides from lanthanides was a major achievement in the area of partitioning. A first hot demonstration took place of a new actinide/lanthanide separation scheme using genuine effluents from the DIAMEX process (i. e., the separation of actinides and lanthanides from fission products). In a continuous counter-current arrangement, high actinide recovery and good separation factors from lanthanides (larger than 100) were achieved.

The melting point of the candidate inert matrix magnesium oxide was determined. New accurate measurements using well-controlled laser pulses show clearly a much higher value of 3220 ± 10 K compared with the literature value of 3100 K.

Improved understanding of fission products

New cross-sectional electron microscopy has yielded a threshold energy loss value of fission products for amorphisation of spinel. Subsequent electron irradiation in the electron microscope induces recrystallisation and produces a nanocrystalline structure. These results present a basis for understanding the behaviour of spinel/americium dioxide fuel during reactor irradiation.

The construction of the Minor Actinide Laboratory proceeded with the installation of water walls, the delivery of major equipment and termination of construction of the first of ten glove boxes. For the fabrication of americium targets, preparatory work using the sol-gel process was performed with cerium substituting americium.

- ***Radioactivity in the environment***

Health protection in the EU is governed by Chapter III of the Euratom Treaty. A particular aspect is related to the control of radioactive emissions and discharges from nuclear installations. A new requirement is control of the implementation of commitments undertaken in the framework of the OSPAR Convention to protect the marine environment.

A joint development programme has been defined and started in response to the needs expressed by the Environment DG. In view of this work and similar activities in the area of safeguards, a micromanipulator was successfully used in a new scanning electron microscope to select and separate minute actinide-containing particles for chemical analysis.

- ***Nuclear safeguards***

Nuclear safeguards are a set of activities by which the Euratom Safeguards Directorate of the Commission in Luxembourg and the International Atomic Energy Agency (IAEA) seek to verify that states or plant operators are not using nuclear material or equipment to develop or produce nuclear weapons.

High test throughput

The first on-site laboratory was inaugurated in October 1999 at the Sellafield reprocessing plant in the UK. The construction and commissioning of this laboratory was a challenge in three major aspects:

1. Throughput: A high degree of automation was required to achieve a throughput of 1000 samples per year with the need to have only 4 analysts on site.

2. Accuracy: The re-measurement of basic nuclear physics parameters (spontaneous fission rate of even-numbered plutonium isotopes) was required for one method to achieve the limits of accuracy specified by the customer.

3. Cost: As waste handling and treatment turned out to be an important factor in the operational costs, new techniques were used to minimise waste production.

The work related to the on-site laboratory at La Hague in France proceeded on schedule.

In the area of nuclear forensics, the ITU participated successfully in a 'round robin' test organised by the P-8 International Technical Working Group to identify the origin of an unknown plutonium sample. Also in the framework of this co-operation, a 'model action plan' was developed and demonstrated in Ukraine related to a seizure of nuclear material.

Analytical techniques were developed to determine the age of plutonium by the rate of the in-grown uranium nuclides. The nuclear material data bank was extended by provision of data from EU industry.

In the area of environmental monitoring, the method of particle searching for SIMS analysis has been investigated in detail and a proposal for software to automate this process has been developed. The prototype for automation of the sample loading was tested and first trials will start soon.

Institute for Advanced Materials (IAM) (Petten)

Institute Director	***Kari TÖRRÖNEN***
1. Management support	Michael CUNDY
2. Energy production and conversion	Johan BRESSERS
3. Safety of industrial components	Roger HURST
4. Clean technologies	Juha-Pekka HIRVONEN
5. High flux reactor	Joël GUIDEZ
6. Scientific and technical support	Edward BULLOCK

Mission

The mission of IAM is to support the sustainable development and competitiveness of European industry through research on the structural integrity and performance of materials in components and processes in areas of concern to the public. The prime applications are in the sectors of energy, transport, and chemical processes. The IAM manages the High Flux Reactor (HFR) for the benefit of the European nuclear industry and supports nuclear and radiation applications in medicine.

The Institute for Advanced Materials continued research on the structural integrity and performance of materials in components and processes in sectors such as energy, transport and chemical industry. It contributed expertise on emission reduction technology for transport and increased efficiency in energy production. Further work was carried out on nuclear and radiation applications in medicine, and the Boron Neutron Capture Therapy (BNCT) facility at the High Flux Reactor (HFR) was upgraded with the purchase and installation of components for the liquid argon system.

Research activities funded from the EU research programme are carried out in 12 projects, grouped in three main clusters:

- Structural integrity of industrial components;
- Emission reduction technologies and increased efficiency in energy and transport; and
- Nuclear and radiation applications in medicine.

This clustering was designed to steer the development of IAM competence towards issues and areas of public interest that have been identified as needing support, both in the definition of EU policymaking and in the promotion of industrial competitiveness.

- ***Structural integrity of industrial components***

All projects in the Structural Integrity cluster combine experimental and theoretical research actions with the co-ordination, management and operation of European networks. The networks include the establishment and maintenance of European Reference laboratories and

are primarily targeted at providing an international platform for achieving consensus on technical and safety matters and developing accredited testing methodologies for lifetime assessment of components used in critical industrial applications. Three projects and their related networks focus on issues related to nuclear power plants (namely AMES, ENIQ and NESC) whereas the two other projects (namely EPERC and HYDANET) focus on issues more of relevance to the petro-chemical sector. Further to an internal management decision, activities related to pressure equipment (EPERC) and hydrogen damage (HYDANET) will be carried out and reported under one project as of January 2000.

Highlights of activities from the five projects within this cluster include:

- The European Pressure Equipment Research Council (EPERC). Milestones achieved in 1999 include the launching of a European 'Service Integrity and Life Extension' task force, the publication of a bulletin '*A European Approach to Pressure Equipment Inspection*' and the organisation of a workshop on 'Inspection Qualification'.

- Hydrogen Damage Prevention and Networking (HYDANET). A new venture, this network, which focuses on identifying and combating high temperature hydrogen damage in structural steels, was prepared for launch in early 2000 with many industrial companies, research organisations and international federations. The IAM has established a Reference Laboratory of unique European competence to support the network. Scientific achievements in 1999 include specific targeting of various techniques to the analysis of hydrogen attacked materials and consequent progress in understanding mechanisms involved.

- The European Network for Inspection Qualification (ENIQ) has formulated and published two 'Recommended Practices', entitled '*Qualification Dossier*' and '*How to Conduct Test Piece Trials*'. The network is particularly concerned to ensure that internationally approved inspection procedures are mandatory in all relevant countries and to this end, the Network section concerning Eastern Europe (ENDEF) has issued guidelines for detailed project proposals to improve in-service inspection in Russian-type WWER and RBMK reactors.

- The Network for the Evaluation of Steel Components (NESC). The first round project NESC I has now been completed and final reports are being published. A second generation (NESC II) project was launched in 1998; a network partner has already conducted two large pressurised thermal shock tests and the results are now the subject of critical evaluation.

- The IAM Reference Laboratory for the Ageing Materials Evaluation and Studies (AMES) has carried out a successful irradiation of model alloys in the High Flux Reactor (HFR) (LYRA-03 project). A conception and initiation of a key action study on the influence of the chemical composition on irradiation embrittlement was undertaken. A matrix of 33 different model alloys, with controlled variation of copper, nickel and phosphorus content, is currently being investigated. Additionally, a specialist meeting was organised jointly with the IAEA (International Atomic Energy Agency) in Petten on 'Non-Destructive Methods for Monitoring Degradation'. The meeting attracted about 90 participants from 25 countries.

Support for Tacis/Phare programmes

An Administrative Framework Agreement signed in 1998 between the JRC and the External Relations DG defined a programme of technical support to the External Relations DG for the Tacis/Phare programmes on Nuclear Safety, which is now detailed in annual Work Plans.

In 1999, an agreement was signed to provide technical expertise for on-site assistance to the Tacis Nuclear Power Plants in Russia, Ukraine, Armenia and Kazakhstan for the next three years. The agreements involve the participation of IAM experts in all procurement processes for safety-related equipment. Finally, the IAM prepared an agreement with DG Common Service for External Relations (SCR) for the execution of a project on dissemination of Tacis project results.

These actions allow the JRC to assist the European Commission services during all preparation and implementation phases of the Tacis/Phare programmes in nuclear safety, as well as to assess the results of the individual projects for the beneficiaries.

- ***Emission reduction technologies and increased efficiency in energy and transport***

The Emission Reduction Technologies cluster encompasses over 50% of IAM activities and is composed of two projects related to energy production, two related to transport and one related to waste treatment.

To supplement the specialist facilities for assessing materials behaviour under closely simulated plant conditions, a rig for subjecting pipes to bending loads and a facility for assessing the combined action of creep and thermal fatigue on notched tubular components have been constructed and are being commissioned.

An integrated lifetime prediction model has been developed and will be validated using data from thermal fatigue crack growth of cracked 316 stainless steel components and multiaxial creep behaviour of welded ferritic alloy tubes.

Thermal barrier coatings

The IAM has launched a 'Thermal Barrier Coatings-in-Service' network, which groups representatives of EU gas turbine manufacturers and users and is targeted at pooling European R&D resources to improve thermal barrier coatings performance and reliability. The Network contract terms have been agreed and the network is scheduled to start in January 2000. The IAM will contribute experimental facilities for mechanical testing, corrosion, residual stress measurement, thermal properties and structural analysis. Theoretical analysis will use a finite-element computer model of interfaced material which calculates the stress fields in thermal-barrier-coated systems that evolve during thermal-mechanical loading typical of gas turbine components.

The IAM contributes extensively to the development of standard test methodologies. A recently developed High-Temperature Ceramic Fibre Bundle Test facility has been submitted for patent application and the corresponding testing procedure drafted for scrutiny by CEN for adoption as a standard.

Engine-testing laboratory

The 'European Reference Vehicle and Engine Testing Laboratory on emission Reduction Technologies' at IAM is in the final design phase. The engine-testing laboratory for wear-measurement on engine components by thin layer activation has been transferred from Ispra to the IAM's Petten site. This laboratory will be the first to function in the facility which will finally include a full-size light duty vehicle testing and a fully equipped engine rest bench with state-of-the-art emission measuring capabilities.

A European network on **'**Performance Reliability and Emission Reduction in Waste Incinerators' (PREWIN) has been set up. Following a period of consultancy, a preliminary report of literature on waste incineration conditions and materials has been issued, leading to the identification of key materials to be used in laboratory studies. The laboratory autoclaves have been adapted and re-commissioned for use with simulated waste incineration atmospheres including sulphur, carbon and chlorine-containing species.

- ***Nuclear and radiation applications in medicine***

This cluster, accounting for some 10% of IAM's effort, includes two projects:

- The Boron Neutron Capture Therapy (BNCT) facility at the HFR, which was upgraded in 1999. Newly drafted standard operating procedures guarantee smoother and more reliable operation of the facility. Software for treatment planning is now more user-friendly, producing data and results more efficiently, and especially allowing the performance of self-checks routinely to enhance the reliability of the results. Studies, primarily theoretical, have been made to assess the use of BNCT to combat other diseases (e.g. diabetes). One new collaborative project with medical partners entitled **'**Therapeutic Strategies for BNCT with Boron Imaging**'** has been approved within the FP5 'Quality of Life' programme.

- A state-of-the-art review in medical x-ray was carried out and relevant x-ray equipment has been purchased. The major preparatory steps to launch a European Network on Medical Radiographic Equipment Characterisation (MERECH) have been undertaken, including identification of partners. Further to the scientific audit carried out in the JRC in July 1999, a recommendation was issued to phase down this project because of its remoteness from the core activities of the institute. Agreeing with this evaluation, the management decided that this project will be phased down and terminated in course of 2000.

- ***Management aspects***

The audit for certification according to ISO 9001 in July was a major milestone in the IAM's global effort towards TQM development. The certification was granted in November. Efforts are now concentrating on the implementation of the EFQM (European Foundation for Quality Management) Excellence Model within the IAM.

Improvements in organisation and transparency of the IAM's project management have been implemented. A project management portfolio was established. A new regime of regular project reviews has improved organisation of project monitoring.

- ***Competitive activities***

The projects grouped into the three 'Institutional Programme' clusters account for approximately 85% of the IAM's budget. 49 other projects supported by competitive funding have been proposed this year. These competitive activities take the form of direct contract work for third parties, partnerships in shared-cost actions and other competitive actions. Shared-cost actions were continued under the FP5 'Quality of Life', 'Nuclear Fission', 'Growth', 'Energy, Environment and Sustainable Development', and 'Copernicus' programmes. Other competitive actions mainly cover work for DGs in response to a direct request or call for tender outside the frame of the research programme.

Only competitive activities that are relevant to the institutional projects or to the future evolution of the IAM are taken on. Most competitive actions complement or supplement on-going institutional research.

- ***High Flux Reactor – Supplementary programme***

The Commission operates the High Flux Reactor (HFR) at Petten in accordance with the Euratom/Netherlands agreement of 25 July 1961. On 27 June 1996, the Council adopted a four-year (1996 to 1999) supplementary research programme at the High Flux Reactor to be implemented by the JRC for the European Atomic Energy Community. Three countries support the supplementary programme: Germany, the Netherlands and France.

Besides traditional work for nuclear research and industry, it was decided to dedicate a large part of the High Flux Reactor activities to medical applications. On the basis of contractual relationships, the reactor is now a major contributor to the production of medical radioisotopes for the European radio-pharmaceutical industry.

A major highlight in the operation of the High Flux Reactor throughout 1999 was the large number of operational days – more than 280 – and a high occupancy rate for the reactor. An important decision was the commitment taken to convert the reactor from the use of highly enriched uranium to the use of low-enriched uranium.

Institute for Systems, Informatics and Safety (ISIS) (Ispra)

Insitute Director	***David WILKINSON***
Head of unit acting as Institute Deputy Director	Marc CUYPERS
1. Quality and management support	David WILKINSON f.f.
2. Reliable information technologies	Fernand SOREL
3. Risk management and decision support	Alfredo LUCIA
4. Safeguards and verification techniques	Marc CUYPERS
5. Nuclear safety	Horst WEISSHAÜPL
6. Safety in structural mechanics	Michel GERADIN
7. Methodology for information analysis	Martyn DOWELL

(*) Jean-Pierre AUBINEAU: Adviser ad personam.

Mission
The mission of ISIS is to support EU policies with systems-oriented research in areas where safety and security are of concern. Its prime objectives are to develop techniques for the assessment of risk in complex systems and to apply information, communication and engineering technologies for improving their reliability, safety and security.

The Institute for Systems, Informatics and Safety did more work on information technology in 1999 with emphasis on the development of reference laboratories to analyse, benchmark and certify software products of EU research programmes. Support for the EU's Dependability Initiative, part of the FP5 Information Society Technologies Programme, included the setting-up of a web-based information hub and the TRINIDAD – trial infrastructure for information and dependable application deployments – architecture to test attributes of e-commerce applications such as privacy and electronic signatures.

The structural mechanics laboratories concentrated on providing research to underpin the development of European safety standards in construction and transport. The unique LDTF (Large Dynamic Test Facility) is being modified so that it can conduct both compression and tension tests for the analysis of crash barriers.

The institute’s main application areas are:

- Security and reliability in the Information Society;
- Safety of building structures and means of transport and the protection of cultural heritage;
- Safeguarding against the proliferation of nuclear materials;
- Safety aspects of nuclear energy;
- The fight against fraud; and

- Methodologies for risk assessment and decision support.

- ***Security and reliability in the Information Society***

In response to demand from customers, ISIS is expanding its work on information technology. Particular emphasis is given to improving security, reliability and interoperability.

The central plank of the activity was ISIS's close support to the EU's Dependability Initiative. The work included setting up a web-based information hub and developing the TRINIDAD architecture for testing, benchmarking and certifying software products resulting from EU research programmes (see BOX). A number of sectors have been targeted for special attention:

1. Health care. A case study to analyse dependability requirements was completed and a long-term project started to study, develop and promote a European scientific and technical framework for the testing, validation and certification of medical imaging and media communication systems. A communication infrastructure using ISDN telephone lines for the transmission of medical images has been successfully tested as part of the project.

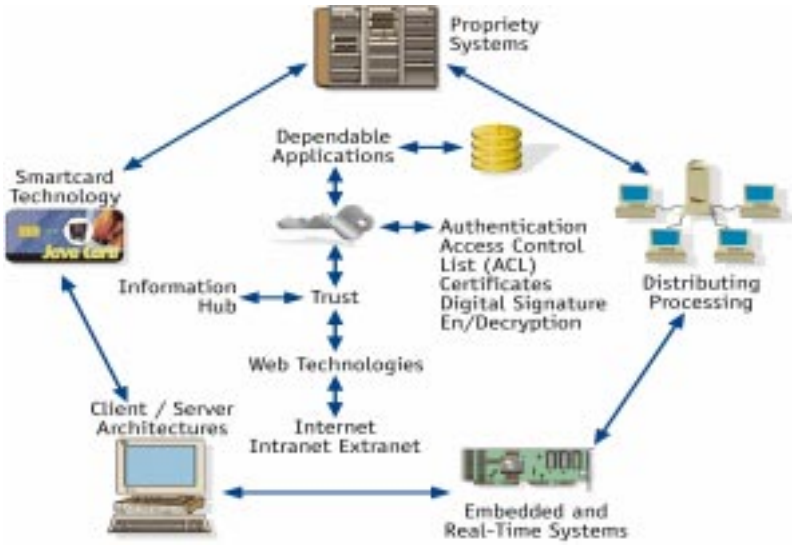
2. Education. ISIS has constructed a software repository to archive products resulting from the Commission's multimedia in education initiative and has provided software to promote education and training in the European society.

3. Statistics. ISIS, within the framework of a European statistical laboratory, helped improve the accuracy and coverage of Eurostat's official statistics and increase public access to them. Work in 1999 included the testing of the DEMETRA reference software for time series analysis.

4. Mine action. Together with the SAI, ISIS contributed to efforts to reduce the harm caused by anti-personnel landmines. In 1999, ISIS set up an information hub to improve the visibility, coherence and efficiency of the Commission's mine-action programme, developed a prototype decision support system for the clearance of unexploded ordnance in Laos, demonstrated how computer-aided design (CAD) can aid the fusion of data from different sensors, surveyed US work on electronic noses, and suggested a possible European strategy in the area and tested electrostatic and weak infra-red detection methods.

TRINIDAD
(TRial Infrastructure for Information and Dependable Application Deployments)

As computers and information systems become increasingly interconnected by means of distributed communication networks, the operational risks and vulnerabilities associated with these systems become more complex and important – particularly when these systems are used for safety-critical or trusted business applications such as electronic commerce.



The trial infrastructure TRINIDAD is a neutral platform designed for testing and investigating dependability-related attributes of applications. Its aim is to provide access to an infrastructure that will allow projects to test, demonstrate and benchmark both newly developed and existing dependability technologies that enhance trust and confidence in applications.

TRINIDAD components are based on 'open systems' standards and are as independent as possible of hardware architectures or operating systems. Different application designs (lookup services, object-oriented and component-based applications, database and multi-tier implementations, distributed and networking information systems) are supported.

- ***Safety of building structures and means of transport and the protection of cultural heritage***

ISIS's work in structural mechanics concentrates on the civil engineering and transport sectors. The main overall objective is to support the development of European safety standards based on sound science.

Testing large-scale structures

Civil engineering work is centred round the European Laboratory for Structural Assessment (ELSA) and its Reaction Wall facility, which is capable of testing large-scale structures under seismic and dynamic loads.

Following indications of the vulnerability of welded steel connections in Japanese and Californian earthquakes, a series of tests were carried out to investigate how Eurocode design rules could be improved.

The structural integrity of fibre-reinforced structures was studied – partly for new buildings but mainly for retrofitting old buildings. One trial experiment at ELSA demonstrated how bonding membranes manufactured from layers of unidirectional glass fibre considerably improved the seismic performance of load-carrying masonry walls.

Progress was made in improving the control system of the pseudo-dynamic testing system. The aim is to test only the critical components of a structure at full or large scale. The forces and displacements produced by the surrounding structure are modelled numerically.

Focusing on transport safety

The Large Dynamic Test Facility (LDTF) now focuses on transport safety. The aim is to develop a methodology that allows precise large-scale laboratory crash tests with refined instrumentation to complement the more expensive in-field global tests presently prescribed by European safety standards. Precision measurement is required of the mechanical parameters of energy absorption, resistance and deformability under impact load of vehicle and crash barriers. The main work during the year has been the transformation of the LDTF so that it is able to conduct compression tests instead of only tension tests.

- ***Safeguarding against the proliferation of nuclear materials***

The Euratom Treaty of 1957 requires the European Commission to satisfy itself that fissile materials within the EU are not diverted from their intended use. These responsibilities were extended when collaboration agreements with the International Atomic Energy Authority (IAEA) were signed in 1977. Further challenges are expected in the future from the entry into force of Safeguards of material released from excess weapons and from the enlargement of the EU. ISIS provides direct support to both Euratom and to the IAEA and undertakes longer-term research into techniques for meeting future requirements.

In 1999, the main achievements were:

- The TEMPEST calibration laboratory was accredited under Quality Standard EN 450001.

- In the refurbished PERLA non-destructive assay laboratory, calibration procedures for neutron detectors were improved; a gamma-scanning method for nuclear waste drums was developed and checked in a inter-laboratory test; prototype electronic boards for neutron counters were developed; and a new Monte Carlo code – including complete neutron pulse train analysis – was developed and validated with experiments in the laboratory.

- A demonstrator for a multi-camera surveillance system based on merged laser-video data was prepared for the Web. It included live video images inserted in a 3D presentation of the environment. A computer simulation of a prototype tele-operation system, including kinematics optimisation, to be used in advanced storage areas was prepared.

- A feasibility study was undertaken of an ultrasonic sealing system for LWR MOX fuel assemblies and a patent application made for an underwater identification system for nuclear fuel.

- A prototype pressure instrument module for volume measurements was developed and tested in the TAME laboratory.

- ***Safety aspects of nuclear energy***

The first year of FP5 has brought changes to ISIS's work on nuclear safety. The world-renowned FARO facility has largely completed its mission and is closing. Emphasis is now less on operating large facilities and more on providing a direct support to European Commission services – in particular in helping the integration of the Applicant Countries' reactor systems into the European safety culture.

The two last FARO tests were successful The first one was a melt-spreading test. Although water was present, no melt-water interactions were observed. The objective of the second test was to assess the energetics of a triggered event with realistic quantities of melt and conditions as favourable as possible for steam explosion. In the event, even though there was an energetic event after triggering, there was no strong steam explosion. This confirms results from the smaller scale KROTOS test, which continued testing till the end of 1999. Low-pressure tests with realistic mixtures of urania and zirconia consistently showed less energy production than tests with simulants.

ISIS continued to supply technical assistance to the Phebus-FP programme on the Cadarache site and co-ordinated the analysis efforts of the EU partners from Ispra. The debris bed test FPT-4 was successfully carried out in July 1999.

A study comparing structured and unstructured expert judgement approaches for fuel coolant interaction and hydrogen combustion accidents in a nuclear power plant was completed and a prototype database for supporting level 2 Probabilistic Safety Assessment studies has been delivered.

- ***The fight against fraud***

Fraud, if left unchecked, can attack the roots of society by destroying confidence in institutions and encouraging lawless behaviour. Responding to a strong demand from those EU bodies that have a responsibility for helping Member States combat fraud, ISIS has expanded its work in this area.

Animal tagging

Work continued on animal tagging. The objectives are firstly to evaluate the performance of electronic identification devices in a test covering a period of three years and involving a million animals and secondly to advise how the scheme could be extended to the approximately 300 million livestock in the EU.

In 1999, the central IDEA data base system at the JRC was implemented and tested, the X-400 communications connections with all the participating organisations set up and the EDIFACT conversion software installed to permit electronic data interchange with the participants' regional databases. New equipment for IDEA was tested and certified in the TEMPEST laboratory. By September, about 150,000 animals had been provided with electronic identification devices and data from the participants began to arrive at JRC.

IT support for OLAF

ISIS continued to apply specialised information technology on behalf of the European Union's anti-fraud body, OLAF. During 1999, studies were completed on data warehousing technology for paying agencies' data and on workflow management technology applied to two processes in OLAF. On VAT fraud, a problem statement was completed and prototype software developed. Projects on automatic intelligence gathering from the Web, and language engineering were started.

Statistical techniques were used to help improve auditing of agricultural support payments. Transactions were analysed in an effort to improve error estimation and optimise a sampling strategy.

ISIS worked on two projects on behalf of the Fisheries Directorate. The objective of the first was to understand how space-borne synthetic aperture radar imagery could complement a vessel-mounted GPS-based monitoring system (the VMS system). It was found that even coarse imagery could detect vessels in the Flemish Cap fishing area and that the positions of those with VMS installed were consistent with the VMS information. In the second project a web-based information system on the identification of the origin of commercial fish using DNA was completed.

- ***Risk assessment and decision support***

ISIS institutional work on risk assessment and decision support is based on two linked themes:

1. The development of harmonised European reporting systems for incidents so that risks can be compared, duplication avoided, lessons learnt, the public informed and mitigation measures found; and

2. The development of methods and tools for the integrated assessment of policy options.

The Major Accident Hazards Bureau (MAHB) supports the implementation and monitoring of EU policy on the control of major hazards and the prevention and mitigation of major accidents. It manages and maintains the distributed information exchange and analysis tool with which Member States report data on major accidents – the Major Accident Reporting System (MARS) – and also the Community Documentation Centre on Industrial Risks (CDCIR). During 1999, a prototype version of the 'Seveso Plant Information Retrieval System' (SPIRS) was completed and a full set of 'Guidance documents' published.

The Natural and Environmental Disaster Information Exchange System (NEDIES) entered the operational phase. A first draft of a 'lessons learnt report' on natural disasters was completed.

The JRC makes the software for the European Co-ordination Centre for Aircraft Incident Reporting System (ECCAIRS) available to all aviation authorities in the EU and integrates the data in an information system, accessible from all Member States. During 1999, a new graphical analysis tool (Grapher) was completed. The Nordic countries and Germany decided to base their future reporting systems on ECCAIRS.

ISIS's work on integrated assessment aims to support both of the main aims of European environmental policy – to integrate sustainability considerations into all sectoral policies and to replace the command-and-control approach with shared responsibility between

government, industry and the public. ISIS has participated in a number of collaborative projects, both indirect actions from the Fourth Framework Programme and projects on behalf of regional authorities. The main deliverables were software products combining satellite observations and ground measurements, multi-criteria decision aids and tools for participatory decision-making.

Environment Institute (EI) (Ispra)

Institute Director	***Jean-Marie MARTIN***
1. Management support	Emanuela ROSSI
2. Environmental impact	Peter PÄRT
3. Air quality	Dimitrios KOTZIAS
4. Atmospheric processes in global change	Frank RAES
5. Soil and waste	Giovanni BIDOGLIO f.f.
6. Water research and monitoring	Peter PÄRT f.f.
7. Renewable energies	Heinz OSSENBRINK

Mission

The mission of the EI is to carry out research in support of EU policy for the protection of the environment and the citizen. The prime objectives of EI are to investigate the level and fate of contaminants in the air, water and soil, to assess the effects of those contaminants upon the environment and individuals and to promote a sustainable energy supply.

In 1999, the Environment Institute focused on air quality, atmospheric processes in global change, soil and waste, water research and monitoring, renewable energies and research on environmental impact with emphasis on radioactivity environmental monitoring and environmental integrity and human health.

- ***Air quality***

Integrated Air Quality Assessment (IAQA) includes all essential methodologies needed for exposure-based urban air quality assessment. The project includes:

- Broader aspects of air monitoring – measuring campaigns in urban areas, participation in the European Monitoring Evaluation Programme (EMEP) for trans-boundary air pollution;
- New monitoring techniques – diffusive sampling for priority pollutants;
- Quality assurance; and
- Pre-normative work for new air quality directives – poly-aromatic hydrocarbons, heavy metals and Particulate Matter 2.5.

The successful participation in competitive projects, e.g. MACBETH, has significantly contributed to the preparation of the European Commission proposal for a Benzene Directive. In view of the implementation of the Air Quality Framework Directive, ERLAP organised two inter-comparison exercises in 1999 for sulphur dioxide, nitrogen oxides, ozone and carbon monoxide with the participation of 18 national reference laboratories. The aim was to

harmonise the calibration procedures in the Member States and to control the accuracy of the national reference standards.

Successful air quality conference

The Air Quality 2000 Conference was jointly organised by the Environment Institute/ERLAP, DG Environment and the Fondazione Maugeri (I) from 19-21 May 1999 in Venice. It created an opportunity to present both the scientific community and the Public Authorities with recent knowledge on air pollution and jointly to debate more efficient technical and political strategies for its control. More than 550 participants from research organisations, national and international authorities and industry attended the Conference.

The AUTO-OIL II programme went into its final phase for the establishment of an integrated strategy on ambient air quality in Europe. A report on the forecasted air quality for 2005 and 2010, taking into consideration both regulated and non-regulated pollutants will be available early in the year 2000.

A new reference laboratory on waste incineration and vehicle emission

During 1999, the European Reference Laboratory on Waste Incineration and Vehicle Emission Measurements (ERLIVE) performed several tests in the pilot plant for waste incineration to optimise its performance and the instrumentation. In the vehicle test facility, particulate emissions from diesel and gasoline vehicles have been characterised under various running conditions.

- ***Atmospheric processes in global change***

Studies focused on the study of physical, chemical and biological processes controlling the tropospheric concentrations of reactive gases (e.g. ozone) and stable greenhouse gases as well as aerosols. They aim at understanding the interactions between these three issues in order to provide an integrated scientific basis for EU environmental regulatory actions, including the assessment of the outcome of the Kyoto Protocol.

The EI carries out its own research, co-ordinates European projects, and promotes international networks on research and systematic observations. These activities are relevant to DG Environment, complement the DG Research shared-cost-action programmes on Environment and Climate, and contribute to international environmental programmes – e.g., International Geosphere Biosphere Programme (IGBP).

Previous research pointed at the finding that secondary aerosol formation, and its interactions with photo-oxidants, plays a central role in atmospheric processes. As a follow-up, in 1999, large efforts were devoted to initiating the PHAMA project (an investigation of the links between Photo-oxidants, Aerosols, and specific meteorological patterns through experimental and modelling studies in the Mediterranean Area).

Project members completed the collection of data of the FP4 BEMA (Biogenic Emissions in the Mediterranean Area) and ACE-2 projects (Aerosol Characterisation Experiment), in the form of special journal issues and data archives (CD-ROMs). They form a strong basis for future PHAMA activities.

Leader in aerosol characterisation

An on-line single particle mass spectrometer produced its first results in the EI laboratory. This put the unit in the front line among the world leaders of aerosol characterisation. This frontline instrumentation will be used in future investigations within the PHAMA project and within future competitive and institutional activities.

The EI's 'Atmospheric processes in global change' unit has become increasingly involved in supporting the EU policymaking process. For example, it contributed to development of the Ozone Directive and to the implementation of the Kyoto Protocol.

- ***Soil and waste***

During 1999, the main focus has been the implementation of the Impacts of Waste Emissions on Soils (IWES) project. The aim of IWES is to conduct research in support of EU policies on soil protection by establishing relationships between soil pollution and pressures from industrial, urban and agricultural waste producing activities.

An expert meeting, involving a number of Member State institutions, was held to investigate the feasibility of setting up a network on European Watershed-wide Assessment of Soil and water Pollution (EuWASP).

In collaboration with several partners – the European Environmental Agency, Consejeria de Medio Ambiente, Consejo Superior de Investigacion Cientificas and the SAI – a field campaign was organised to study the consequences of the Aznalcóllar mine accident that caused the discharge of toxic slurry along the Guadiamar river.

On the basis of various European Environmental Agency (EEA) initiatives, more than 100 regional indicators on contaminated sites for Europe have been proposed to the EEA Topic Centre Soils. Following a request from DG Environment, an activity has been launched to gather information on concentrations of heavy metals and levels of organic matter in European soils.

The installation of a new high-resolution gas chromatography/mass spectrometry (HRMS) laboratory to measure dioxins and related persistent organic pollutants has progressed. The facility will be fully operational at the beginning of 2000 to provide support to EI and other JRC projects.

Research work on greenhouse gas emissions from soils was carried out as part of the NAME Project. Field measurements of methane and nitrous oxide emissions from rice paddies were carried out using tunable diode laser spectroscopy coupled with micrometeorological techniques.

- ***Water research and monitoring***

The EI reinforces its support to the Commission in the field of water quality
The main achievement was the official participation of the EI in all the technical committees of the water-related Directives. This made possible a more institutional and effective involvement of the JRC as the scientific/technical branch of the European Commission in the field.

The involvement of the JRC in the European Approval Scheme on Construction Products in contact with Drinking Water (CPDW) allowed the realisation of a European Testing laboratory for CPDW in Ispra. This constitutes the first element for EURODWA, the EURopean Drinking WAter observatory.

Sustainable Waste Water Management. The main scientific successes where the first scientific results from the newly established laboratory of micro-calorimetry and respirometry on activated sludge physiology, and with the first results on the fate of selected organic micropollutants in sub-surface flow reed beds. Successes have also been achieved in experiments of macrophite removal from the shallow zones of sub-alpine lakes.

DAQUA (DAta QUAlity) Here, a series of collaborative laboratory performance studies has been prepared. The matrices and related determinants were:

- Road dust powder and sewage sludge powder for metal analysis;
- Sewage sludge powder for the analysis of persistent organic chlorine compounds; and
- Polycyclic hydrocarbons.

The series on waste water analysis has been continued by preparing two simulated waste water materials (municipal and industrial) for the analysis of sum parameters (DOC, COD, AOX) and simple ions. Laboratory participation, both in EU Member States and Accession Countries, varied between 54 (organic compounds) and 175 (waste water) for each study.

ESCON (European Scientific Coastal Zone Observational Network) Here the main efforts have been focused on setting up the proposed network. This has consisted of holding an experts' meeting in Ispra where both river basin and coastal zone scientists were invited to provide input to the project, discuss objectives, identify possible test sites, and agree on a strategy to develop a European network. A number of potential test sites have been identified and contacts made with local authorities and institutes to discuss collaboration.

- ***Renewable energies***

The Photovoltaic and Solar Thermal Electricity (SOLAREC) project has defined three main objectives to develop, demonstrate and promote the use of solar electricity in a wide scale for the benefit of the European Citizen:

1. Reference measurements;
2. Materials supply and cost reduction;
3. Systems integration.

The project has organised co-ordination meetings between manufactures of the raw materials for conventional silicon solar cells and the manufacturers of finished photovoltaic solar modules, together with researchers, in order to define a consistent and directed approach to meeting the environmentally oriented energy challenge of the new century. This resulted in a common agreement on a road map for the development of solar photovoltaic energy over the next ten years.

Considerable efforts have been devoted to identify alternative materials for solar cell production, as the demand for photovoltaics cannot be satisfied by silicon alone. Among others, poly-crystalline thin films, CIS and the more common amorphous silicon materials were evaluated in terms of their stability and performance. Initiatives are also under way to look at the potential of Dye solar cells produced from organic compounds.

The large-scale deployment of independent small photovoltaic systems to provide a minimum of light and power to remote locations needs considerable improvement of system reliability. The group has developed standard test procedures for quality assurance for these systems and is now operating specific tests on them.

The development of applications of solar photovoltaics in the construction environment has been enhanced by the realisation of several demonstration installations within the project, integrating solar photovoltaic systems into new buildings and developing methods to asses and quantify the associated benefits from these installations.

The Best Available Technologies for Efficient and Environmental Energies (BATEEE) project targets three main topics:

1. The assessment of new energy efficiency measurements using Information Technologies (IT) in buildings. This is a new field of development, which can be used by energy service companies in a competitive electricity market to foster energy efficiency investments.

2. Investigation on electricity saving in office buildings. The service sector has shown in the past decade the fastest growth of consumption. The potential of saving for personal computers (PCs) and lighting was analysed. The study of PC stand-by losses has shown that existing low-energy features have to be more generally applied.

3. System studies of Electric Motor Systems (EMSs). About half the electricity consumption in the EU is due to EMSs. To promote electricity saving of EMSs, support information tools such as databases and diagnostic software are being developed. The JRC has produced the EuroDEEM database and an upgraded version was released in 1999.

The Advanced Electricity Storage (ADELS) project: In the field of storage, facilities were set up to allow measurements of hydrogen adsorption in carbon nanostructures at temperatures from 80 to 873K (-193 to 600°C). Initial measurements were also performed as a function of pressure and temperature. They showed that the as-received samples adsorbed between 0.1 and 2.4% by weight of hydrogen, depending on temperature and pressure. In collaboration with ISIS, an in-house development of a centrifugal electrochemical power source has been started. The objective is to develop and test a novel idea on enhancing the performance of fuel cells and other electrochemical power devices by using strong centrifugal forces.

Producing single wall carbon nanotubes

Activities on nanotechnology have started, with particular attention to the recently discovered single-wall carbon nanotubes (SWNTs) for energy storage applications (hydrogen storage). Initial measurements of its storage capacity were performed as a function of pressure and temperature. A new method for producing carbon nanotubes has been developed. It has the potential for continuous production with much lower energy costs than the current energy-intensive batch processes.

The Hydrogen from Biomass (HYDRA) project aims to assess and promote the production of hydrogen from renewable sources. For the steam-reforming of (bio-)ethanol, a catalyst evaluation is in progress. Collaborative research on the purification of bio-gas has demonstrated that fixed beds offer advantages for tar removal. The new catalyst for hydrogen production by steam reforming is cheap, effective and not degraded.

- ***Environmental Impact research***

Radioactivity environmental monitoring

In support of EU environment policy, the Radioactivity Environmental Monitoring (REM) project is focused on establishing an automatic information system for collecting and evaluating and exchanging information (measurement data and model predictions) on radioactivity levels in normal (REMdb) and in emergency (EURDEP, ECURIE, RTMOD) conditions.

Long-range atmospheric dispersion modelling

*The Real Time MODel evaluation system (RTMOD) has been completed within the planned time limits. It allows for the acquisition and communication of long-range atmospheric dispersion model results from a worldwide community of modellers. A series of dry runs were carried out during which the model results were acquired and compared in realtime. A web-based system for realtime statistical evaluation of long-range dispersion models was developed for this work (*http://rtmod.ei.jrc.it/rtmod). *The successful final meeting, held at Ispra, saw the participation of about 30 modellers from Europe as well as from Japan and the USA.*

Environmental integrity and human health

The toxicity of selected groups of environmental pollutants has been assessed *in vivo* and *in vitro* on sensitive target species. The search for reliable biomarkers of exposure/effect has driven the approach adopted using cell biology, molecular biology and biochemistry.

Research on endocrine disrupting chemicals (EDCs) has progressed. The development of advanced molecular biology-based testing methods for EDCs is of particular interest. These will be by randomly amplified polymorphic DNA (RAPDs) analyses in mRNA from keratinocytes and murine embryonic stem cells and by construction of a transgenic cell line model. Suspected EDCs have been successfully screened using the uterotrophic assay and primary cultures of uterine epithelium. Finally, a patented transgenic mice model (hsp70/hGH) on chemical stress response has been successfully applied in toxicological experiments with environmental chemicals and drugs.

There is an active role in the EU and worldwide – US Environmental Protection Agency (EPA) and the World Health Organisation's International Programme on Chemical Safety (IPCS-WHO) – research on the environmental and human health impact of EDCs. Of particular relevance are the Global Endocrine Disrupters Research Inventory (GEDRI) database now housed at the EI and the meeting of experts in Ispra within the EU-US Transatlantic co-operation in Human and Environmental Health on EDCs.

Space Applications Institutes (SAI) (Ispra)

Institute Director	**Rudolf WINTER**
Head of unit acting as Institute Deputy Director	Jean MEYER-ROUX
1. Management support	Albert JERABEK
2. Technologies for detection and Positioning	Alois SIEBER
3. Environmental geo-information	Jacques MEGIER
4. Agriculture and regional information systems	Jean MEYER-ROUX
5. Global monitoring of vegetation	Alan BELWARD
6. Marine environment	Peter SCHLITTENHARDT
7. Strategy and systems for space applications	Peter CHURCHILL

Mission

The mission of the SAI is to develop and promote the use of space-derived data in combination with geospatial information from other sources in the service of EU policies, especially in disciplines that relate to agriculture, fisheries, transport and anti-fraud. SAI also seeks to make the best use of information from space systems, to maximise the return obtained from European investments in space, and to help the EU reinforce its role in international action on the environment and sustainable development.

In 1999, the Space Applications Institute's work has been organised in 11 projects that expand horizontally through its six scientific units. Driven by the goal to provide competent technical support to EU policies, the SAI will continue to interact with policy DGs to identify relevant areas of activities where it can offer technical expertise within the framework of institutional activities within FP5. The SAI will continue to develop its outputs further from analysed satellite data towards spatial information services, thus integrating space data with all other relevant information sources and techniques. The end product will be designed according to user's needs and presented in a form accepted by decision-makers.

The MARS project has provided technical support and expertise to the Agriculture DG for more than ten years. It has developed, tested and implemented new methods and tools specific to agriculture, using remote sensing. New technological developments in precision farming techniques are being tested and the applicability of new sensors and satellites for agricultural applications assessed.

The GI and GIS project supports activities to create a European Geographic Information Infrastructure (EGII) focusing on technical aspects related to Geographic Information (GI) and Geographic Information Systems (GIS). The project further focuses on setting up harmonised and coherent multidisciplinary databases for an enlarged EU, including the conception, creation and harmonisation of various spatial pan-European databases.

- ***Serving the Citizen***

In the service of the citizen, the SAI has focused on developing systems and applications related to civilian demining and monitoring and managing natural hazards.

Civilian demining

The European Commission is strongly supportive of the 1997 Ottawa Landmine Convention, and recognises the need to reduce the anti-personnel landmine threat. Within this framework, the SAI has worked on the development and application of demining technologies, including:

- Investigation of techniques such as sensor data fusion for minefield surveys and mine detection;
- Development of improved sensors for detection; and
- Improvement of processes for clearance and quality assurance.

The objective has been to ensure that appropriate and safe equipment is made available quickly to mine-action programmes, and that key technologies necessary for demining activities are further developed and improved. Meanwhile emphasis was given to the organisation of demonstration experiments and the creation of efficient information management systems.

Monitoring fires and floods

In the field of natural hazards, emphasis was given to monitoring forest fires and floods. In particular, the SAI initiated the development of an information system on forest fires in Europe, which includes historical series of forest fire risks, daily and forecast forest fire risk, evaluation of burnt areas, and estimates of forest fire damage. Meanwhile, research work was related to the development of a flood-simulation model for national and trans-national catchment areas. Flood damage assessment tools are in preparation.

During 1999, there was excellent visibility outside the JRC. The national water authorities of Poland, the Czech Republic and Germany and the national forest fire services of Portugal, Spain, and Greece are directly involved in the project activities. Within the framework of STRIM (Space Techniques for Major Risks Management) support, France, Greece, Portugal, Spain, Algeria, Russia, and Bulgaria requested the proposed project services

- ***Environment and sustainability***

Global monitoring of environment and security

The Global Monitoring of Environment and Security (GMES) initiative supports the development of an independent European global monitoring capability for environment and security, involving space agencies, private industry, research organisations, environmental organisations and the relevant European Commission services, thus supporting the establishment of private-public partnerships. The SAI leads the GMES initiative, and is supported by a number of European partners. To sustain this initiative, a GMES Office was opened in April 1999 at the SAI, which offers space industry an opportunity to develop its own strategy in Earth observation for the next century by benefiting from the vicinity of the Commission and other European space companies. The development of an environmental monitoring system in support of the UN Framework Convention on Climate Change (the Kyoto Protocol) will form a central part of this activity

The SAI placed special emphasis in 1999 on environmental monitoring using space-derived data. Activities range from developing global environmental information systems to monitoring coastal zones, air quality and the European landscape, covering both rural and urban areas.

Within the framework of existing international conventions – such as the Framework Convention on climate change, the Convention to combat desertification and the Convention on biological diversity – and the commitments made by the EU to the Kyoto Protocol, the SAI launched the Global Environmental Information Systems (GEIS) project. This focuses on issues such as the state and evolution of the global vegetation cover, the current global forest resources, and the ocean primary production.

On these lines, using VEGETATION data at 1-km resolution from 1999 onwards, a land-cover map and seasonal parameters have been created together with the development of methods for inventory, mapping and monitoring of global forest resources. In particular, the 'World Fire Web' network was initiated, providing maps of global fire activity. Deforestation risk models as well as specific algorithms started being developed to predict changes and to improve estimates of marine productivity.

Research work was also carried out to evaluate, and test the capabilities of space-borne Earth observation to provide information on air quality. Results were obtained for nitrogen dioxide and sulphur dioxide. The project aimed at developing retrieval methods to estimate near surface ozone concentrations using data assimilation techniques in atmospheric models and the temperature dependence of the ozone optical absorption.

Geo-information for the European landscape

With a view to collecting geo-information for the European landscape, the EURO-LANDSCAPE project was launched, with the following three key areas:

- Spatial development and land-use dynamics, dealing with built-up areas and areas affected by transport;

- Environmental indicators for environmental protection, dealing with the mitigation of land degradation, desertification; and

- Rural development, monitoring the European rural environment.

In the field of land-use dynamics, reference land-use data over different study areas was combined with land-cover data and other information layers related to the transport network, and with socio-economic data which provided the basis for developing more complex indicators. The scenarios are expected to be used for formulating and evaluating long-term strategies towards a sustainable development.

A degradation network was created covering seven sites throughout the Mediterranean region where the most critical land-degradation processes occur, resulting from natural hazards or socio-economic factors. Based on the data collected, a set of indicators started being defined at a regional level. Close contact with the European Environment Agency was established.

Rural development and monitoring

Activities were also undertaken in support of rural development and environmental monitoring:

- Mapping of the forest and grassland resources in the pan-European area – including the production of the European Forest and Communication Information System (EFICS); and

- Catchment characterisation and modelling – including the development of models integrating bio-physical, social and economic factors to assess the environmental impact of EU policies related to the rural environment.

The COAST project was launched to support policies related to sustainable exploitation of marine resources, prevention and control of water quality, and decision support to the management of coastal areas. It builds on a series of scientific and technical advances to analyse data in the optical, thermal and microwave range. Research work was conducted on archive data. Target areas included building a system for the continuous identification of oil spills, developing a fisheries information system, and an integrated coastal information system.

- ***Agriculture***

In the field of agriculture, the Monitoring Agriculture with Remote Sensing (MARS) project continued to provide technical support and expertise to the Agriculture DG by developing, testing and implementing new methods and tools specific to agriculture using remote sensing. The project is divided into four main activities:

1. The fight against fraud;

2. Crop and yield monitoring;

3. Specific surveys; and

4. New sensors and methods.

In this framework, quality checks were performed. Evaluation methods, a parcel identification system and automated counting of vineyards and olive trees were tested. Information on crop-yield monitoring and area estimates was regularly supplied. Area-frame sampling techniques were applied to provide rapid and specific information needed for the definition or reform of agricultural policies. Finally, new technological developments in precision farming techniques are tested and the applicability of new sensors and satellites for agricultural applications is assessed. Last but not least, an initiative related to managing and monitoring schemes related to Agri-environment was launched.

Control of area-based agricultural subsidies

In the autumn of 1998, the Agriculture DG and the JRC agreed to transfer to the JRC the responsibility for providing technical support to Member States related to the control of area-based subsidies, an operational activity at a European level in the field of agriculture. Thus, in 1999, the SAI successfully started providing this service. This included close collaboration with the national administrations of all Member States with the exception of Luxembourg. More than 700 satellite images were purchased and distributed to 18 contractors. A number of these contractors were quality controlled. The purpose was to assess their work by applying a series of well-defined checks and appraise the specific results achieved.

- ***Underpinning European competitiveness***

To underpin European competitiveness, the SAI continued its activities related to the Centre for Earth Observation, and focused on developing new key applications on the synergy of satellite telecommunications, Earth observation, and navigation (ASTRON). The SAI launched activities targeting the harmonisation and interoperability of Geographic Information (GI) and Geographic Information Systems (GIS).

The Centre for Earth Observation (CEO) project continued, pursuing activities leading to an operational Earth-observation capability in Europe seeking to meet the needs of EU policies. These needs are expected to be used to stimulate the associated industry and to raise European competitiveness in this field. The Information on Earth Observation (INFEO) system was finalised and launched in September 1999.

Exploring synergy

Within the general framework of space technologies, the Applications on the Synergy of Satellite Telecommunications, Earth Observation and Navigation (ASTRON) project, following its pathfinder phase, initiated a series of activities investigating the synergy of Earth observation, satellite communications and satellite navigation. The aim is to introduce innovative and sustainable services and applications based on the convergence of digital information from satellites. Target areas included:

- Applications requiring fast transfer of Earth-observation data and products; saving resources applications; business applications;

- Global Navigation Satellite System (GNSS) transport applications; and

- GNSS non-transport applications.

Work included monitoring and assessment of technology; analysis of market and industry trends; and study of applications and users requirements.

Developing geographic information

The GI and GIS project supported activities to create a European Geographic Information Infrastructure (EGII) focusing on technical aspects related to Geographic Information (GI) and Geographic Information Systems (GIS). It included four components:

1. Technical support was supplied to the European Commission providing documents relating to GI;

2. Assistance was provided for the creation of the EGII by supporting the policy making process in infrastructure issues and in formalising specifications;

3. Technology watch was performed in areas such as interoperability, GI & GIS standards and market monitoring;

4. The project focused on setting up harmonised and coherent multidisciplinary databases for an enlarged EU including the conception, creation and harmonisation of various spatial pan-European databases.

In 1999, major information dissemination efforts were put into the use of Internet. Moreover, the development of a pan-European soil erosion risk assessment started.

INSTITUTE FOR HEALTH AND CONSUMER PROTECTION (IHCP) (Ispra)

Institute Director	***Finbarr McSWEENEY****
1. Management support	Giacinto TARTAGLIA
2. Food products and consumer goods	Elke ANKLAM
3. Validation of biomedical testing methods	Michael BALLS
4. Toxicology and chemical substances	Ernst VOLLMER
5. Support to pharmaceutical regulation	Flavio ARGENTESI
6. Biomedical materials and systems	……..

***** Appointed in 2000.

Mission

The mission of the IHCP is to support EU policies for health and consumer protection. IHCP carries out research to improve the understanding of the hazards, exposure and risks posed by food contaminants, drugs, chemicals, products, services and systems and to develop, validate and apply advanced methods and strategies of a high scientific quality.

In 1999, a set of guidelines was implemented to strengthen the role of the Institute for Health and Consumer Protection structure as a research asset and as a reference service of the European Commission in areas of increasing priority for the EU citizens. The activities of the IHCP were undertake along five major work lines:

1. Analysis of food products (safety and quality control, genetically modified organisms), food contact materials and other consumer goods;

2. Validation of non-animal alternatives to animal testing for regulatory toxicology;

3. Information services and risk assessment/management of chemical substances;

4. Research and validation of biomedical materials/systems and diagnostic/therapies in nuclear medicine; and

5. Information/communication systems for regulatory actions to enhance consumer tutelage.

The IHCP unit for food products and consumer goods acted in rapid response to the dioxin crisis by setting up screening methods for the source of contamination of Belgian food and feeds with dioxins. Selected food products were analysed as a support to the Belgian laboratories.

In the validation of biomedical testing methods, *in vitro* methods were endorsed as a replacement for animal production systems, for all levels of monoclonal antibody production – e.g., for vaccine production and in the quality assessment of immunobiologicals and hormones.

The IHCP's International Uniform Chemical Information Database (IUCLID), in use in the EU, was adopted by the International Council of Chemical Associations (ICCA) thus opening the way for IUCLID to being taken up by the USA and Japan as the basis for the exchange of information on chemicals.

- ***Food products and consumer goods***

IHCP analysis of food products and other consumer goods aims to respond adequately and independently to consumer concerns regarding food safety and quality. Technical support is provided for the implementation of EU policies in the field of food and related items – including feeding stuff – as well of other consumer products such as childcare products and cosmetics.

Activities on food safety were carried out on natural toxicants (e.g. mycotoxins), and pesticides in food, and on the presence of mycotoxins and other parameters in feeding stuff within the framework of BSE. The IHCP has completed a kinetics study for migration and several monitoring studies at a European level concerning the contamination of various food products with bisphenol-A-diglycidylether (BADGE), used in the lacquer of cans. The transfer of the reference collections of monomers and additives used in food contact materials into a single specimen bank in the JRC Ispra site has been completed.

The IHCP was also involved in a restricted ring test using a technique for the mechanical simulation of phthalates migration from toys and childcare articles and has developed a prototype machine for the investigation of gnawing and chewing of toys by babies on simulants of physiological saliva.

Simplified food testing methods

Simplified methods for the determination of polychlorinated biphenyls (PCBs), the source of the recent contamination of Belgian food and feeds with dioxins, were set-up and selected food products were analysed as a support to Belgian laboratories. Analysis of samples from blocked meat in Russia and milk powder for developing countries was also performed within the framework of EU humanitarian help programmes.

Development and validation of methods for food quality control – such as authenticity proof of fruit juices and vegetable oils – were been carried out, as well as studies to assure compliance with labelling (e.g. chocolate and dairy products).

The management of the BEVABS (the European office for wine, alcohol and spirit drinks) databank is a permanent assignment of the IHCP and was continued in 1999.

Boost to GMO studies

The microbiology laboratory upgrade was completed in 1999, and will allow molecular diagnostic studies within the field of genetically-modified organisms (GMOs). In support of the IRMM, which is in charge of the preparation of reference materials, several batches of reference materials containing GMOs have been analysed using diverse polymerase chain reaction (PCR) based techniques – direct, nested or using different varieties of PCR primers. These materials are and will be used in the development and validation of new methods for the detection and quantification of GMOs in food items. The validation trial of a protein-based method applied to genetically-modified soy beans (Roundup Ready^{TR}) has been concluded.

Activities on GMOs are carried out in support of the implementation of EU regulations regarding their release into the Environment. In 1999, more than 150 dossiers dealing with field trials have been analysed for the compliance with European Biotechnology Directives. A

project has been initiated to promote the exchange of information between Member State authorities to access and share information easily on GMOs issues and documentation.

Several workshops and official meetings have been organised within the IHCP on various food-related items – such as analysis of BADGE, determination of GMOs, reference cocoa butter, extraction of fat-soluble vitamins, quantification of caseinate in cheese and 1998 vintage for BEVABS.

- ***Validation of biomedical testing methods***

The European Centre for the Validation of Alternative Methods (ECVAM) of the IHCP is today the reference centre, at international level, for the development, scientific and regulatory acceptance for alternative testing methods – e.g. *in vitro* studies using cell tissue cultures, computer-based testing and use of non-invasive technologies in human volunteers. This work is aimed at replacing, reducing or refining the use of laboratory animals and to be applied in different fields of the biomedical sciences. This is done through:

- Co-ordination of prevalidation/validation of alternative test methods at the European level;

- Research and new test development;

- Implementation and maintenance of the ECVAM databases to provide, through the ECVAM Scientific Information Service (SIS), a specialised information tool concerning the state-of-the-art of alternative test development and validation; and

- Organisation of ECVAM workshops and task forces to review the current status of alternative tests in specific areas and make recommendations about the best ways forward, to promote the integration of *in vitro* tests and other alternative methods into the regulatory process.

Test development and prevalidation/validation of *in vitro* tests were performed in the areas of: embryotoxicity (assays using micromass cultures, rat whole embryo cultures and embryonic stem cells); haemotoxicity (related to the blood-forming system); and for *in vitro* models for the blood-brain barrier. In 1999, prevalidation studies were also initiated in the areas of skin-irritation testing, metabolism-mediated toxicity and nephrotoxicity testing.

In 1999, the development of the main SIS databases – on Alternative methods (dbAlm), including the INVITTOX protocols in full; on Validation studies (dbVas); and on Workshop Reports – has continued.

Other highlights include:

- A patent application has been filed for an innovative model based on genetically-engineered neuronal cell lines for pharmaco-toxicological testing, and which will permit the elucidation of mechanisms on neurological disorders and neuromuscular diseases.

- *In vitro* methods are now available for all levels of monoclonal antibody production (e.g. used for vaccine production and in the quality assessment of immunobiologicals and hormones). They have been endorsed by the ECVAM scientific committee (ESAC) as replacements for animal production systems.

- An on-line organisational structure for *in vitro* toxicological work (OLIVE© JRC) is being developed, which will facilitate the implementation of the OECD Good Laboratory Practice (GLP) principles for *in vitro* toxicological studies. OLIVE© JRC is copyright protected and a trademark has been applied for.

- ECVAM organised the Third World Congress on 'Alternatives and animal use in the life sciences', held in Bologna, Italy, from 29 August to 2 September 1999. This was a major event, which brought together about 800 scientists, including 30 from the JRC, and will certainly reinforce the reputation of ECVAM, the IHCP and the JRC in this area.

'In vitro' workshops

Three ECVAM workshops were held in 1999, on:

- *In vitro models for the intestinal barrier, (Rennes);*
- *Long-term in vitro toxicity testing, (Innsbruck); and*
- *A second workshop on 'In Vitro Photoxicity' (Berlin).*

In addition, an ECVAM symposium on 'Integrated Testing' was held at Ispra.

- ***Toxicology and assessment of chemical substances***

The European Chemicals Bureau (ECB) provides scientific and technical support for the conception, development, implementation and monitoring of EU policies on dangerous chemicals. The ECB is the focal point for collecting information on new and existing chemicals. It manages the assessment of risks posed to workers, consumers and the environment. It supports:

- Legal classification and labelling;
- The notification of new substances;
- Information exchange on import and export of dangerous substances;
- The development and harmonisation of testing methods; and
- The authorisation of biocides.

Permanent responsibilities of the European Chemicals Bureau (ECB) include the assessment of risks which may be posed by existing and newly developed chemicals to health and the environment, the development of testing methods, the notification procedure for new chemicals and the Export/Import scheme. In 1999, the ECB organised and hosted in the classification and labelling area, working group meetings on effects on the environment, on health, and on health and environment.

IUCLID database adopted worldwide

In 1999, the International Uniform ChemicaL Information Database (IUCLID), which is developed and maintained by the ECB, was adopted by the International Council of Chemical Associations (ICCA). This is a major step forward in standardisation, as the world chemical industry will now use the IUCLID database to collect and distribute chemical data and to enhance accessibility to information on chemical substances.

In the area of risk assessment for existing substances, the ECB has contributed to the development of a risk-assessment methodology for the marine environment. In the Export/Import sector, the EDEXIM CD-ROM was issued in 1999, and contains information on import/export of restricted chemicals under Regulation (EEC) 2455/92. Five testing methods on the effects of man-made mineral fibres have been developed. Activities on biocide substances have been oriented towards the preparation of guidance documents for the implementation of EU Directives in this area, scheduled for May 2000.

- ***Biomedical materials and systems***

This work includes three main projects;

- Studies of bio-compatible materials and functional systems;
- Activities on radio-tracers for nuclear medicine; and
- Analysis of material releases during processing, packaging and use of consumer products and medical implants.

In 1999, activities in the field of biomedical materials included the deposition of bio-compatible thin films to enhance the integration of prostheses with bone tissues and prevent metal migrations from these devices. The coatings presently under consideration include carbon-based materials, zirconia, HAP and bio-active glasses/nacre to be applied on orthopaedic devices and dental implants. Activities undertake to improve surface functions include the modification of topography in new titanium alloys for orthopaedics and in bio-compatible polymers to be applied in orthopaedics and catheters.

The use of techniques for the investigation and the validation of coating and surfaces characterisation underpin all of the above tasks. These comprise electronic microscopy/ spectroscopy, auger electron spectroscopy (AES), x-ray diffraction (XRD) and photoelectron spectroscopy (XPS), including the assessment of their use for a wider range of ceramics as well as for studies of polymeric materials.

Accurate wear measurements

Performance testing of biomedical devices was conducted along two main lines, for pre-normative activities – wear and chemical releases from implant materials. Studies for on-line monitoring of ultra-high molecular weight polyethylene (UHMWPE) wear have been conducted using ultra thin layer activation (UTLA). This allows accurate measurement of very small amounts of wear resulting from metal-UHMPWE interaction, such as those arising in hip joints. A hip-joint simulator and a pin-on-disk machine for wear simulation under multidirectional sliding motion have been developed and constructed in-house. Radiotracers were also considered for the measurements of small amounts of released nickel in relevant

large volumes of biological environments, for studies of allergies due to chemical releases from medical implants.

Biomechanical modelling activities have been focused on odontoiatric (i.e. related to the teeth) applications. Bio-resorbable membranes, new titanium alloys and BICON® dental implants have been considered. Modelling results have been compared with the outcomes from mechanical tests, in which the mechanical resistance has been measured.

Radiotracer production

In the field of activities on radiotracers for nuclear medicine, the upgrade of the cyclotron beam line for the production of fluorine 18 has been undertaken and the implementation of the fluorodeoxyglucose (FDG) production line was initiated – FDG is widely used for positron emission tomography (PET) medical imaging. The IHCP is co-ordinating a network for astatine-211 production. This network will ensure the availability of this isotope for research groups involved on their use for anti-cancer alpha-immuno therapies.

Studies on contamination of nutrition and consumer products caused by material release have been concentrated in pre-normative research in support of the Nickel Directive (e.g. related to consumer products in contact with the skin) and for migration during food processing. Systematic studies were undertaken on nickel release as a function of relevant test parameters, test time and statistical scatter on multiple samples.

Electrochemical thin layer activation facility

Activities on migrations during food processing have focused on the assessment of nickel and chromium releases from steels used in the large-scale production of glucose syrups. This works is being carried out using an electrochemical thin layer activation facility (ETLAF). ETLAF combines conventional electrochemical testing with radiotracer methodologies, available at the IHCP cyclotron, for the study of corrosion processes. It provides highly sensitive, realtime monitoring of low level metal releases into liquid food products.

- ***Support to pharmaceutical regulation***

Safety validation of medicinal products such as pharmaceutics, vaccines, blood derivatives, radio-pharmaceuticals and homeopathic medicines as well as biotechnology derivatives is essential to ensure the protection of the citizen's health. These regulatory procedures are greatly enhanced by the availability of management information/communication systems, developed at the IHCP. These are able to supply regulators with all the necessary information tools to monitor the evaluation of the scientific, efficacy and safety aspects of the medicinal products and to track the marketing authorisation processes of medicinal products throughout the EU.

In FP5, the aim pursued is to develop the Unified Tracking System (UTS), integrating the distinct marketing authorisation procedures and current telematic solutions – EudraTrack Mutual Recognition (EMR) and Application Tracking System (ATS) – previously developed by the IHCP. UTS is a telematic system that enables the tracking of all marketing submissions of medicinal products in Europe, and capable of monitoring improper submissions. In addition, the activities in this area include the design and implementation of a centralised database service (named MINE 1) which gathers all scientific, efficacy and safety information on medicinal products authorised within the EU.

UTS and MINE 1 prototypes

In 1999, prototypes of the UTS system and the MINE 1 database have been presented to the project stakeholders and customers. The UTS system aims to track the processes of evaluation and marketing authorisation of medicinal products. The MINE 1 database comprehend the available authorised medicinal products and product life tracking, including summaries of products characteristics (SPCs), and allows basic product searching, SPC retrieval and comparison of analysis functions.

The upgrading and extension of the existing network services of the EudraNet network was continued. Reports on the requirements for the implementation of Virtual Private Network (VPN), Public Key Infrastructure (PKI) for authentication and safety insurance, and Desktop Video Conferencing (DVC) have been issued, to sketch the specifications for the summing up of these services in the EudraNet II.

Electronic payment and electronic commerce reliability

The Laboratory for Electronic Payment and Electronic Commerce (LEPEC) project aims to provide a highly qualified, neutral and experimentally-based support to EU policies on electronic commerce and electronic payment systems, oriented towards the protection of consumer economic interests. The LEPEC project also covers the identification, study, monitoring and experimental testing of new technologies related to electronic commerce.

On-line commerce in medicines

In 1999, the objectives of the LEPEC were extended to include a preliminary assessment of the requirements for a reliable on-line commerce of medicines and pharmaceuticals. This was in response to emerging concerns and regulatory difficulties on the purchase of medicines on the Internet, following a request from the European Parliament.

Reports surveying security systems – on-line payments relying on credit cards; cryptographic algorithms and protocols used for Internet Security – have been issued. The specification, design and development of the consumers' Complaints Management System (CMS) have been documented encompassing its legal aspects. CMS is a communication tool between consumers, professionals – on-line sellers or service providers – and their associations to categorise and address problems arising in on-line transactions and other services, likely to affect individual economic interests aiming at satisfying consumers. A prototype version of CMS was completed and has been presented to the pertinent stakeholders and customers.

The set-up of the LEPEC facility – cryptography-based security laboratory, including biometrics identification equipment – is under way, and is to be finalised in the spring of 2000. The laboratory provides the necessary authentication to users of security critical applications such as CMS. The IHCP was also involved in the JRC cluster on Electronic Commerce and participated in the set-up of '*Electronic Commerce: JRC Strategy*' document.

Institute for Prospective Technological Studies (IPTS) (Seville)

Institute Director	**Jean-Marie CADIOU**
1. Management support	Claude TAHIR
2. Technologies for sustainable development	Per SØRUP
3. Technology, competitiveness, employment and society	Peter FLEISSNER
4. Technologies for life science, information and communication	Bernard CLEMENTS

Mission

The mission of the IPTS is to provide techno-economic analyses in support of the European policy-making process. IPTS's prime objectives are to monitor and analyse science and technology developments, their cross-sectoral impact, and their inter-relationship with the socio-economic context and their implications for future policy development. The IPTS operates international networks, pools the expertise of high level advisors, and presents information in a timely and synthetic fashion to policy makers.

The Institute for Prospective Technological Studies is an important component in the new orientation of the JRC towards a more explicit policy-support focus. The mission of the IPTS is to provide techno-economic analysis to support European decision-makers, by monitoring science- and technology-related developments and projecting the policy implications for the socio-economic context. By providing support to more than 20 different European Commission services, the IPTS cuts across administrative vertical lines and supports policymaking at the level of the Commission as a whole.

The IPTS also acts as a rapid reaction force for the European Commission and its services on ad-hoc issues, a typical example being IPTS' contribution of relevant and timely information to support the Commission's case in the recent EU-US beef hormones dispute.

In 1999, the Futures project was one of the most important tasks developed by the institute. This assesses the impact on technology, employment and competitiveness of the major drivers of change Europe will experience in the next ten years. The Futures project will present its main results at the "Futures" Conference, to take place in Brussels on 10 and 11 February 2000, which will be an opportunity to discuss the major interrelated questions analysed by the project and derive the main messages for policy makers.

Expanding networking actitivities

In 1999, the IPTS launched two new networks of research targeted at two strategic geographical areas:

1. The Techno-Economic Analysis network in the Mediterranean (TEAM); an informal network of experts, intended to alert decision-makers on S&T developments, informally discuss and analyse techno-economic strategies and their impact, and develop concepts for regional co-operation activities.

2. A prospective network with representatives of the pre-accession countries to address key techno-economic issues linked to enlargement and which will be of importance to the future of both parts of the new Europe being created.

The IPTS also operates a series of networks such as the European Science and Technology Observatory (ESTO), providing real-time information on the socio-economic significance of scientific and technological advances. It draws on resources and competencies of experts in 35 major 'think tanks' and other institutions across Europe and it functions as a virtual network-based 'European office of technology assessment'.

Use is made of external Advisory Groups, such as the High Level Economists group, comprising a number of eminent economists, amongst whom is Nobel Award winner Robert Solow.

Regrouping of activities

In 1999, IPTS activities have been restructured in three closely related units, covering the following fields of work:

1. Life sciences and information and communication technologies;

2. Technologies for sustainable development; and

3. Technology, employment, competitiveness and society.

These units manage the new range of IPTS activities, including the following ten main projects:

- Futures
- Mediterranean and regional perspectives
- Enlargement: Building linkages on prospective activities
- Environment and society
- Life sciences and impact on society
- Building the information society
- Electronic business
- Energy and sustainability
- Transport and mobility: Regional and global aspects
- Knowledge and skills: Perspectives for Europe

In 1999, the IPTS' new public web site (http://www.jrc.es) as well as its Intranet were launched and have quickly become a highly practicable communications and working tools for IPTS staff.

- ***The Futures Project***

IPTS' major prospective exercise, the Futures Project, investigates the impact on European technology, employment and competitiveness of the major drivers of change that Europe is going to experience in the next ten years. These include economic and monetary union (EMU), the completion of the Internal Market, EU´s enlargement, major demographic changes, fast technological change (notably in information and communication technologies, and in the life sciences area), and the need to take major steps towards environmental sustainability. All these elements simultaneously cut across policy areas, and are often the responsibilities of different vertical departments within the Commission, yet they strongly affect each other.

The project has drawn on over 120 experts from industry, academia, the Member States and from the Commission itself. IPTS has produced panel reports on the following issues: Demographic and Social Trends; Information and Communication Technologies; Life Sciences and the Frontiers of Life; and Natural Resources and the Environment.

Investigating future policy options

Early results of the Futures Project highlight some heavy trends that will significantly change Europe in 2010. The implications of an ageing population, the blurring boundaries between work, leisure and learning known as the 'mosaic society', and the extended use of new technologies raising a number of societal issues, are only a few examples of the challenges highlighted. Another important consequence of the ageing population, combined with the shortage of skills in the main drivers of growth (information and communication technologies in particular) is the need for the education and training system to address the more mature segment of the labour population. The project is currently investigating the policy options to meet such challenges.

The first results have been presented and extensively discussed at a seminar that took place in Brussels on 5 and 6 July 1999. The concluding Futures Conference is scheduled to take place in Brussels on 10 and 11 February 2000.

- ***Techno Economic Analysis network in the Mediterranean (TEAM)***

The Techno Economic Analysis network in the Mediterranean (TEAM) is an informal network of experts with access to high-level decision-makers in the Euro-Mediterranean region. This network is intended to alert decision-makers on science and technology developments, informally discuss and analyse techno-economic strategies and their impact, and develop concepts for regional co-operation activities.

Launched by the IPTS in October 1998, TEAM comprises several groups of experts of the Euro-Mediterranean area discussing critical policy issues for the socio-economic development of this region. These issues include skilled human development, industrial development, food technology and toxicity (in co-operation with EI), land use and water Management assisted by satellites (in co-operation with SAI), and diabetes.

Working papers have been produced on each of these topics, follow-up actions identified and new areas for collaboration launched during the second TEAM meeting, which took place in Seville in June 1999 – including a working group on industrial co-operation for the Mediterranean countries in collaboration with DG Enterprise. At the meeting of the working

group in Athens, on 14-15 October 1999, the IPTS proposal on a strategy for 'Technology Innovation in Favour of Businesses' was very well received by all countries' delegations.

Web platform for Barcelona Process

The IPTS was also given the responsibility to provide the web platform for the activity of the Monitoring Committee (MoCo) set up by the European Council in the context of the Barcelona Process. The Committee consists of high-level officials representing the ministers concerned with co-operation from the 15 Member States of the European Union and the 12 southern and eastern Mediterranean countries and is charged with stimulating Euro-Mediterranean co-operation in the field of science and technology and supporting the sustainable development of the whole region.

- ***EU enlargement***

The IPTS has initiated a 'prospective dialogue' on techno-economic issues of interest to EU and pre-accession countries. A workshop held in Berlin on 3-4 June 1999 and co-organised with the German Presidency brought together top-level experts from the eleven pre-accession countries to exchange opinions with selected EU counterparts on the key science and technology themes. On 20-21 September 1999, the IPTS organised a follow-up workshop in Brussels on foresight in the pre-accession countries.

Co-ordinated foresight exercise

Terms of reference for a network dealing with foresight in view of enlargement were elaborated, making it possible for all parties involved to make progress towards co-ordinated foresight exercises on specific and concrete issues like the Baltic region or the impact of enlargement on competitiveness.

The relevance of these activities is shown by the level of the participants from the pre-accession countries – in four cases they are the designated representatives of these countries to the JRC Board of Governors, one of them a State Under-secretary.

- ***The European Integrated Pollution Prevention Control Bureau (EIPPCB)***

The European Integrated Pollution Prevention and Control Directive, adopted in September 1996, became effective in the Member States in 1999 for new installations, and all existing installations will have to be brought in conformity by 2007. Member State authorities, local or regional, will deliver permits.

The key to efficient implementation of this Directive is the exchange of information on best available techniques (BAT) to be used by the permit-delivering authorities in fixing the emission levels of industrial facilities. The European Integrated Pollution Prevention and Control Bureau (EIPPCB) performs the process leading to the production of appropriate reference documents. It was established in the IPTS in agreement with DG Environment.

Best Available Techniques reference documents

During 1999, the EIPPCB started to work on Best Available Techniques reference documents in six new industrial sectors – refineries, smithies and foundries, large volume organic chemicals, intensive livestock farming, emissions from storage, and waste water and waste gas treatment/management. The Best Available Techniques reference documents on Iron and Steel and Cement and Lime industries were finalised during this year.

- ***Life sciences and impact on society***

The Life Science project has concentrated on an extensive study of the use of very advanced biotechnology (bio-catalysts) in European industry. The study aims at providing a better understanding of the reasons for the low use of bio-catalysts, and identifying factors which could improve it. The OECD has adopted a new initiative along the lines of this study, which has created the possibility for interesting comparisons of technology transfer mechanisms applied by the USA, Japan and the EU in this field.

Co-chairing an OECD Life Sciences project

The IPTS co-chairs the OECD "Biotechnology for Sustainable Industrial Development" initiative, together with the Canadian Ministry for Industry and the Japanese MITI, and is representing the EU in the steering committee.

Early results were presented at a workshop in Seville in November 1999. Actions have also been undertaken concerning the safety of the release of genetically-modified organisms (GMOs) into the environment and for human health. IPTS actively contributed to the European Commission services' joint effort in the EU-US trade dispute on safety of hormone-treated beef.

- ***Electronic business***

This new project will assess the implications of business-to-business and business-to-consumer electronic commerce on competitiveness, regional development and social cohesion. As a starting point for this activity, the IPTS organised workshops in the areas of electronic-commerce regulation and data-protection policy development during 1999. These sought to compare different regulatory perspectives and provided an open forum for debate with a view to informing European policy-makers on developments in other regions.

The IPTS has also completed a study for the European Parliament on electronic payment systems and the related standardisation and security issues. This study polled a wide range of views among leading industry representatives, and emphasised the importance of building consumer trust. As a follow-up activity, the IPTS is to set up an observatory on electronic payment systems, with the financial support of the Enterprise DG.

- ***Energy and sustainability***

The Energy and Sustainability project is providing modelling support to the European Commission to provide a better basis for crucial political decisions on how Europe will have to implement its Kyoto Protocol assignment. The modelling concentrates on various scenarios, which could come out of the use of the so-called Tokyo 'flexible mechanisms' – i.e. emission trading, joint implementation and clean development mechanism.

Results indicate that costs involved in compliance with Europe's commitments could vary between 0.5% and 1.5% of GDP. This depends on a number of conditions, in particular the speed with which action is taken and the way in which the flexible mechanisms might be implemented.

- ***Transport and mobility: Regional and global aspects***

Technology forecasting and assessment work for DG Transport was continued. While a large-scale collaboration project to explore technology options at the time horizon 2020 was finished in autumn 1999, a new project looks at systems which could become available even beyond that point. Several new activities have been launched. The experiences obtained by the implementation of European environmental guidelines in cities are being evaluated for DG Environment. New co-operation projects have been suggested for the research programmes of DG Transport and DG Research, dealing with the uptake of innovative mobility concepts and their integration into the urban and regional context.

- ***IPTS Publications***

The *IPTS Report* is a monthly publication with articles covering the whole range of IPTS' fields of interest, specifically addressed to European decision-makers. The articles are presented in a short, concise format, which is easy to understand, quick to read, but with sufficient depth to cover the issue in question. It has an important alert function and often flags issues before they come on the political agenda. In 1999, for instance, *IPTS Report* special issues addressed 'Information Society and Sustainability', 'Standardisation and RDT', 'Enhancing Human Capital' and 'Europe 2010: Futures and Scenarios'.

The *IPTS Report* is published in English, French, German and Spanish. It has a circulation of approximately 7,000 printed copies and is also freely available on the IPTS' web site (http://www.jrc.es), bringing the total readership well over 10,000.

In 1999, the first issue of the annual *Techno-Economic Analysis Report* was published. This report elaborated in close co-operation with the ESTO network, aims at identifying relevant prospective techno-economic information that can be useful to European decision-makers. It is intended as a yearly publication, presenting in a distilled, selective and user-friendly fashion the techno-economic links and implications drawn from the development occurred during each year.

GLOSSARY

ABACC	Argentina - Brazilian Agency for Accounting and Control of Nuclear Materials
ADELS	Advanced Electricity Storage
AMES	Ageing Materials Evaluation and Studies
AOX	Absorbable Organic Halogens
ASTRON	Applications on the Synergy of Satellite Telecommunications, Earth Observation and Navigation
ATS	Application Tracking System
BADGE	Bisphenol-A-diglycidylether
BAT	Best Available Technique
BATEEE	Best Available Technologies for Efficient and Environmental Energies
BCR	Bureau Communautaire de Référence
BEMA	Biogenic Emissions in the Mediterranean Area
BEVABS	European office for wine, alcohol and spirit drinks
BIPM	Bureau International des Poids et Mesures (the international weights and measures institute)
BNCT	Boron Neutron Capture Therapy
BSE	Bovine Spongiform Encephalopathy
CAD	Computer-aided design
CCQM	Consultative Committee on Amount of Substance
CDCIR	Community Documentation Centre on Industrial Risks
CEA	French atomic energy commission
CEN	European standards committee
CEO	Centre for Earth Observation
CERN	European laboratory for particle physics
CIS	Commonwealth of Independent States
CMS	Complaints Management System
CNRS	French national centre for scientific research
COAST	Coastal zone inventory
COD	Chemical Oxygen Demand
CPDW	Construction Products in contact with Drinking Water
CRIEPI	Japanese Central Research Institute of Electric Power Industry
CRM	Certified reference material
CSIC-CNM	Spanish national centre for microelectronics
DAQUA	DAta QUAlity
DERA	UK Defence Evaluation and Research Agency

DG	European Commission Directorate General
DOC	Dissolved Organic Carbon
DVC	Desktop Video Conferencing
EC	European Community
ECB	European Chemicals Bureau
ECCAIRS	European Co-ordination Centre for Aircraft Incident Reporting System
ECIS	European Centre for Innovation and Spin-Offs
ECURIE	European Community Urgent Radiological Information Exchange
ECVAM	European Centre for the Validation of Alternative Methods
EDC	Endocrine Disrupting Chemical
EDEXIM	European Database on Export and Import
EEA	European Environment Agency
EFICS	European Forest and Communication Information System
EFQM	European Foundation for Quality Management
EGII	European Geographic Information Infrastructure
EI	Environment Institute
EIPPCB	European Integrated Pollution Prevention Control Bureau
ELISA	Enzyme-linked immunoassay
ELSA	European Laboratory for Structural Assessment
EMEA	European Agency for the Evaluation of Medicinal Products
EMEP	European Monitoring Evaluation Programme
EMR	EudraTrack Mutual Recognition
EMS	Electric Motor System
EMU	Economic and Monetary Union
ENIQ	European Network for Inspection Qualification
EPA	US Environmental Protection Agency
EPERC	European Pressure Equipment Research Council
ERLAP	European Laboratory for Air Pollution
ERLIVE	European Reference Laboratory on waste incineration and vehicle emission measurements
ESA	European Space Agency
ESAC	ECVAM scientific committee
ESCON	European Scientific Coastal Zone Observational Network
ESTO	European Science and Technology Observatory
ETLAF	Electrochemical Thin-Layer Activation Facility
ETTI	European Technology Transfer Initiative

ETTN	European Technology Transfer Network
EU	European Union
Euratom	European Atomic Energy Community
EURDEP	European Union Radiological Data Exchange Platform
EURODWA	EURopean Drinking WAter observatory
EUROMET	European Organisation of Metrology
EuWASP	European Watershed-wide Assessment of Soil and water Pollution
FDG	Fluorodeoxyglucose
FP5	EU Fifth Framework Programme for RTD
GDP	Gross Domestic Product
GEDRI	Global Endocrine Disrupters Research Inventory
GEIS	Global Environmental Information Systems
GI	Geographic Information
GIS	Geographic Information Systems
GLP	Good Laboratory Practice
GMES	Global Monitoring of Environment and Security
GMOs	Genetically Modified Organisms
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HADES	Underground laboratory at Geel for special radioactivity measurements
HAP	Hydroxy-apatite
HFR	High Flux Reactor
HRMS	high-resolution gas chromatography/mass spectrometry
HYDANET	Hydrogen Damage Prevention and Networking
HYDRA	Hydrogen from Biomass
IAEA	International Atomic Energy Authority
IAM	Institute for Advanced Materials
IAQA	Integrated Air Quality Assessment
IDEA	Identification Electronique des Animaux
IFCC	International Federation for Clinical Chemistry
IEEE	Institute of Electronical and Electronics Engineer
IGBP	International Geosphere Biosphere Programme
IHCP	Institute for Health and Consumer Protection
IMEP	International Measurement Evaluation Programme
INFEO	Information on Earth Observation
INVITTOX	In-Vitro Toxicology data bank

IPCS-WHO	World Health Organisation's International Programme on Chemical Safety
IPTS	Institute for Prospective Technological Studies
IRM	Isotopic Reference Material
IRMM	Institute for Reference Materials and Measurements
ISIS	Institute for Systems, Informatics and Safety
ISS	Istituto Superiore de Sanità, Italy
IT	Information Technologies
ITU	Institute for Transuranium Elements
IUCLID	International Uniform ChemicaL Information Database
IWES	Impacts of Waste Emissions on Soils
JAERI	Japanese Atomic Energy Research Institute
LDTF	Large Dynamic Test Facility
LEPEC	Laboratory for Electronic Payment and Electronic Commerce
LWR MOX	Light Water Reactor – Mixed Oxide Fuel
MACBETH	Monitoring of Atmospheric Concentration of Benzene in European Towns and Homes
MAHB	Major Accident Hazards Bureau
MAPWIN	Materials Performance in Waste Incinerators
MARS	Major Accident Reporting System
MARS	Monitoring Agriculture with Remote Sensing
MERECH	European Network on Medical Radiographic Equipment Characterisation
MITI	Japanese Ministry for International Trade and Industry
MoCo	Barcelona Process Monitoring Committee
MoU	Memorandum of Understanding
NEDIES	Natural and Environmental Disaster Information Exchange System
NESC	Network for the Evaluation of Steel Components
OECD	Organisation for Economic Co-operation and Development
OLAF	European Commission's anti-fraud body
OSPAR	Oslo - Paris Convention
PCB	Polychlorinated biphenyl
PCR	Polymerase Chain Reaction
PECO	Central and Eastern European Countries
PERLA	Performance Laboratory
PET	Positron Emission Tomography
Phare	EU support programme for pre-accession countries in central and eastern Europe
PHEBUS	French test reactor, Cadarache (France)

PIGS	Primary Isotopic Gas Standards
PKI	Public Key Infrastructure
REM	Radioactivity Environmental Monitoring
REMdb	Radioactivity Environmental Monitoring (REM) data bank
RTD	Research and Technological Development
RTMOD	Real Time MODel evaluation system
SAG	Space Advisory Group
SAI	Space Applications Institute
SCG	Space Co-ordination Group
SCR	Service Commun Relex
SIS	Scientific Information Service
SME	Small and Medium-size Enterprises
SOLAREC	Photovoltaic and Solar Thermal Electricity
SOP	Standard Operating Procedure
SPC	Summary of Product Characteristics
SPIRS	Seveso Plant Information Retrieval System
STRIM	Space Techniques for Major Risks Management
Tacis	EU support programme for transition in the New Independent States
TAME	Tank Measurement Laboratory
TEAM	Techno Economic Analysis network in the Mediterranean
TEMPEST	Thermal, Electromagnetic and Physical Equipment Stress Testing
TNO	The Netherlands Organisation for applied scientific research
TQM	Total Quality Management
TRINIDAD	TRial Infrastructure for Information and Dependable Application Deployments
UHMWPE	Ultra-High Molecular Weight PolyEthylene
US/DoE	United States Department of Energy
US/FDA	United States Food and Drug Administration
UTLA	Ultra Thin Layer Activation
UTS	Unified Tracking System
VMS	Vessel-mounted GPS-based Monitoring System
VPN	Virtual Private Network
WEU	Western European Union

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