



COMMISSION OF THE EUROPEAN COMMUNITIES

Brussels, 07.05.2001  
COM(2001) 239 final

**REPORT FROM THE COMMISSION**

**JRC ANNUAL REPORT 2000**

## CONTENTS

<b>FOREWORD</b> .....	4
<b>INTRODUCTION</b> .....	5
<b>OBSERVATIONS OF THE BOARD OF GOVERNORS</b> .....	9
<b>THE JOINT RESEARCH CENTRE IN 2000</b> .....	11
<b>THE WORK PROGRAMME 2000 IN SUPPORT OF EU POLICIES</b> .....	11
Institutional research activities .....	13
Clusters – an interdisciplinary approach .....	18
Nuclear research activities (outside the 5 <sup>th</sup> Framework Programme) .....	18
Co-ordination of space activities .....	20
A year of evaluations and future recommendations.....	20
<b>JRC AND THE EUROPEAN RESEARCH AREA</b> .....	22
<b>THE JRC AS A PARTNER IN NETWORKS</b> .....	23
<b>PARTICIPATION OF ACCESSION COUNTRIES</b> .....	24
<b>INTERNATIONAL RELATIONS</b> .....	24
The nuclear field .....	25
Food security and consumer protection .....	26
Environmental protection .....	26
General security .....	27
<b>COMPETITIVE ACTIVITIES</b> .....	27
<b>TECHNOLOGY TRANSFER</b> .....	28
The European Technology Transfer Initiative (ETTI).....	28
Expertise for the setting-up of innovative firms (EXSIF).....	29
Protection and exploitation of JRC research results .....	29
Innovation project competition.....	29
<b>COMMUNICATIONS STRATEGY</b> .....	29
Events.....	30
JRC site visits .....	31
Media relations .....	31
Publications .....	31
JRC corporate website activities.....	32

Providing information to the public .....	32
YOUNG SCIENTISTS PRIZE 2000 .....	32
THE JRC IN FIGURES .....	33
SCIENCE AND GOVERNANCE .....	35
WOMEN AND SCIENCE.....	35
TOTAL QUALITY MANAGEMENT.....	36
<b>SCIENTIFIC ACTIVITIES OF THE INSTITUTES IN 2000 .....</b>	<b>36</b>
Institute for Reference Materials and Measurements (IRMM) - Geel .....	36
Institute for Transuranium Elements (ITU) - Karlsruhe.....	46
Institute for Advanced Materials (IAM) - Petten .....	53
Institute for Systems, Informatics and Safety (ISIS) - Ispra.....	61
Environment Institute (EI) - Ispra .....	67
Space Applications Institutes (SAI) - Ispra .....	74
Institute for Health and Consumer Protection (IHCP) - Ispra .....	80
Institute for Prospective Technological Studies (IPTS) - Seville.....	87
<b>GLOSSARY .....</b>	<b>92</b>
<b>JRC BOARD OF GOVERNORS.....</b>	<b>99</b>
<b>ORGANISATIONAL CHART.....</b>	<b>102</b>

## FOREWORD

The Joint Research Centre (JRC) is one of the Directorates General of the European Commission and is made up of eight individual institutes. These carry out basic and applied research, and provide technical know-how in support of European Union (EU) policies. JRC also participates in networks with Member State institutes, and plays an active part in harmonising data, testing and validating new scientific methods and techniques. Its status as a Commission service, which guarantees independence from private or national interests, is crucial to the pursuit of this role.

The JRC implements its mission through specific research programmes decided by the Council on advice from the European Parliament. Falling within the EU Framework Programmes for research and technological development (RTD), this work is funded by the EU budget, with additional funding from associated countries. It includes customer-driven scientific and technical services for specific Community policies – such as those on the environment, food and health, the information society, agriculture and nuclear safety.

In addition, the JRC is involved in competitive activities, as a means of validating its expertise and increasing its know-how in core competencies. Its remit is to ‘add value’ where appropriate, rather than to compete directly with establishments in the Member States.

### **Eight institutes spread over Europe**

The eight JRC institutes are distributed over five separate sites around Europe. Each has its own focus of expertise.

The Institutes are:

- The Institute for Reference Materials and Measurements (IRMM), in Geel (BE);
- The Institute for Transuranium Elements (ITU), in Karlsruhe (DE);
- The Institute for Advanced Materials (IAM), in Petten (NL);
- The Institute for Systems, Informatics and Safety (ISIS), in Ispra (IT);
- The Environment Institute (EI), in Ispra (IT);
- The Space Applications Institute (SAI), in Ispra (IT);
- The Institute for Health and Consumer Protection (IHCP), in Ispra (IT); and
- The Institute for Prospective Technological Studies (IPTS), in Seville (ES).

### **Management of the organisation**

The JRC headquarters are in Brussels and include the Programmes Directorate, which serves as the link between the institutes and 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 function is to promote technology transfer of the JRC’s own research results, both to create industrial added value and to support the Community’s innovation policies.

The JRC employs around 2,100 staff under various schemes. Its funding of about € 300 million per year stems from the research allocation of the EU budget and from income generated by competitive activities. Each of the eight institutes produces its own annual report, where more comprehensive information can be found. The JRC also publishes numerous technical reports, contributes to scientific journals, frequently presents papers to conferences, and organises workshops, seminars and conferences to disseminate its scientific output.

Further information can be obtained from the JRC website: <http://www.jrc.cec.eu.int/>.

## INTRODUCTION

The year 2000 of the JRC was a period of evaluation and many initiatives were launched to assess how to best develop the JRC's mission as a research centre in support of EU policies. An independent external scientific audit of its resources and scientific skills was concluded; a five-year assessment of its activities was carried out; a High Level Panel chaired by Viscount Davignon delivered a report on the implementation of the JRC's mission, and a Commission Peer Group issued, in the framework of the Commission Reform, instructions on activity prioritisation. The wealth of recommendations collected during these exercises will shape the future orientations of the JRC.

The JRC's future is outlined in the Commission's initiative Towards a European Research Area presented in January 2000 and which is intended to contribute to the creation of better overall framework conditions for research in Europe. In this context, the JRC will contribute where appropriate to the development of a common scientific and technical reference system for policymaking. Toward this goal, the JRC will pool expertise from research organisations both inside and outside Europe to provide the best possible set of competencies for such support. During the year, the JRC continued to develop a more strategic approach to its role as a partner in networks. It also pursued specific activities designed to integrate the Central and Eastern European dimension in its work, through a detailed Work Programme.

Much effort was devoted throughout the year to improving the interface with European policy-makers. A workshop with its users, the Commission services, was held to set priorities according to customer needs; improvement teams on Total Quality Management were set up; and a debate was launched on science and governance.

The JRC promotes the technology transfer of its own results, thus supporting Community innovation policies. New activities added during the year included the set-up of an external seed capital fund and an incubation function at Ispra for JRC spin-off projects.

The JRC attaches a great importance to its international relations and refocused its activities in key areas. Co-operation with Japan and USA on the control of nuclear materials was widened to include nuclear technologies and a memorandum of understanding on technologies for mine clearance was signed between the European Commission (represented by the JRC), the USA, Canada and five Member States. Several international agreements were also initiated in the areas of food safety and environmental protection.

### **The Work Programme 2000**

The JRC's Work Programme in 2000 was arranged according to the four competence areas;

- Safety of food and chemicals;
- Environment;
- Dependability of information systems and services; and
- Nuclear safety and safeguards.

In addition, two horizontal characteristics of JRC expertise are spelled out:

- (1) A forward-looking insight into current technology trends (including life sciences and the information society) and socio-economic issues (such as employment, sustainability, EU-enlargement and the Mediterranean partnership area); and

- (2) Networking with other RTD players in Europe to produce science and technology references (methods, data, materials and measurements) guaranteeing transparency of the internal market and international trade. Central to this activity is JRC participation in the development of EU standards in close co-ordination with the European standards committee CEN, with which JRC signed a collaboration agreement during 1999.

This new structure is used to give a clear indication of the JRC core competencies, as a basis for further concentration of efforts and future strategic planning.

### **Meeting the customer DGs**

To strengthen communication with its customers, the JRC organised an inter-service workshop with customer DGs, presenting selected areas of current work. The programme was structured around the four JRC core competencies.

The main objective of the October 2000 workshop was to discuss EU policy priorities guiding the JRC Work Programme 2001, the concentration process of the JRC and future activities implementing the European Research Area (ERA). In addition, a final session was dedicated to the prospective activities of the IPTS, and to the JRC's role in the context of ERA. The workshop brought together 232 people from the Commission services, of which 151 were from other DGs and 81 from the JRC. The input from the Commission services has been used as a basis for changes to be introduced in the JRC Work Programme of next year.

\*\*\*

\*\*

### **Highlights of the year**

All institutes have participated in activities to increase the visibility of the JRC to the research community and the general public. Highlights include:

#### **- Inauguration of on-site laboratory**

A new on-site laboratory was inaugurated on 6 June 2000 at the La Hague nuclear reprocessing plant in France. At the request of the Euratom Safeguards Office, this laboratory was designed, installed and commissioned by ITU staff. In the past, radioactive samples from the reprocessing plant would have had to travel long distances to be analysed at an accredited laboratory. This on-site facility cuts out the need for transportation as analysts from ITU in Karlsruhe will travel to the site at La Hague on a weekly basis to carry out the necessary work.

#### **- Demonstration of pyrochemical reprocessing of nuclear fuels by electrorefining**

Non-aqueous (molten salt) reprocessing of irradiated spent nuclear fuels is being studied between the ITU and CRIEPI. This process is considered a major part of a partitioning and transmutation strategy for nuclear waste management. Its goal is to demonstrate the feasibility of recovering actinides from irradiated fuel and high level waste, e.g. waste from the PUREX plutonium uranium extraction process. A hot cell facility for up to 1 kg of melt has been constructed and its performance successfully tested. The installation operates under a highly pure argon atmosphere and first demonstrations of the electrorefining process have generated deposits of up to 10 g of metallic uranium.

#### **- A notification system for GMOs**

SNIF (summary notification information format) software has been developed for an electronic notification system that will help the Environment DG implement two EC directives, one on the contained use of genetically modified micro-organisms and another on the deliberate release of GMOs into the environment.

#### **- Antibiotics in food**

An important current concern of the EU is to detect and control the presence and concentration of antibiotics in foodstuffs of animal origin. IRMM has accepted the task of developing analytical methods to determine the misuse of several important classes of antibiotics.

#### **- Genetically modified organisms**

In collaboration with the Health and Consumer Protection DG and in support of the Novel Food Regulation (EC) 258/97, the IRMM has continued to provide scientific support for the enactment of EU labelling requirements by providing reference materials and methods urgently needed for detecting genetically modified organisms (GMOs) in food. In 2000, a second generation of certified reference materials for RR (Roundup-ready)-Soya was produced, as well as BT-samples (*Bacillus Thuringensis*) for GMOs in processed food. Mixing, characterisation and genetic expression (zygosity) tests for the third generation certified crop MON810 was performed and the study of DNA quality in RR Soya was completed, making it possible to launch this material onto the market.

#### **- PCB and dioxin reference materials**

The preparation of dioxin standard solutions, fly ash and sewage sludge was completed in collaboration with the Environment DG. In addition, the preparation of candidate material for the renewal of polychlorinated biphenyls (PCBs) in sewage sludge was completed in collaboration with the Research DG in 2000.

#### **- Three-dimensional reconstructions**

As part of the effort to improve the efficiency of surveillance, documentation and inspector training, ISIS has developed software for '3D reconstruction'. Distance measurements and digital cameras are combined to create a photo-realistic computer model of a real object or building – such as a three-dimensional reconstruction of the French National Assembly in Paris. Models are coded into the Virtual Reality Modelling Language (VRML), which makes them Internet compatible.

#### **- Performance testing by ELSA**

ISIS is part of an international partnership investigating the use of systems for the control of vibration in structures. Its European laboratory for structural assessment (ELSA) has been used for performance testing of structural systems in large suspension bridges, and studies are underway for an application which can be used for railways.

#### **- Biogenic emissions in ozone and particulate matter**

A year-long measurement campaign at the JRC site in Ispra produced a unique data set to study the links between ozone and particulate matter (PM) formation. A seasonal trend was observed in both total aerosol mass and aerosol chemical composition. During winter months, PM levels were found to be three times higher than during summer months. This is despite the fact that in summer months higher biogenic emissions and photochemical activity (causing high ozone level) were observed. The high PM concentrations during winter are probably due to domestic heating. Chemical analysis of fine aerosol revealed that organic compounds and elemental carbon have a higher relative contribution to aerosol mass during winter than during summer, making them probably more hazardous for human health in winter.

#### **- European Observational Network**

The European Observational Network became operational in 2000. It has been set up to assess the impact of EU policy and legislation on the quality of soil and water resources of inland and coastal watersheds. Network points have been established in Finland, France, Greece, Italy, Spain, the UK and Eastern Europe, in collaboration with the Environment DG and with regional and national institutions.

### **- Global Monitoring for Environment and Security (GMES)**

SAI has contributed at all levels to the further evolution of GMES, closely involving European space and user organisations. GMES uses cutting edge space technology to provide precise information on a range of global environmental parameters, from meteorology to terrestrial and marine resource assessment. In May 2000, Commissioner Ph. Busquin said that "GMES could be the next theme for a cross-European co-operation". A GMES conference was organised in Lille during October at which SAI delivered a keynote speech. A follow-up conference is in preparation. GMES has now become the representative for Earth Observation in the strategy for space put forward jointly by the European Union and the European Space Agency.

### **- Validated in-vitro methods**

Guidelines for three *in-vitro* toxicity tests – one for phototoxic potential and two for skin corrosivity – have been accepted by EU Member State authorities. They will be included in technical annex V of the EU Directive on dangerous substances. The JRC-run ECVAM's (European Centre for Validation of Alternative Methods) scientific advisory committee endorsed two non-animal tests – one for skin-sensitisation using local lymph nodes, and the EpiDerm skin corrosivity test – as validated methods. An ECVAM study showed that three *in-vitro* tests for embryotoxicity had met validation criteria for study.

### **- Science and Governance**

A high-level workshop on the relationship between Science and Governance was organised on 29 and 30 March 2000 in order to develop an understanding of how to develop a common system of scientific and technical reference for policy implementation. This high-level workshop was followed on 16 and 17 October by a conference on "Science and Governance in a knowledge society: the challenge for Europe" jointly held by the JRC and DG Research. The role of the European Research Area for the development of new European citizenship was debated.



## OBSERVATIONS OF THE BOARD OF GOVERNORS

The Board acknowledges the JRC management's concern of assessing how best the centre could achieve its mission, facing the challenges of the new century and making better use of its resources. The consolidation of the new mission of the JRC, to provide customer driven scientific and technical support to the conception, development, implementation and monitoring of European Union policies, has driven all activities of the JRC during this year 2000.

The Board supports the JRC management efforts in evaluating the JRC both at the scientific and strategic level and at the administrative level and looks forward to analysing the results.

As regards the external evaluation exercises, the Board notes that The Scientific Audit report by "Visiting Groups", assessing the scientific strengths and weaknesses of JRC Institutes' resources, has contributed to the 5-Year JRC Assessment exercise carried out this year.

The Board appreciates the report of the High Level Panel, chaired by Viscount Etienne Davignon, on implementing the JRC's mission, and the Commission's Peer Group review, that will both serve to better define the orientation which the JRC should adopt in the future. The Board acknowledges the suggestions made, especially those concerning the proposed role of the JRC in the European Research Area to be developed in the frame of the new Framework Programme under preparation. The JRC should indeed concentrate its activities and further contribute to the development of a common European Reference system in support of EU Policymaking. *To this end, more managerial flexibility would be required to better adapt the JRC resources to implementing its mission.*

The Board appreciates the efforts devoted to integrate the users in the JRC policy formulation process with a view to setting the JRC priorities according to customer needs and EU policy priorities. To this end, the creation of an inter-service Users Group, allowing for a permanent systematic mechanism as interface with European policy-makers, is welcome; so is the collaboration with National Research organisations in specific fields, to increase the JRC's know-how and 'add value' to its competencies to better develop its role as partner in networks. In this respect, the Science and Governance conference improved the JRC's understanding to developing a common system of scientific and technical reference, in order to provide independent and high-quality support for policy implementation.

The Board notes that the internal audit has continued its work with a view to improve the efficiency of the JRC.

The introduction of the Total quality management (TQM) process, launched for the whole of the JRC with a systematic long-term approach, has completed its first cycle this year with the reporting of the various improvement teams.

The Board follows with interest the JRC Work-Programme's implementation and the efforts to integrate the Central and Eastern European partner countries in the JRC's work. It appreciates Institutes' achievements as scientific reference, and their contribution to solving European problems such as the dioxin crisis and the "mad cow" disease. It welcomes the JRC's performance on competitive activities.

The Board notes the promotion of JRC technology transfer in support of Community innovation policies, and the setting-up of an external seed capital fund and an incubation function at JRC Ispra site for JRC spin-off projects. It further encourages managerial efforts with respect to the improvement of its external communication and of the JRC's public image.

The Board supports the development of international collaboration also outside Europe in key areas, mainly the control of nuclear materials food safety and environmental protection.

With respect to nuclear activities outside the FWP, the Board welcomes the “Decommissioning” programme carried out at the JRC, for the management of waste and obsolete facilities, which commenced this year. While welcoming the normal running of operations of the 4-year Supplementary Programme of the High Flux Reactor –HFR- in JRC Petten site, the Board notes the setting up of a users strategy aiming at further involving the HFR in the European Research Area.

The Board appreciates the work carried out at the JRC for co-ordinating the Space activities and for the setting up of joint ESA/Commission strategy for Space which should be developed by a task force.

The Board notes the report on how the JRC complies with the Council Resolution on “Women and Science”, of 20 May 1999 and with the European Parliament Resolution of 9 March 1999.

The Board acknowledges the contribution of the former Director General, Mr. Herbert J. Allgeier, who retired on 31 October 2000.

Finally, the Board wishes to express its recognition to Commissioner Philippe Busquin for his efforts to create an environment aiming at optimising the efficiency of European research results in the frame of the European Research Area.

## THE JOINT RESEARCH CENTRE IN 2000

### THE WORK PROGRAMME 2000 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, development, implementation and monitoring of Community policies. As a service of the European Commission, the JRC functions as a reference centre of science and technology for the Community. Close to the policy-making process, it serves the common interest of the Member States, while being independent of commercial or national interests.*

*Carrying out specific high-level research in close contact with industry and other bodies, the JRC support the policy maker in addressing the concerns of the individual citizen, improving the interaction between man and the environment and promoting sustainable development.*

In line with its mission, the JRC Work Programme 2000 focuses on research topics relevant to important EU policies. The JRC resources were allocated to 97 projects distributed between the following four pillars:

- *Safety of food and chemicals and health-related issues* focuses on improving the understanding of hazards, exposure and risks posed by food contaminants, chemicals and chemical products (e.g. vaccines and pharmaceuticals) as well as on health and biomedical issues in the context of preventive strategies to protect consumer health. The bulk of the activities concentrate on the development and validation of advanced methods and certified reference materials, the improvement of the quality of measurements and the study of important processes involving food and chemical products. In addition services like information systems, data banks, advice and training will be provided in support to relevant EU policies. Prospective and socio-economic analyses represent an important part of the approach. The JRC maintains a close attention to scientific developments in life sciences and to the evolution of the legislative programme in food, chemical safety and health;
- *Environment* which focuses on issues of policy relevance in the field of environment and resources management. Its objective is to develop knowledge and provide reference information and a range of environmental processes and conditions. To do so it will foster the development of methods for measuring and monitoring environmental changes, evaluate and validate its impacts and harmonise scientific approaches at the Community level. Activities are designed to contribute to the sustainable development of the European and global environment;
- *Dependability of information systems and services* with the objective to support EU policies for the protection of the citizen in the emerging Information Society, and to provide the Commission with an in-house centre of expertise in dependable information and communication technology to support EU policies in general;
- *Nuclear safety and safeguards* which supports the Commission Services in charge of tasks defined by the Euratom Treaty in the field of Safeguards, Radiation Protection, nuclear waste management and focuses on policy issues such as harmonisation in the field of reactor safety and fuel cycle safety. Its objective is to develop and assemble knowledge through co-operative projects leading to a wide consensus on a range of issues relevant with nuclear safety and security at European level and often world-level. The application of Safeguards by the Euratom Safeguards Office and the IAEA requires R&D support and direct assistance. In view of the EU enlargement, special attention will be given to the co-operation with future EU Member States.

There were also two groups of horizontal activities. One covered current technology trends, such as life sciences and the information society, and socio-economic issues – including employment, sustainability, EU enlargement and Mediterranean co-operation. The second related to networking with other RTD actors in Europe, to produce science and technology references and to guarantee transparency of the internal market and international trade.

A considerable part of the Work Programme 2000 was devoted to direct services in support of EU regulations, such as the activities carried out by the European Laboratory for Air Pollution (ERLAP), the Integrated Pollution Prevention and Control Bureau (IPPCB) and the European Chemicals Bureau (ECB).

The following table presents the institutional research activities carried out by the eight JRC Institutes within the Work Programme 2000.

## Institutional research activities

<b>1. Safety of food and chemicals, and health related issues</b>								
<b>JRC WORK PROGRAMME LINES</b>	<b>IRMM</b>	<b>ITU</b>	<b>IAM</b>	<b>ISIS</b>	<b>EI</b>	<b>SAI</b>	<b>IHCP</b>	<b>IPTS</b>
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							
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 disruptors; development and validation of methods							X	
The validation of alternative methods							X	
Chemical products, risk assessment							X	
International comparability of chemical measurements	X							
Chemical reference methods and measurements for normalisation and certification	X							
Boron Neutron Capture Therapy (BNCT) for the treatment of cancer and other diseases			X					
Alpha-Immunotherapy		X						
Medical Imaging and Therapy using Radio-Tracers – MITRA							X	
Reliability of bioMEDical Devices (REMEDI)							X	
Functional systems for health and consumer protection							X	
Biomedical certified reference materials for clinical diagnostics	X							
Life science and impact on society								X

<b>2. Environment</b>								
<b>JRC WORK PROGRAMME LINES</b>	<b>IRMM</b>	<b>ITU</b>	<b>IAM</b>	<b>ISIS</b>	<b>EI</b>	<b>SAI</b>	<b>IHCP</b>	<b>IPTS</b>
Civilian de-mining						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; structural diagnostics and strengthening/repair techniques for building structures under stress (SEISPROTEC)				X				
Natural hazards						X		
Environment and society								X
The European landscape: geo-information for development and environmental monitoring						X		
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			
Reference materials for pollution control	X							
Energy and climate change								X
Global Monitoring for Environment and Security (GMES)						X		
Atmospheric processes related to regional and global changes					X			
Photovoltaic and solar thermal electricity (SOLAREC)					X			
Advanced Electricity Storage (ADELS)					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					

JRC WORK PROGRAMME LINES	IRMM	ITU	IAM	ISIS	EI	SAI	IHCP	IPTS
Sustainability in transport and mobility								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					
European Soil Bureau						X		
Population dynamics and Security						X		
EPERC/HYDANET merged Project			X					

### 3. Dependability of information systems and services

JRC WORK PROGRAMME LINES	IRMM	ITU	IAM	ISIS	EI	SAI	IHCP	IPTS
Telematic systems for the EU pharmaceutical regulatory activity (ETOMEPE)							X	
Electronic business								X
Consumer protection Laboratory for the study, experimental testing and monitoring of Electronic Payment and Electronic Commerce (LEPEC)							X	
Dependability of information technology systems				X				
Networks, multimedia and education				X				
Medical and health telematics				X				
Statistics support: European statistical laboratory (ESL)				X				
S&T Support to implementation and monitoring of anti-fraud policy				X				
Safety and emergency management systems for man-made and natural hazards				X				
Information systems in civilian demining				X				
European Co-ordination Centre for Aircraft Incident Reporting Systems (ECCAIRS)				X				
Integrated assessment and decision support				X				
The MARS Project (Monitoring Agriculture with Remote Sensing)						X		

JRC WORK PROGRAMME LINES	IRMM	ITU	IAM	ISIS	EI	SAI	IHCP	IPTS
Advanced statistics for clearance of accounts (ASCA)				X				
Animal Tagging (the IDEA project)				X				
Building the information society								X
Applications on the synergy of satellite telecommunications, earth observation and navigation (ASTRON)						X		
GI and GIS: Harmonisation and interoperability						X		
New technologies for monitoring fishing vessels				X				
Galileo Technical Support						X		

#### 4. Nuclear safety and safeguards

JRC WORK PROGRAMME LINES	IRMM	ITU	IAM	ISIS	EI	SAI	IHCP	IPTS
Reference measurement for neutron – materials interaction	X							
Neutron reference measurements for environmental protection	X							
Reference measurements for neutron data standards	X							
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				
Safeguards Research and Development at Ispra				X				
Safeguards Research and Development at Karlsruhe		X						
Metrology and Quality Assurance for Nuclear Safeguards	X							



<b>JRC WORK PROGRAMME LINES</b>	<b>IRMM</b>	<b>ITU</b>	<b>IAM</b>	<b>ISIS</b>	<b>EI</b>	<b>SAI</b>	<b>IHCP</b>	<b>IPTS</b>
Support to Euratom Safeguards Directorate				X				
Support to the International Atomic Energy Agency (IAEA)				X				
Radioactivity Environmental Monitoring (REM)					X			
Measurement of Radioactivity in the Environment		X						
High Temperature Reactor (HTR)			X					
Historical Liabilities (Decommissioning)	DEC							
<b>Horizontal activities</b>								
<b>JRC WORK PROGRAMME LINES</b>	<b>IRMM</b>	<b>ITU</b>	<b>IAM</b>	<b>ISIS</b>	<b>EI</b>	<b>SAI</b>	<b>IHCP</b>	<b>IPTS</b>
BCR and industrial certified reference materials	X							
Metrology in chemistry and traceability	X							
Radionuclide metrology	X							
The "Futures" project								X
Knowledge and skills: perspectives for Europe								X
Enlargement: building linkages on prospective activities								X
Mediterranean and regional perspectives								X
European Science & Technology Observatory (ESTO)								X
Co-ordination of space activities	SC							
Technology assessment and validation, demonstration, partner search and transfer	TT							

## Clusters – an interdisciplinary 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 established at JRC during 1999, continued during 2000 with the addition of a new cluster devoted to issues related to water:

- **Electronic commerce:** focus on dependability and consumer 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 and IAM).
- **Food:** focus on food safety, anti-fraud measures, support to biotechnology directives and development of standards for reinforcing industrial competitiveness (IHCP, IRMM and IPTS).
- **Agri-environment:** geospatial information, integrated assessments and verification of agri-environmental measures (SAI, EI, ISIS and IPTS).
- **MAREL:** Co-ordinates the JRC projects relevant with the existing reactors safe operation: fuel safety and performance, integrity of the fission circuit, accident analysis, risk assessment (IAM, ITU and ISIS).
- **Water:** Focus in interdisciplinary analysis of water issues including quality, multiple uses, and socio-economic dimension (EI, SAI, IAM, IRMM and IPTS).

### **Nuclear research activities (outside the 5<sup>th</sup> Framework Programme)**

#### **• The High Flux Reactor (HFR)**

##### **Implementing a Euratom agreement**

The Commission operates the High Flux Reactor (HFR) at Petten (NL) in accordance with the 1961 Euratom/Netherlands agreement. The Netherlands, Germany and France jointly regulate the HFR, with each partner guaranteeing a percentage of the finance required.

The JRC carries out research at the HFR for Euratom on the basis of four-year supplementary research programmes. 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 new fuels.

While the current four-year programme remains the basis of the operation of HFR until 2003, a strategy is now being developed by a group of experts to involve HFR in a more European circle of users and R&D projects, in the context of the European Research Area.

## Support to medical activities

The HFR is used for the development of products and technologies in support of 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. Moreover, the reactor's location allows its medical products to be despatched rapidly 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 boron neutron capture therapy (BNCT) techniques is also using the HFR.
- Other medical-related research includes production of new isotopes, development of other technical BNCT-applications and new alpha-immunotherapy products, and studies on the materials for medical prosthesis.

## Assuring easy fuel availability

In order to assure easy fuel availability in the future, the JRC decided to convert the HFR from highly enriched uranium to low enriched uranium.

Four transfers of spent fuel from the reactor pool sector to the Dutch national repository were organised in 2000.

### • Decommissioning of nuclear installations

#### Dealing with obsolete facilities

Within the Euratom Treaty, site agreements concerning nuclear plants facilities were signed during the period 1960 to 1962 between the Community, Belgium, Germany, Italy and the Netherlands. In the two latter cases, national nuclear installations were transferred to the Community and infrastructure for nuclear development was put in place. The installations in Karlsruhe and Petten are still in full use today and some nuclear activities remain in Geel and Ispra. Others have been shut down, 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 obsolete nuclear facilities. The plan is divided into three parts:

- (1) **Management of waste** resulting from JRC activities since 1960. 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 shutdown facilities**, such as reactors and laboratories; a procedure that will generate new waste, which also needs to be processed.
- (3) **Evaluation of resources necessary for future dismantling** of nuclear facilities still in operation, such as the cyclotron at Ispra (IT), the hot cells at the ITU in Karlsruhe (DE), and the HFR at Petten. Although some dismantling is required at these facilities, their shutdown is not envisaged in the actual action plan.

A group of independent experts was set-up to advise JRC on the strategies to follow. Work is proceeding as expected at Ispra, Karlsruhe and Geel (BE). An important test of the work was accomplished at the IRMM with the intention of downgrading the Geel licence and hence reducing surveillance costs.

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

A challenge for the EU is to find ways of providing European support to mostly nationally driven space activities. The Commission helps in defining Europe's ambitions, taking into account the growing importance of space for socio-economic policy objectives in the information and communication services, as well as for science, technology, space-access and security.

- **European strategy developed for space**

Through the Commission's Space Co-ordination Group, chaired by the Director-General of the JRC in his personal capacity, the Commission and the European Space Agency (ESA) have devised a joint strategy for space and recommendations for actions, in consultation with Member States and industry. The final communication<sup>1</sup>, drafted together with ESA, was adopted by the Commission on 27 September 2000. This proposes setting up a joint ESA/Commission task force to implement and develop the European strategy for space.

- **Global monitoring for environment and security (GMES)**

Following discussion with the Space Advisory Group (SAG) in July 1999, the concept of global monitoring for environment and security has continued to be developed by the Commission under JRC stewardship. A study<sup>2</sup> was undertaken to develop the political arguments and reinforce links with Commission services. It concluded that the broader issue of environment and security is growing in political importance, and that global monitoring can provide effective support for information gathering.

At the technical level, the SAI continued to provide support in collaboration with European space agencies. A GMES office and partnership were established, involving these agencies, EUMETSAT (the European organisation for the exploitation of meteorological satellites), and industry. A memorandum of understanding was signed with the German space agency DLR, similar to that concluded in 1999 with the French agency CNES, and support was given to the French EU Presidency in organising a colloquium on GMES at Lille in October 2000. A seminar held at the International Astronautical Federation (IAF) congress in October 2000 on GMES explored co-operation aspects with an international panel from the EU, Brazil, Russia and the USA.

- **EU-Russia partnership and co-operation agreement**

Discussions continued with the Russian Federation on space and on GMES in particular. In September, a visit by Commissioner Busquin to Moscow led to an agreement to establish a EU-Russian working group, allowing experts from the two sides to develop and promote co-operative space observation projects, particularly in the domain of GMES.

## **A year of evaluations and future recommendations**

Four formal external evaluations of the JRC were carried out in a short period. These were the 1999 Scientific Audit, the Five-Year Assessment (1995-1999), the High Level Panel Report, and the Commission Peer Group evaluation – each responding to separate requirements and targeting different objectives. They have generated a wealth of recommendations to help to steer the JRC's future and shape its strategies.

---

<sup>1</sup> Europe and Space: Turning to a new chapter, COM(2000)597.

<sup>2</sup> *The use of global monitoring in support of environment and security*, Final Report, August 2000.

- **1999 scientific audit**

The first exercise was the scientific audit of the JRC institutes in the second half of 1999. The JRC Director-General launched this non-statutory evaluation immediately after the approval by the Commission of the JRC Work Programme 1998-2002. It was designed to provide early feedback to JRC management on the scientific standing of the institutes, and to assess their scientific strengths and weaknesses in terms of staff and other resources. A major objective was to ensure that the European Commission Fifth Framework Programme requirements could be fulfilled with the requisite scientific quality.

The audit was carried out by ‘visiting groups’ of external experts. All the reports were finalised and published by early 2000, allowing institute management to take advantage of the specific observations, as well as drawing conclusions valid for the JRC as a whole.

Some 40 recommendations in the reports were discussed in detail with each institute director and the panel of experts. The recommendations were incorporated into the institutes’ medium- and long-term plans. Staff were briefed on the outcome and, in most cases, any feasible suggestion immediately initiated. Monitoring of the implementation of these recommendations was eventually merged with that of the five-year assessment.

The overall audit conclusions confirm the soundness of JRC’s scientific strategies:

- The new JRC mission is supported by management and staff, and well received by the EU research community. An essential element linked to the mission, networking with Member State laboratories, is strongly encouraged.
- The science base underpinning the JRC mission is vital and must be kept strong. Attention is to be given to the balance between services and research.
- JRC’s effort in supporting nuclear technology is recognised and encouraged – but its sustainability depends on maintaining the current level of funding.

- **Five-year assessment**

The five-year assessment (5YA) exercise is legally necessary before the Commission can make proposals for the Sixth Framework Programme. It covers both the impacts of the Fourth Framework Programme and progress on the Fifth Framework programme. The main focus for the JRC was on the management aspects of its activities, the impact of its support to EU policies and delivered results in relation to adopted programmes. JRC input involved a report of activities over the five-year period, with individual evaluations of the eight institutes, backed by an overall report from a high-level R&D personality.

In June 2000, after four months of meetings, visits to the institutes and deliberations of a panel of 12 independent experts of high scientific repute, Professor S. Barabaschi delivered a report carrying a wide range of constructive recommendations. Its overriding statement is that the new mission of the JRC must be maintained and its implementation assured in all aspects and consequences. To help this process, the JRC should:

- Allocate more resources to managing interfaces with its institutional customers, pay more attention to their needs, and translate results into user-friendly language;
- In planning support to policies, not limit effort to the R&D part alone, but remain involved in the whole project life-cycle, including post-delivery assistance;
- Increase management perception of outside opportunities and collaboration potential, identify internal knowledge gaps and bridge them with external capabilities; and
- Improve the awareness of the need for networking, both internal and external, which must become second nature to the JRC researcher.

The valuable recommendations collected in these two exercises have been combined in an action plan. A large majority of the recommendations has been accepted and agreed by JRC management, and checkpoints for six-monthly verification of progress established.

- **High level panel**

In January 2000, Research Commissioner Philippe Busquin established a high level panel, chaired by Viscount Etienne Davignon, to review and make recommendations on the workings of the JRC. A report presenting the unanimous view of the panel was issued in July 2000, containing a number of recommendations concerning:

- In which areas should the JRC concentrate its activities taking account both of its areas of excellence and the Commission's political priorities?
- What are the operational consequences of its mission in terms of its relationship with the European Parliament, scientific committees and various agencies?
- What are the needs in terms of establishing partnership networks with national centres in the Member States and at international level, and how can this best be achieved?
- How can the JRC be adapted to the changing relationship with national centres and EU institutions, while taking into account the status of the JRC as a Commission DG?
- How should JRC activities be funded?

The panel endorses the mission assigned to the JRC by the Fifth Framework Programme, and finds the JRC has a clear long-term role. It proposes opening the JRC up to the other Community institutions, and offers a number of organisational suggestions. It recommends that the JRC should not dissipate its efforts, but should focus activities and promote intense networking with other European centres of excellence. Finally, the panel attaches particular importance to nuclear activities.

After presenting the conclusions of the report to the Commission, Commissioner Busquin offered to follow it up with a communication on the JRC's role in the context of the European Research Area, and with a decision on improving the governing and advisory structure of the JRC.

- **Commission peer group evaluation**

On 26 July 2000, the Commission published the communication *Matching the Commission activities with its human resources – the means to achieve our objectives*, undertaken in the framework of the Commission Reform initiative. A peer group comprising five Commission members had been appointed earlier in the year to make a political overview of the institutions' activities and bring them into line with the available human resources.

The peer group concluded that a total of 298 research posts could be phased out. Of these, 200 were to be achieved by reductions in JRC staff, either by closing down the IAM Petten site or by reducing activities overall. A study on the potential closure of Petten concluded that this would not be feasible, so the JRC is identifying possible areas for reduction of activities across its structure. This task is scheduled for completion in early 2001.

## **JRC AND THE EUROPEAN RESEARCH AREA**

On 18 January 2000, the European Commission adopted the Communication *Towards a European Research Area*<sup>3</sup>, envisaged by Commissioner Philippe Busquin as a means of contributing to the creation of better overall framework conditions for research in Europe.

---

<sup>3</sup> COM(2000)6 - 18 January, 2000. See also the web-site: <http://europa.eu.int/comm/research/area.html>.

The document was discussed during the informal meeting of research ministers in Lisbon and endorsed by the Lisbon Summit at the end of March 2000. The European Parliament, the Economic and Social Committee and the Council of the Regions took part in the debate, together with the scientific community and industry.

An important dimension of the European Research Area initiative is the need to strengthen and develop the relationship between science and policy-making. This includes supporting scientific infrastructure, selecting and evaluating research programmes, as well as developing policies that rely on scientific excellence – from public health to vehicle safety.

A European scientific and technical reference system is required to analyse diverse opinions, fully assess the implications of the different options and provide objective information for democratic debate and decision-making. Such a reference system must be capable of reacting quickly in emergencies.

The JRC can play an important role in the development of the scientific and technical reference system by helping to provide support to policy-makers on the scientific and technical dimensions of their decisions.

Key activities of the JRC in this respect could include:

- Evaluating test methods and standards to help remove barriers to international trade;
- Providing independent verification of methodologies to promote EU-wide consensus on conflicting scientific issues; and
- Anticipating changes in society's demands over the coming decades.

The JRC is already engaged in these activities through various projects: the system for reference materials, which is essential in achieving comparable and traceable measurements; the European reference laboratory for air pollution (ERLAP); the work of the JRC-managed European Chemicals Bureau (ECB); the European integrated pollution prevention and control bureau (EIPPC); and the JRC's function as a world-wide reference for nuclear safeguards.

### **THE JRC AS A PARTNER IN NETWORKS**

Networking with research organisations and industry has long been recognised by the JRC as indispensable to fulfilling its mission of providing the best scientific and technical support to EU policies. It has collaborated with partners in research centres, universities, regulatory bodies, local authorities, industrial associations and companies throughout the EU and beyond. Within the context of the European Research Area initiative, a timely reflection was launched by the JRC throughout 2000 to explore the establishment of a scientific reference system that could provide independent and high-quality support to the Commission and Member States.

A first international workshop on science and governance was organised by the JRC in March 2000, bringing together policy-makers, scientists and academics from Europe, the USA, Canada and Japan. From these, the working group CERCLE (chief executives of research centres and laboratories in Europe) was formed to consider in detail the concept of a European scientific reference system. This body addressed the practical components and functions of such a system – how it would operate, the type of results it should deliver and how it could support its customers, namely the European Commission, the European Parliament and Member States.

Following the workshop, a two-day conference was jointly organised on science and governance by the JRC and the Research DG in October 2000, attracting some 450 delegates. Strong support emerged for the creation of a scientific reference system that would enable experts and organisations to network in delivering sound scientific advice.

The JRC continued its policy of collaborating with strategic partners to this end, and concluded a memorandum of understanding with the Spanish national research centre CSIC. Agreed areas for collaboration include research to identify, control and establish common standards on GMOs; food technology and quality control; biomaterials; and environmental monitoring. On the socio-economic level, CSIC and the JRC will work together on issues relating to Mediterranean candidate countries and on the European Science and Technology Observatory (ESTO). Collaboration will primarily materialise through joint projects, sharing facilities and staff exchanges. It will complement agreements reached with other leading research organisations.

## **PARTICIPATION OF ACCESSION COUNTRIES**

Since mid-1999, 11 accession countries have joined the Fifth Framework Programme as associate members and are benefiting from full participation in all EU research programmes (seven countries have also subscribed to the nuclear section).

The report of the panel of independent experts chaired by Viscount Davignon (July 2000) spurred the JRC to draw up an integrated strategy covering science and technology issues to aid the enlargement process. In particular, the panel emphasised the increasingly important role for the JRC in helping Central and Eastern European countries to improve the performance and safety standards of their nuclear installations.

In 2000, the JRC started a specific action in support of the enlargement process. This will strengthen the collaboration with research organisations in the pre-accession countries, through various measures such as:

### ***Progressive opening up of the JRC work programme***

Within the JRC Fifth Framework Programme work programme, 18 projects have been accorded higher priority to address specific needs of the pre-accession process in the areas of environment, nuclear safety and safeguards, harmonisation of measurements, agriculture, food and chemical products, prospective analysis and modelling.

### ***Encouraging submission of joint proposals to the Fifth Framework Programme***

Through its core competences, the JRC plays an important role in drawing research organisations from pre-accession countries into European project networks. In 1999, 43 shared-cost projects were selected, in which the JRC joined with 60 research organisations from these partner countries.

### ***Organising joint events***

In 2000, information days for senior representatives of the research community were organised in major pre-accession countries (Bulgaria, Hungary and Poland), to raise awareness of the opportunities offered by collaboration with the JRC. In addition, several joint workshops and conferences have taken place, or have been scheduled.

## **INTERNATIONAL RELATIONS**

In the context of its new mission, the JRC had announced to the joint Group Research/Atomic Questions in spring 1999 that it intended to undertake a dramatic revision of its international relations to focus on the aims set by its mission.

The past year has seen the effects of this transition and a realignment of the international activities of the JRC – both in its own fields of jurisdiction and in its interaction with the USA and Japan, who are essential EU partners. Certainly, improvement is still required and some sectors of activity reflect too great a diversity in the interventions of the JRC. But, on the whole, significant progress was made.



### **An individual partner: Japan**

Links between the JRC and Japanese research institutes form the principal Community-level co-operative activity between the EU and Japan. This is largely explained by the structure of research in Japan. This co-operation covers the aspects of science and technology at the centre of common interest.

While all four pillars of JRC activity have benefited from this change, it is in nuclear safety and food security that the effects are most pronounced.

### **The nuclear field**

- **With the USA**

Bill Richardson, the US Secretary of Energy, invited the JRC Director-General to be associated with the ideas and initiatives launched by the former. Following a meeting held in Washington at the end of October 1999 between the Director-General and the Under Secretary in the US Department of Energy (DoE), the decision was taken to widen the field of co-operation, currently limited to the control of the nuclear materials. A draft Euratom/US-DOE agreement covering nuclear technologies is now being examined.

In addition, under the existing agreement, these meetings helped reaffirm the wish of the two parties to continue co-operation, particularly in assistance to Russia and the newly independent states (NIS) in the field of controlling nuclear materials (nuclear safeguards).

- **With Japan**

A visit by the JRC Director-General to Japan in spring 1999 had resulted in similar conclusions. Co-operation with the Japan Atomic Energy Research Institute (JAERI) has been widened to nuclear technologies, in the same way as with the USA. In addition, the R&D agreement concerning the control of nuclear materials should be renewed very soon.

Within the framework of a profound restructuring underway in Japan, which should be completed in 2001 with the disappearance of the Science and Technological Agency (STA), control of nuclear materials will be entrusted to the Nuclear Material Control Centre (NMCC). The NMCC has already stated that it would welcome JRC technical support and experience, both for training its inspectors and developing the most suitable techniques. A draft agreement, comprising possible contractual clauses to allow the payment by the Japanese for the services of the JRC, is being examined.

- **With Brazil/Argentina**

The Brazilian-Argentinean Agency for Accounting and Control of Nuclear Material (ABACC) is the only regional organisation – other than Euratom – responsible for the control of nuclear materials. While its operating rules are different from those of Euratom, its objectives and technological needs are similar. It was therefore natural that a co-operation agreement be concluded between the two bodies. Modelled on the Euratom/US-DOE agreement, this was duly signed on 10 February 1999.

- **With Russia**

Co-operation with Russia under TACIS continues, while that with the EU enlargement candidate countries is being intensified.

## **Food security and consumer protection**

- **With the USA**

Discussions were carried out mainly with the USA on food security and consumer protection. At the 'New Vistas' meeting held in Stuttgart on 15 June 1999, it had been agreed that the questions of food security (including that of GMOs) should be the subject of genuine co-operation. It was agreed in Washington in February 2000 that the optimal approach would be to draft a memorandum of understanding between the JRC and the JIFSAN (joint institute for food safety and applied nutrition) research centre at the University of Maryland.

- **With Australia**

During an international conference on GMOs in Sydney in spring 1999, close contacts were made with the Australians.

- **With Canada**

Formal collaboration was established with the objectives of obtaining scientific data concerning safety and food quality, plus the establishment of co-operation in the more specific fields of chemical contamination and fraud prevention, with particular respect to GMOs.

- **With the World Health Organisation**

At the end of 2000, the World Health Organisation (WHO) approached the JRC to examine the possibility of the JRC leading research projects intended to improve food security and environmental safety aspects of human health protection. Such projects will come within the broader agreement currently under discussion between the Commission (the Health and Consumer Protection DG) and WHO.

## **Environmental protection**

- **With applicant countries**

Numerous actions are in hand in the field of environmental protection, particularly with the applicant countries for enlargement. The EI takes part in monitoring the Danube basin, and in the fight against pollution there. The countries concerned called for support following the accidental discharge of highly toxic products.

- **With Japan**

EI is acting in three priority areas with Japan that interest both partners: urban pollution and the question of emissions, overall climate change and the implementation of the Kyoto protocol, and solar energy. In the latter field, CRIEPI (the joint research organisation of the Japanese electricity producers) and the Japanese Quality Association wish to develop joint projects with EI.

- **With the USA**

EI has been collaborating with the US DoE 's Environmental Chemistry Division at Brookhaven National Laboratory, in determining the role of atmospheric aerosols (e.g. particulate matter derived from fuel combustion) in the radiation budget of the Earth. The two groups are currently collaborating to integrate ten years of international research in this area, as requested by the International Geosphere-Biosphere Programme (IGBP).

Jointly with the Environment DG, EI set up collaboration with the US Environmental Protection Agency (US-EPA) in order to develop and implement aligned global standards relating to emissions from non-road machinery.

Finally, in the area of human and environmental health, a common EU-US framework is being established to promote transatlantic co-operation in endocrine disruptor research. Preliminary contacts include US EPA and other US institutions (National Academy of Sciences, universities...) and private companies.

- **With Canada**

Three areas of co-operation are underway with Canada:

- (1) Monitoring of radioactivity in the environment, with the Meteorological Centre of Canada and the University of British Columbia;
- (2) Use of remote sensing for soil monitoring, with COLUTEQ (Consortium of the Teledetection Laboratories of Quebec); and
- (3) Sustainable development, with the Canadian ministries of industry and environment. In this context, the IPTS co-presides the OECD's task force on biotechnology for sustainable industrial development with the Canadian Ministry of Industry and MITI (the Japanese Ministry for International Trade and Industry).

- **With Russia**

SAI and the International Forestry Institute (IFI) in Moscow have established collaboration for the monitoring of forests and fires covering the whole of Siberia.

- **Under the Kyoto Protocol**

The SAI TREES project in support of the Environment and Development DGs covers the countries of the tropical area in Africa, South East Asia and Latin America confronted with a deforestation problem. This work is carried out in collaboration with the space agencies in Japan (NASDA) and the USA (NASA). Agreements drawn up with these two bodies, and with the ESA, comprise a contribution to the definition of new instruments for ground observation, as well as to their use.

The SAI World Fire Web (WFW) project provides for systematic monitoring of forest fires at world level, in co-operation with national institutions of 15 countries, including Canada, USA, Brazil, Australia and Russia.

### **General security**

In fields more generally connected with security in its broad meaning, the following are worthy of mention:

- *Signature of an arrangement between the JRC and the US National Science Foundation (NSF) in the field of seismic engineering.* This agreement, similar to that existing between the JRC and the Building Research Institute (BRI) of the Japanese Ministry of Construction, concerns co-operation with three American university laboratories financed by the NSF.
- *Signature of a memorandum of understanding on 17 July 2000 on the technologies intended for mine clearance for humanitarian purposes.* The International Test and Evaluation Programme (ITEP) for humanitarian mine clearance proposes a framework for co-operation between the European Commission (represented by the JRC in accordance with its Work Programme), the USA, Canada and the five Member States undertaking an R&D programme in this field (Belgium, Germany, the Netherlands, Sweden and the United Kingdom).

### **COMPETITIVE ACTIVITIES**

While the majority of the JRC budget supports its core research Work Programme, approximately 15% is earned from other sources. Competitive activities is the umbrella term given to all other income earned – from participation in the collaborative projects of the Fifth Framework Programme, additional paid work to support European Commission services and work for third parties, typically regional authorities or industry.

Participating in such activities brings several advantages. In addition to benchmarking against other research centres, the JRC also gains access to new expertise and shares its own competences and facilities. In accordance with JRC's own regulations, projects must complement the JRC's mission and must respect the subsidiarity principle.

Throughout 2000, the JRC enjoyed a success rate of approximately 40% in its applications for shared-cost projects, resulting in a further 90 new projects awarded. The majority of these were from the 'Energy, Environment and Sustainable Development' and the 'Competitive and Sustainable Growth' Programmes' of the Research DG, although the JRC was also represented in other programmes.

## **TECHNOLOGY TRANSFER**

### **The European Technology Transfer Initiative (ETTI)**

The JRC often produces results with potential industrial applications as a by-product of its core research programme. In addition to on-going activities to protect and exploit research results with commercial applications, the JRC is developing a number of specific projects to promote technology transfer by the creation of spin-offs. These activities are grouped under the European Technology Transfer Initiative (ETTI).

Approved by the Commission in 1998, ETTI aims to provide access to, and maximise, the exploitation of JRC's research results to the benefit of European industry. The initiative is composed of three strands:

#### **1. Entrepreneurship courses**

Following the successful pilot course in 1999, a second course in entrepreneurship training for JRC researchers – particularly those on short-term contracts – ran between March and September 2000 at the JRC Ispra site. Candidates selected for the course on the basis of a business proposal attended 18 weekend workshops, consisting of approximately 150 hours of training delivered by professionals from Member States. All phases of business planning – from feasibility studies via financing to practical steps for start-ups – were covered during the course, giving it a strongly pragmatic flavour.

#### **2. Technology Transfer Fund**

The concept behind the Technology Transfer Fund was to stimulate the set-up of a seed capital fund that would be both trans-European and trans-technology. In June 2000, following a call for interest published in 1999 and subsequent negotiations, a contract was signed between the JRC and German venture capital company Industrie Management Holding (IMH) GmbH to raise the fund. A € 20 million fund is being raised on the market, with no financial or legal involvement on the part of JRC. Half of the fund is dedicated to JRC projects, but it will also invest in other spin-off projects throughout the Member States and Associated States.

Throughout the second half of 2000, a selection of results with commercial potential was presented to the fund managers on a 'first right of refusal' basis. Of these, four projects were selected for development of a detailed business plan with a view to possible investment.

#### **3. European Centre for Innovation and Spin-offs (ECIS)**

This new centre is intended to provide an incubation function for selected JRC spin-off projects. ECIS will typically assist with assessment of intellectual property rights, market studies, design consulting, business plan development and so on, before a new legal company is formed. Two to three such spin-offs are expected every year. Facilitating technology transfer from JRC to innovative SMEs in less-favoured regions of the Member States is a second objective. It is anticipated that the ECIS incubator management team, assisted by a network of consultants, will help to identify and contact such companies. Two to three

projects of this kind are anticipated each year. ECIS will be located at JRC's Ispra site, but access will be open to all JRC researchers. The centre is expected to be operational in 2001.

### **Expertise for the setting-up of innovative firms (EXSIF)**

Complementing the above activities is JRC's involvement in the collaborative EXSIF project, funded by the Enterprise DG. A consortium of European R&D organisations – including CEA (FR), CERN (CH), CNRS (FR), CSIC-CNM (ES), DERA (UK) – representing some 40,000 researchers is pooling resources to promote high-tech spin-offs. The expected results are the establishment of pools of experts, as well as the definition of a set of best practices validated in case studies and pre-packaged for dissemination throughout the EU.

### **Protection and exploitation of JRC research results**

Results produced at the JRC are the property of the European Communities. JRC researchers are encouraged to protect research results by the most appropriate means (e.g. patent or copyright) prior to publishing or other disclosure. The JRC's technology transfer unit works closely with the Enterprise DG and a network of technology brokers to ensure that JRC results are protected and exploited. Fourteen patent applications and four requests for software registration were filed throughout 2000. Licensing a technology to the appropriate industrial partner is the most common means of exploitation. The JRC has more than 800 partners in both industry and academia through its collaborative work, and welcomes new contacts.

### **Innovation project competition**

An internal competition was organised to encourage innovation within the JRC institutes. More than 30 proposals were submitted, reflecting the broad range of results arising from JRC core research. Four projects were selected for full funding; a further three received partial support. In addition, market studies were commissioned in order to assess the commercial potential of two projects. The development of a new type of fuel cell and the commercialisation of a biotech cell screening kit are among the projects supported.

## **COMMUNICATIONS STRATEGY**

The JRC communications strategy, defined in 2000, provided for a number of objectives intended to increase the visibility of JRC activities to the outside world. A major objective was to promote JRC's image towards its stakeholders, including the European policy-makers (the European Parliament, European Commission DGs and services, and Member States), the scientific community, the media – and, ultimately, the general public.

Media relations and the popularisation of scientific information were accorded high priority. The media is considered a valuable partner for the JRC; the press and radio/television are not only vehicles for the relay of information, but also a target audience.

To attain these goals, a large number of significant events were organised in 2000, targeting the European decision-makers both in the European Parliament and Member States, as well as the media – resulting in increased media coverage and visibility for JRC activities.

Another objective was to streamline communications activities in order to foster JRC-wide cohesion. This was achieved by setting common guidelines and a house style for publications, and by tailoring key media messages to the relevant target audiences.

Considerable effort was dedicated to the expansion and reinforcement of JRC networks, notably by organising a launch event for the JRC Alumni Network.

In 2000, integration of communications activities into mainstream JRC policy and scientific work also had to adapt to the refocusing of JRC activities, taking into account new priorities.

### Events

During the year, major JRC-organised events included conferences, exhibitions, seminars and workshops – many of which also involved media relations. These included:

- **JRC@EP** was a large exhibition held from 31 January to 4 February 2000 at the European Parliament in Brussels, with the aim of increasing the visibility of key JRC activities to members of the European Parliament, as European policy-makers and JRC stakeholders. Research Commissioner Philippe Busquin inaugurated the exhibition and gave a press briefing to some 20 journalists. Very positive results ensued. The event generated strong interest, and contributed to enhanced recognition for the JRC, its role and its possible support to the European Parliament. It also provided an opportunity to establish new contacts between MEPs and the JRC.
- A **JRC Information Day** was organised in Lisbon on 4 May 2000 to recognise the Portuguese Presidency of the EU and target the Portuguese scientific community. Featuring project presentations, visits to research centres and a press dinner, this was successful in helping to establish good links with Portuguese research organisations and paving the way for further collaboration. It also obtained extensive media coverage.
- A major conference on **‘Science and Governance in a Knowledge Society: the Challenge for Europe’** was organised on 16 and 17 October 2000 in Brussels. This served as a follow-up to a workshop held in March 2000 on the same subject, at which the interaction between science and society was debated. The October event was attended by more than 500 participants from industry, research organisations, European and national decision makers, universities from all over Europe and other continents – as well as many journalists. Some 40 speakers took part in the various sessions, and the closing presentation by Commissioner Busquin was broadcast live on the Internet.
- A high level international workshop on **vehicle emissions** and the inauguration of the ERLIVE laboratory took place on 11 and 12 July 2000 in Ispra. This event brought together the Commissioner for Research, Philippe Busquin, Italian Minister of Research Ortensio Zecchino, industry partners, plus representatives from the European Parliament and other DGs of the European Commission. A group of journalists also participated in a press conference on globalisation of emissions standards, and the JRC contribution to this drive.

The signature of several memoranda of understanding afforded further opportunities to raise awareness of JRC activities:

- A memorandum of understanding with the European Council for Automotive Research and Development (EUCAR) and CONCAWE (the oil companies' European organisation for environment, health and safety) on polluting emissions was signed on 12 May 2000;
- A memorandum of understanding on humanitarian demining with the International Test and Evaluation Programme (ITEP) was signed on 17 July 2000.

Commissioner Busquin participated in the latter event, both of which generated good press coverage.

The Commissioner also participated in a number of JRC external events, such as the GMES Space Symposium in Lille (FR) on 16 and 17 October 2000, and the new technology exhibition SITEF 2000 in Toulouse (FR) from 18 to 21 October 2000.

## **JRC site visits**

As in 1999, JRC sites received a large number of visitors, including such prominent members of the European Commission as President Romano Prodi, Vice-President Neil Kinnock, Environment Commissioner Margot Wallström, and Health and Consumer Protection Commissioner David Byrne.

The Commissioner responsible for the JRC, Philippe Busquin, visited JRC sites on several occasions during the year, inaugurated a number of projects and held meetings with staff as well as their representatives.

Many MEPs were welcomed to Ispra, including European Parliament Vice-President Alejo Vidal-Quadras on 25 February 2000, a STOA (the European Parliament scientific and technological options assessment unit) visit and meeting on 5 May 2000, and an ITRE working group (the European Parliament committee on industry, external trade, research and energy) visit and meeting on 25 May 2000.

National policy makers visiting the Ispra site included Italian President Carlo Azeglio Ciampi on 12 September 2000, the Italian Minister for Research Ortensio Zecchino on 11 July 2000, Swedish Secretary of State for Research Agneta Bladh on 30 and 31 May 2000, and Portuguese Secretary of State Luis Parreirao on 5 June 2000. Representatives of the scientific community, journalists and members of the general public further swelled the list.

By mid-December, a total of 10,986 persons – including 1623 for visits to institute facilities and laboratories – had passed through the Ispra site for 209 events such as meetings, conferences, workshops and seminars. In addition, Ispra held its first open day for the general public on 13 May 2000 to celebrate Robert Schuman Day.

## **Media relations**

A large number of specific press events were organised in 2000, for which the JRC distributed 23 press releases, as well as information packs and other material. These led to very positive results in terms of media coverage, notably by the Member State press and press agencies: some 450 press articles and interviews specifically dedicated to JRC activities were collected, together with more than 30 TV clips.

## **Publications**

The strategy for JRC newsletters – both internal (*JRC in (month)*), common to all JRC institutes, and external (*Letter from the JRC*) – was consolidated in 2000. The two newsletters are now published on a monthly basis and cover a wider range of subjects.

Distribution of the *Letter from the JRC* has been increased to 10,000, notably to European policy-makers. Its contents are more thematic and project-oriented, with the various institutes contributing to their compilation.

Documents such as the Annual Report and the thematic brochure *Serving the Citizen* were published and disseminated, while work began on a new set of four general brochures to be published in 2001.

In addition to specialised scientific publications, a total of 45 project leaflets and more than 250 posters illustrating JRC projects of close interest to the citizen were produced for use at exhibitions, conferences and workshops. And, an historical book entitled *JRC – 40 years of service for Europe* was distributed for the first time on the occasion of the ‘JRC Alumni Event’ in June 2000.

In 2000, a corporate video on the JRC was duplicated and 3,000 copies were disseminated, and the production of a ‘view-card’ (a type of mini CD-ROM) was launched.

### **JRC corporate website activities**

A new JRC corporate website, launched on the occasion of the JRC@EP event in January 2000 attracted very positive feedback. The contents of the site are updated frequently – and the implementation of various enhancements, including a search engine, began in December 2000.

A large number of queries are received through the website, which won favourable reviews in the specialised press. A survey carried out by Politik-Digital (<http://www.politik-digital.de/>), a major German portal website for politics, has ranked it as the fourth best – together with that of OPOCE (Office for Official Publications of the European Communities) – among the Commission DGs' websites.

During the last quarter of 2000 there were an average of about 800,000 hits, 50,000 visits and 150,000 successful information requests a month – in general, one visit corresponds to many hits and may result in the download of several files.

### **Providing information to the public**

The JRC received many requests for information and publications from various publics – journalists, scientists, students, institutional bodies, etc. In 2000, the Information and Public Relations unit handled some 1713 requests – including 936 for the Annual Report.

### **YOUNG SCIENTISTS PRIZE 2000**

For the first time in 2000, the JRC Young Scientists Prize prizes were awarded to recognise the impact of work undertaken in support of EU policies. The prize was announced during spring 2000, calling for proposals or applications for awards to scientists less than 36, serving or having served at the JRC. Up to three awards were available. There was a total of 54 applications/proposals concerning work at all JRC institutes and covering a very wide spectrum of scientific activities.

The prizes were an initiative of Research Commissioner Philippe Busquin, and intended to recognise *'a significant contribution to the scientific life of the JRC with emphasis on a scientific accomplishment having contributed to the implementation of the JRC mission'*. An additional qualification was that the scientific accomplishment should have added to the links between the JRC and other partners on the European research scene.

On the occasion of the Alumni Event 'JRC in the 21<sup>st</sup> Century – Science and Governance' held in Varese and Ispra (IT) on 29 and 30 June 2000, the JRC Director General bestowed the JRC Young Scientists Prize on:

- Dr. Julia H. Fentem of Unilever, formerly with the JRC ECVAM (European Centre for Alternative Methods) at the EI (now at the IHCP) at Ispra (IT) for her work on alternative (non animal) tests for skin corrosion.
- Dr. Ioannis Papadakis of the IRMM in Geel (BE) for his work on co-ordination of and research on reference values of trace elements.
- Dr. Gabriele Tamborini of the ITU in Karlsruhe (DE), formerly with the EI, for his work on secondary ion mass spectrometry method for analysis of radioactive micro-particles.

Each award winner received a diploma, a medal and an invitation to participate on behalf of the JRC in a scientific seminar or congress of his/her choice. The three winners also presented their work at the Alumni Event.



## THE JRC IN FIGURES

### *Staff*

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

<b>Statutory Staff</b>	<b>1999 M</b>	<b>1999 F</b>	<b>2000 M</b>	<b>2000 F</b>
Officials	566	135	600	159
Temporary agents on 5-year renewable contracts	671	186	612	187
Temporary agents on 3-year non-renewable contracts	102	71	78	44
Auxiliary staff (1-year contracts)	182	55	110	106
<b>TOTAL</b>	<b>1521</b>	<b>447</b>	<b>1400</b>	<b>496</b>

Of the above-mentioned total, about 1500 staff members can be considered as scientific staff out of which about 250 are employed on short term contracts (1-3 years).

During the course of the year, the total number of staff (excluding auxiliary agents) fell by around 50, the number of departures exceeding the number of new recruits. The implementation of the Commission policy for staff financed on the research budget (NPPR) was continued. The objective of this policy is to reach 40% of the total statutory staff as officials, with a flexible portion of temporary agents (35% of the statutory staff on 5-year contracts, 25% on 3-year contracts). In 2000 the percentage of officials reached 36% of total staff.

Taking into account short-term statutory staff (3-year temporary and auxiliary agents), and the short-term non-statutory staff (national detached experts, visiting scientists, grant-holders and trainees), approximately 30% of JRC staff are recruited on three-years, or less, non-renewable contracts.

### *Equal Opportunities*

In 2000, 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. The year was marked by the establishment, in February, of the JRC Network for Women in Science in the framework of the Commission communication on Women and Science, where each institute and directorate of the JRC is represented.

<b>Staff Distribution*</b>	<b>1998 M</b>	<b>1998 F</b>	<b>1999 M</b>	<b>1999 F</b>	<b>2000 M</b>	<b>2000 F</b>
DG and programme management	30	27	24	31	26	28
Institute for Reference Materials and Measurements	156	33	135	31	133	38
Institute for Transuranium Elements	160	27	159	33	167	38
Institute for Advanced Materials	156	10	143	21	132	24
Institute for Systems, Informatics and Safety	214	36	194	40	196	47
Environment Institute	160	51	148	41	135	38
Space Applications Institute	102	39	102	37	82	28
Institute for Health and Consumer Protection	100	50	97	46	86	42
Institute for Prospective Technological Studies	28	14	32	11	34	12
Administration	72	58	68	70	67	67
Ispra Site Infrastructure	275	25	237	31	232	28

\* Officials and temporary agents.

*Visiting scientists, seconded experts, trainees, grant-holders*

	<b>1999</b>	<b>1999</b>	<b>2000</b>	<b>2000</b>
	<b>M</b>	<b>F</b>	<b>M</b>	<b>F</b>
Visiting scientists	15	2	19	2
Post-Graduate grant-holders	52	31	69	34
Post-Doc grant-holders	70	27	55	23
Trainees	65	77	42	52
Seconded national experts	20	5	23	5
<b>TOTAL</b>	<b>222</b>	<b>142</b>	<b>208</b>	<b>116</b>

*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 from the European budget to the JRC, from associated countries and from competitive activities. On the institutional budget the following sums were committed:

<b>(in M€)</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>
Staff expenses	160	157	160
Means of execution	51	59	49
Operational appropriations	48	46	50
<b>TOTAL (rounded)</b>	<b>259</b>	<b>262</b>	<b>259</b>

5.7 M€ were engaged for decommissioning.

*Competitive activities*

The 13.3 M€ figure for shared-cost actions reflects the conclusion in the year 2000 of 116 new contracts.

Competitive activities outside the FWP were defined through the conclusion of 16 new contracts for a total amount of 9.5 M€. Third Party Work up to a value of 8.9 M€ was committed for a range of 68 major clients.

	<b>Inscribed in 2000 accounts</b>
Shared-Cost Actions	13.3
Competitive Activities outside the FWP	9.5
Third Party Work	8.9
<b>TOTALS</b>	<b>31.7</b>

*Publications*

<b>Institute</b>	<b>EUR reports</b>	<b>Conferences*</b>	<b>Articles**</b>	<b>Special Publications</b>	<b>TOTAL</b>
General Management	4	2	2	27	<b>35</b>
IRMM	15	101	63	1	<b>180</b>
ITU	3	105	57	-	<b>165</b>
IAM	27	46	13	12	<b>98</b>
ISIS	30	154	39	31	<b>254</b>
EI	32	121	46	7	<b>206</b>
SAI	26	158	65	25	<b>274</b>
IHCP	13	100	49	21	<b>183</b>
IPTS	24	9	5	15	<b>53</b>
<b>TOTAL</b>	<b>174</b>	<b>796</b>	<b>339</b>	<b>139</b>	<b>1448</b>

\* Conferences include oral and poster presentations and proceedings.

\*\* Articles include also conference papers published in periodicals.

## SCIENCE AND GOVERNANCE

Given the accelerating pace of technological change, the increasing importance of scientific matter to policy decisions and the speed with which Europe's institutions are evolving, the JRC organised a high-level workshop on the relationship between science and governance on 29 and 30 March 2000. The workshop was well attended by directors of research establishments, civil servants responsible for research policy, members of the European Parliament, industrialists, NGOs and academics who had studied the relationship between science and policy.

The workshop was a first step in understanding how to develop a common system of scientific and technical reference for policy implementation. This forms an important part of the Commission's European Research Area initiative. European policy-makers and citizens should, in fact, be able to rely on information that is precise, as complete as possible, scientifically up-to-date and continuously validated.

These questions were considered further during a conference entitled 'Science and Governance in a knowledge society: the challenge for Europe' which was jointly held by the JRC and the Research DG on 16 and 17 October 2000 in Brussels. The potential role that the JRC would play in this area was also touched upon during the discussions. Three sessions – respectively on science, citizens and the decision-making process; risk control and precautionary research; and towards a scientific and technical European reference system – were held on the first day. During the closing session, the role of the European Research Area for the development of new European citizenship was debated.

Overall conclusions of the October conference were that:

- In terms of structure, the EU science and technology reference system should be launched, based on networks of centres of excellence providing a common knowledge base for science and technology reference, and facilitating the dialogue between stakeholders, scientists and policy-makers. Benchmarking will help to identify differing practices across countries. The Commission's European Research Area initiative will make possible the first step in this process, the building of the networks.
- The science and governance interaction can contribute a new dimension to the Commission President's initiative on overall governance and the corresponding White Paper on the topic, expected in 2001.

## WOMEN AND SCIENCE

Gender perspectives in research are being addressed by the European Commission, as reflected in its Communication on Women and Science<sup>4</sup> and more recently by the Communication on the European Research Area. The JRC, as the Commission's in-house research centre, has responded with the formation of a 'Women & Science' working group, composed of representatives from its research institutes and directorates.

A first report<sup>5</sup> was compiled and produced in spring 2000 on the gender distribution in the JRC as a snapshot of the organisation. The report illustrates the composition of staff by gender and grade for the overall JRC and by institute. For the total staff, there is a ratio of 65% male to 35% female. Men make up 87% of the scientific staff, and account for 96% of all project leaders. At managerial level (i.e. heads of unit, advisers, directors), men occupy 90% of the total positions. Figures for scientific committees reflect the JRC's scientific staff numbers, with an average female representation of 14%.

---

<sup>4</sup> *Women and Science – Mobilising women to enrich European Research*, COM(1999)76 final.

<sup>5</sup> Gender Perspective in the Joint Research Centre.

Data on staff distribution per institute is available in the report. Considerable disparities are evident amongst institutes. In the IAM, women make up 6% of the scientific staff, whereas in the IHCP, 27% of the scientific staff are female. The situation reflects both the JRC's historical legacy and the fields of discipline.

The JRC also hosts grant-holders (post-graduate and post-doctoral researchers), established senior scientists (visiting scientists) and seconded national experts. Currently all visiting scientists at the JRC are men, whereas women make up 36% of the younger grant-holders. This parallels the situation in most European universities and research establishments.

### **TOTAL QUALITY MANAGEMENT**

A quality management self-assessment exercise was completed in 2000, within the Total Quality Initiative started in 1999. Activities and results were reviewed at all levels of the JRC to identify strengths and areas for improvement. The action made use of the European Foundation for Quality Management (EFQM) model, which is based on best practice, supports sustainable growth and applies several criteria, such as leadership, people, policy and strategy, partnership and resources and processes – as well as the consequences in terms of people, customers, society and key performance.

The outcome of the self-assessment exercise was presented to the personnel of the JRC institutes and headquarters. As a result, improvement teams were established to propose improvement actions. Areas for improvement were identified for each institute and for the headquarters, improvement teams meet regularly and initial agreed actions have already been implemented.

### **SCIENTIFIC ACTIVITIES OF THE INSTITUTES IN 2000**

#### **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 <sup>6</sup><br>Franco CORVI <sup>7</sup> |
| 6. Radionuclide metrology  | Dietmar F.G. REHER   |
| 7. Informatics and electronics   | Richard ROSS <sup>8</sup>                                  |
| 8. Commercialisation of materials and reference methods and scientific liaison | Doris FLORIAN  |

---

<sup>6</sup> Until 30th September 2000.

<sup>7</sup> Acting.

<sup>8</sup> Until 31st October 2000.

### ***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.*

Forming an integral part of the JRC mandate to establish a common system of scientific and technical reference for the European Union, the Institute for Reference Materials and Measurements (IRMM) has today become the trans-national measurement institute of the European Commission. This is analogous to the national measurement institutes in the Member States.

Given its institutional proximity to the development of European Union policies and its independence of national and private interests, the research profile of the IRMM is spearheaded by the EU's political agenda. The Institute supports the Member States by providing state-of-the-art reference materials and measurements.

The IRMM's scientific activities are categorised according to the three scientific pillars of the JRC:

- Safety of food and chemicals
- Environment
- Nuclear safety and safeguards

Selected scientific highlights are documented in the following pages, which also provide a brief insight into IRMM's horizontal activities.

## **SAFETY OF FOOD AND CHEMICALS**

### **Reference materials**

The IRMM has continued to renew, maintain, produce, distribute and manage over 450 different Bureau Communautaire de Référence (BCR) and IRMM certified reference materials. 70% of these materials support the safety of food and chemicals.

### **Genetically modified organisms**

In collaboration with the Health and Consumer Protection DG, and in support to the Novel Food Regulation (EC) 258/97, the IRMM has continued to provide scientific support for the enactment of EU labelling requirements to provide reference materials and methods urgently needed for detecting genetically modified organisms (GMOs) in food. Since 1997, the IRMM has produced no less than 15 new reference materials for soya beans and maize — as well as preparing and providing a range of proficiency testing samples for method validation studies carried out at the JRC Institute for Health and Consumer Protection.

In 2000, a second generation of certified reference materials for Roundup-ready (RR) soya (i.e. six new GMO certified reference materials) were produced, together with PT-samples for GMOs in processed food. The mixing, characterisation and zygoty tests for the third generation certified reference materials for PMON810 were performed. A study of DNA quality in RR soya was also completed, so this material was launched onto the market as IRMM-410R.

## Alleviating the Dioxin/PCB crisis

With the advent of the dioxin crisis in 1999, the Belgian authorities urgently required calibration solutions for polychlorinated biphenyls (PCBs) and dioxins, to permit the installation of proper control measurements and thereby avoid further entry of these highly toxic chemicals into the food chain. The IRMM immediately responded to this request; within weeks, 1,765 ampoules containing 1-ml PCB calibration solutions were prepared and delivered. Additionally, pork was targeted as a meat category that required control. The IRMM therefore prepared blanks and samples for PCBs in pork fat, and organised two proficiency testing campaigns involving a total of 60 analyses for Belgian laboratories. The results of these inter-comparisons meant that 7% of the laboratories involved were declared unfit to continue performing such analyses.

## Nutrients and minerals in pig and dairy feed

In collaboration with the Health and Consumer Protection DG, and in fulfilment of EC Directive 93/28/EEC, reference materials are needed to check that pig and dairy feed materials contain the minimum required amounts of nutrients and minerals (including copper). To meet this requirement, the IRMM produced and bottled 3,422 units of BCR-708 (pig feed) and 3,725 units of BCR-709 (dairy feed) in March 2000. These materials are presently undergoing the certification process.

## Establishing reference systems for *in vitro* diagnostic measurements

The stated purposes of the European *in-vitro* diagnostic (IVD) Directive (98/79/EC) are to eliminate trade barriers within Europe and to ensure improved measurements for healthcare decision-making by creating a single channel of approval for all IVD products within the European Union. This requires manufacturers of *in-vitro* diagnostics who wish to sell their products in the EU to demonstrate that they are ‘traceable to reference systems (i.e. reference materials and/or reference methods) of a higher order’.

This ruling has brought to light an enormous need for internationally recognised certified reference materials. At present, however, neither certified reference materials nor reference methods are available for quite a number of the analytes measured in clinical laboratories. Accordingly, the IRMM has collaborated with the International Federation of Clinical Chemistry (IFCC) in certifying four IRMM/IFCC certified reference materials for enzyme activity at 37°C – as well as an IRMM/IFCC reference panel of 34 sera for cortisol.

CRM	Description
IRMM/IFCC-451	Cortisol reference panel of fresh frozen human sera IRMM/IFCC-452: gamma-glutamyltransferase partially purified, from pig kidney
IRMM/IFCC-452	Gamma-glutamyltransferase partially purified from pig kidney
IRMM/IFCC-453	Human lactate dehydrogenase isoenzyme 1
IRMM/IFCC-454	Alanine aminotransferase partially purified, from pig heart
IRMM/IFCC-455	Creatine kinase CK-MB from human heart

## Reference Methods and Measurements

The IRMM has developed and performed reference measurements to support the safety of food and chemicals.

## **Antibiotics in Food**

One prime EU concern at present is to detect and control the presence and concentration of antibiotics in foodstuffs of animal origin. The IRMM has accepted the task of developing hyphenated analytical methods to determine the misuse of several important classes of antibiotics. In accordance with Directive 70/524/EC and Regulation 2821/98, the Institution is presently developing a new reference method for the determination of several antibiotics in food, for which the maximum residue limits have been established. During the course of the year a multi-residue extraction procedure was developed and applied to 400 kidney samples from pigs and cows.

## **IMEP applied to food and chemicals**

The International Measurement Evaluation Programme (IMEP), running under the auspices of the International Union of Pure and Applied Chemistry (IUPAC), European Analytical Chemistry (EURACHEM), European Organisation of Metrology (EUROMET) and Co-operation on International Traceability in Analytical Chemistry (CITAC), shows the true state of chemical measurements on a global scale. IMEP rounds were carried out during this year to support the safety of food and chemicals:

- IMEP-8 (C/O ratios in CO<sub>2</sub> – for food authentication, emission monitoring and global change) involving 27 laboratories from 14 different countries, was completed.
- IMEP-9 (metals in water – for monitoring water quality) involving 201 participants from 35 different countries was also completed. The samples in this round were selected for a Bureau International des Poids et Mesures (BIPM) key comparison and for a EUROMET pilot project.
- Two new IMEP rounds have commenced for cadmium in rice and lead in wine (130 laboratories from 30 countries), with a high percentage of participating laboratories located in pre-accession countries.
- On behalf of the Agriculture DG, IRMM co-ordinated an inter-comparison of various methods among expert laboratories to determine the water content of sugar and dairy products. The results of these inter-comparisons enable the Agriculture DG and the International Dairy Federation (IDF) to evaluate and select the most suitable reference method for the determination of water content in these foodstuffs.

## **Providing scientific support to combat BSE**

In 1999, the IRMM successfully co-ordinated a post-mortem bovine spongiform encephalopathy (BSE) evaluation project – sample preparation and distribution, laboratory supervision and result evaluation – involving 14,000 BSE-infected and non-infected samples. The results of this test have enabled the scientific community to distinguish with 100% certainty animals clinically infected with BSE from healthy animals – which will lead to a Europe-wide screening of 65 000 cattle.

Today the IRMM, again in collaboration with the Health and Consumer Protection DG, is engaged in four new BSE projects:

- Evaluation of newly developed post-mortem BSE tests;
- BSE test performance in pre-clinical cases;
- Production of an international standard for BSE infectivity testing (using primates); and
- Assessment of relationship between infectivity titre and prion concentration.

While the above projects are being executed, future research avenues under discussion include:

- Provision of tissue samples from non-infected and scrapie/BSE infected sheep;
- A proficiency testing campaign covering European control laboratories that apply post-mortem BSE tests;
- The effect of other neurological diseases on post-mortem tests currently applied; and
- Distribution of PrPres in bovine brain stems.

### **Oxidative compounds in hair dyes**

Changing the colour of human hair has introduced a wide range and variety of cosmetic formulations onto the market. Reference methods therefore need to be in place to check that these formulations conform to EU cosmetic directives.

Supporting EC Directive 76/768/EEC and in collaboration with the Enterprise DG, the IRMM has developed a new reference method for analysing oxidative compounds in hair dyes. In 2000, first results were obtained for real commercial samples. These results have been presented to the working group on methods of chemical analysis for cosmetic products. An international inter-comparison campaign will follow, to validate this analytical method.

### **Additional activities**

- The IRMM is developing a new reference method for selenium speciation in feed/food (EC Directives 70/524/CEE, 89/398/CEE and in collaboration with the Agriculture DG). This year, a new procedure employing enzymatic extraction has successfully been applied to yeast material, giving an 80% yield.
- An advanced measurement method for sugar in industrial syrups has been developed with the Agriculture DG for use in routine laboratories (customs labs). Test results for this method were submitted to the Agriculture DG.
- An exploratory project on metal-binding protein characterisation and analysis is beginning. A method for milk authentication, as stipulated in Directives 83/417/CEE and 91/32/CEE, is being developed in collaboration with the Agriculture DG. The separation of the major milk proteins has successfully been carried out and the method was applied to 10 different types of commercial milk.
- Finally, a reference method using Reverse Phase-Liquid Chromatography-Mass Spectrometry/Mass Spectrometry was developed for the detection of 11 polar pesticides in oranges.

### **The future**

Future priority areas will focus on BSE research, detection and quantification of GMOs, and the control of xenobiotics (dioxins and PCBs) and natural contaminants such as mycotoxins in food. The IRMM will complete the production of reference materials for quantifying enzyme activities and produce new reference materials for cardiac markers and thyroid disorders. It will also develop analytical methods for the diagnosis of proteins.

The IMEP programme will focus more on health, food and chemical safety issues – such as lead in wine or cadmium in rice – and will eventually be expanded to include organic compounds in important matrices – e.g. PCBs in food. Ultra-low level radioactivity measurements in the HADES underground laboratory in Geel (BE) will be applied to radionuclides in food matrices such as milk, as well as to lead-210 measurements for assessing the effects of radon gas on bone tissue. Reference methods for selenium speciation and oxidative hair dyes will further be developed and validated.



## ENVIRONMENT

The IRMM continued to renew, maintain, produce and distribute certified reference materials, as well as performing, developing and validating reference measurements needed for environmental monitoring and protection. Results in 2000 included:

### **PCB and dioxin reference materials**

The preparation of dioxin standard solutions (BCR-614), fly ash (BCR-615) and sewage sludge (BCR-667) was completed in accordance with EC Reg. 26/94 (CEN-TC 264W61) and in collaboration with the Environment DG. Additionally, the preparation of candidate material for the renewal of BCR-392S (PCBs in sewage sludge) was completed with the Research DG in 2000.

### **EUROSOIL certified reference materials**

On 20 March 2000, a project on EUROSOIL certified reference materials commenced in fulfilment of Directive 79/831/EEC. This new project (taken over from the JRC Environment Institute in Ispra) will lead to the production and certification of six different soil types for adsorption coefficient, pH, carbon, nitrogen and particle size.

### **Neutron data measurements for environmental protection, reactor safety and waste transmutation**

Neutron data measurements requested by the Organisation for Economic Co-operation and Development (OECD), the Joint European Fusion File (JEFF) and the nuclear industry progressed significantly. Cross-section measurements were conducted for  $^{99}\text{Tc}$  (n,p) and (n, $\alpha$ ), as well as activation cross-section measurements for long-lived products. Additionally, in support of reactor safety, cross-section measurements were conducted for Al(n,n'),  $^{52}\text{Cr}$ (n,n') and  $^{58}\text{Ni}$ (n,n').

### **International measurement evaluation rounds**

The IRMM's IMEP programme provided strong support to environmental policy through the completion of IMEP-9 (metals in water), involving 201 laboratories from 35 different countries, and IMEP-11 (metals in car exhaust catalyst), involving 36 participants from 16 different countries. On-going IMEP rounds for heavy metals in water (IMEP-12) and in sediment (IMEP-14) progressed significantly; together they involve some 300 laboratories.

### **Environmental measurements underground**

Using the HADES underground laboratory (223m below ground level), the IRMM performed radioactivity measurements on environmental samples taken in the vicinity of nuclear facilities by the EURATOM (European Atomic Energy Community) Inspectorate in Luxembourg.

In collaboration with the National Institute of Standards and Technology (NIST), the IRMM is participating in the radioactivity characterisation of an ocean shellfish material for use as a new environmental reference. Samples collected downstream from a German uranium mine to yield information on sedimentation rates and the burden on the environment were also measured and evaluated. Finally, the IRMM measured samples to assess the neutron flux dose in buildings near the JCO site in Tokai-mura, Japan, where there was an uncontrolled nuclear chain reaction on 30 September 1999.

### **Additional activities**

- Sediment for a BIPM-CCQM (Comité consultatif pour la Quantité de Matières) key comparison required homogeneity control and measurements of lead and cadmium. The concentrations of both metals were determined, and the homogeneity control studies were performed, evaluated and finalised.
- New heptane and iso-octane reference materials were certified and made available for sale as IRMM-441 and IRMM-442 respectively.
- To measure metal pollution in particulate matter in ambient air (aerosol), according to EC Directive 96/62 and in collaboration with the Environment DG and CEN-TC 264 WG14, validation work to determine arsenic, cadmium, copper, lead, manganese, molybdenum, nickel, uranium and zinc was carried out on loaded aerosol filters.
- To measure metal pollution on air filters, validation work was performed for barium, copper, lead, manganese, molybdenum, potassium, titanium, uranium and zinc.
- The IRMM has produced the world's first primary isotopic gas standards (PIGS) for measuring carbon, oxygen, and sulphur isotope ratios – valuable for present and future environmental monitoring techniques. This year's results were produced for sulphur (via sulphur hexa fluoride<sub>6</sub>) and carbon (via carbon tetra fluoride<sub>4</sub>).
- By the end of 2000, the IRMM will have finished the homogeneity control and certification measurements for the replacement of a certified reference material for heavy metals in fly ash (BCR CRM-176R).

### **The future**

Future priority areas will be the completion of tasks concerning heavy metals and PCBs in sediments and sewage sludges. Reference materials and methods for heavy metals in aerosol – Directives 96/62/EC and COM(97)500 – will be developed, as well as reference materials for trace metals in fresh and waste water. The rapidly expanding IMEP programme will continue to address important environmental issues (e.g. sulphur in fuel, and metals in water) with special focus on the pre-accession countries.

## **NUCLEAR SAFETY AND SAFEGUARDS**

### **Nuclear safeguards**

With special focus on metrology and quality assurance for nuclear safeguards, the IRMM is working to maintain and expand an independent European metrological capability in the area of nuclear analysis. It is doing so in collaboration with the Euratom Safeguards Directorate, the International Atomic Energy Authority (IAEA), the official US Safeguards Laboratory in New Brunswick (NBL) and Los Alamos National Laboratory (LANL).

#### ***Isotope reference materials for nuclear safeguards***

In 2000, the IRMM continued to produce and distribute certified element and isotope reference materials, in response to customer requests coming mainly from British Nuclear Fuels Ltd (BNFL), Compagnie Générale des Matériaux Nucléaires (COGEMA), on-site Laboratories (Sellafield and La Hague) and Japan. The preparation of a plutonium/gadolinium/neodymium alloy large spike was completed and preparation work for the production of both uranium isotopic reference materials and filament reference materials was carried out. These reference materials will be used for the calibration of high-tech mass spectrometers.

### ***Additional activities***

Measurements on uranium reference materials for environmental monitoring in the vicinity of nuclear installations were performed, and the certification of uranium in doped glass (Certified Test Samples to be used for environmental monitoring) was completed. The preparation of a dilute spike for the calibration of mass spectrometers (IRMM-073) made significant headway, while the organisation of a second IMEP round for nuclear signatures in the environment Nuclear Signatures IMEP (NUSIMEP-2) commenced in 2000. Finally, isotopic abundances were measured for plutonium in dissolved MOX (mixed plutonium/uranium oxide nuclear fuel) samples – and for the Pu-2000 project, sample measurements were completed by four laboratories.

### ***The future***

Future priority areas will include the preparation and certification of a new uranium-233 spike, the organisation of five international measurement evaluation programmes (two Regular European Interlaboratory Measurement Evaluation Programme (REIMEP) and three NUSIMEP rounds) and the preparation of particle reference materials for environmental safeguards. Ultra-low level radioactivity measurements in the underground laboratory will be performed on swipe samples, and environmental neutron fluence measurements will be carried out. In view of the IRMM's monopoly position in metallic spike preparation (for reprocessing plants), further research will be carried out, leading to the eventual organisation of a world-wide inter-comparison for these materials.

### **Nuclear safety**

Neutron data cross section measurements requested by the OECD, JEFF file and nuclear industry were carried out in support of reactor safety and efficiency, waste minimisation/transmutation and environmental protection.

### ***Doppler broadening studies to examine the temperature dependence of reactivity***

Doppler broadening studies at low temperatures for hafnium progressed significantly in 2000, with measurements completed on a 1-mm sample at 20K and 300K respectively. Measurements on plutonium dioxide are currently under preparation. For Doppler broadening studies at high temperatures, a graphite oven is being transferred from the Institute Laue Langevin (ILL) in Grenoble (FR) to the IRMM.

### ***Activation cross-sections for short-lived products***

This work progressed with new irradiations and activity determinations being completed for several isotopes of copper, molybdenum, strontium, zinc and zirconium.

### ***Reference measurements on actinides***

These measurements provide important data for feasibility studies of the Thorium fuel cycle. Capture cross sections on thorium-232 have been measured with high energy resolution; these are being continued at energies up to 100 keV. Fission cross sections on protactinium-233 are under preparation in collaboration with the University of Uppsala and the Sudsvik Laboratory.  $^{234}\text{U}(n,f)$  cross sections were measured at the 150MeV linear accelerator, complemented by thermal neutron measurements carried out at ILL.

### ***Cross sections of neutron-absorbing materials***

Capture cross sections have been measured with high energy resolution up to 100 keV on  $^{82,84,86}\text{Kr}$ . Total cross section measurements have been completed on krypton-84.

### ***Neutron data for waste transmutation***

Transmission data for technetium-99 from 3 eV to 150 keV have been completed. The average capture cross section of technetium-99 has been analysed up to 100 keV. The neutron resonance parameters of neptunium-237 have been determined up to 500 eV.

### ***Neutron data for accelerator driven systems (ADS)***

Activation cross sections for the reactions  $^{99}\text{Tc}(n,p)$ ,  $^{99}\text{Tc}(n,a)$ , and  $^{94}\text{Mo}(n,p)$  have been measured up to 20 MeV.

### ***Neutron data standards***

Reference measurements for neutron data standards progressed, with the analysis of  $^{239}\text{Pu}(n,f)$  and the experimental work with ILL being performed. The European Commission renewed the International Science and Technology Centre, Russia (ISTC) collaboration with Russian institutes and experimental preparation work was undertaken. Approximately 5Mbytes data on  $^{237}\text{Np}(n,f)$  measurement results were sent to the OECD Nuclear Energy Agency (NEA) databank, and a special initiative was taken for the integration of pre-accession countries into the JRC neutron data measurement and evaluation activities.

### ***The future***

Future priorities will be to produce data needed for the study of reactor temperature dependence on reactivity, for radiation damage calculations and for feasibility studies into the thorium fuel cycle. The study of long-lived fission products for waste transmutation will continue, as will the examination of structural materials and coolants for accelerator-driven systems, plus the provision of data needed to improve neutron data reference standards. Finally, the IRMM will continue to provide the basic data needed for reactor calculations.

## **HORIZONTAL ACTIVITIES**

The IRMM's reputation and extensive experience in metrology (mass metrology and radionuclide metrology) forms an integral part of its scientific profile and thereby supports the three scientific pillars of the JRC.

### **Mass metrology**

The IRMM, as the transnational measurement institute of the European Commission, is working towards the development of a structured measurement system in chemistry through:

- Conceptual input to international forums such as the BIPM, European collaboration on measurement standards (EUROMET), EURACHEM (a focus for analytical chemistry in Europe), Co-operation on International Traceability in Analytical Chemistry (CITAC) and European Accreditation (EA);
- The reference material programme;
- Targeted development of chemical reference methods; and
- International Measurement Evaluation Programmes.

The IRMM has created the Joint European Programme for Primary Isotopic Measurements (JEPPIM) network with Europe's leading institutes in the field, as well as a central and eastern European (PECO) network to ensure the transfer of expertise to future EU member states. The IRMM's pioneering work in producing the world's first PIGS, in the Avogadro project and in realisation of the Becquerel as the world primary standard for radioactivity measurements further complement its role in developing this system. This work impinges very strongly upon all three of the aforementioned JRC pillars and will continue to grow, especially now that the IRMM represents the European Commission in EUROMET, EURACHEM, CIPM/CCRI and CIPM/CCQM, and has assumed an advisory role to the Trade DG.

The IRMM is also collaborating with US and Japanese metrology organisations to harmonise measurements of Charpy impact toughness, which is of significant importance to steel producers and exporters. A metallic tensile property reference material has also been produced for verification of tensile testing machines.

### **Radionuclide metrology**

The radionuclide metrology work at the IRMM directly addresses primary standardisation of radionuclide solutions to the highest level of accuracy and with direct traceability to the Système International. This work also supports the international metrology organisations – EUROMET, CIPM/CCRI, (ICRM) – for example, in co-ordinating the "Calibration and Measurement Capabilities in Europe" for Appendix C of the Mutual Recognition Arrangement of the Metre Convention (CIPM).

### **Unique support to industrial and research sectors**

A wide range of reference materials was produced and certified in 2000 – ranging from the certification of isotopic calibrants produced by Merck GmbH to new heptane and iso-octane chemical certified reference materials that are now available for sale as IRMM-441 and IRMM-442 respectively.

For thin film reference samples, certification data for a common IRMM-BAM (Bundesanstalt für Materialprüfung) implanted reference layer (IRMM-302) 'dose of antimony in silicon' were obtained with Rutherford Back Scattering and Neutron Activation Analysis with excellent agreement (< 1%) between BAM and the IRMM. This material complements the very few thin-layer reference samples that are traceable to the SI units of mass or amount of substance. They are used for both surface and interface analysis in advanced industrial and research sectors.

As regards micro-structured reference materials, a novel example has been developed by the IRMM to augment the quality of microbeam analysis. This consists of permalloy (81% nickel, 19% iron) strip patterns of different widths on silicon substrates. The material has been certified (11 representative lengths on the individual chip) and is now available as IRMM-301.

Finally, for the certification of fine zinc materials (322-325R), the measurements for spiked material impurities were finished and evaluated. A certification report is being prepared, and this series of certified reference materials will be available in early 2001.

## 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       |

### ***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.*

During 2000, a five-year assessment and an advisory group meeting were organised, both to evaluate the Institute for Transuranium Elements' past achievements and to assist in defining the future strategy. Some of the advisory group's suggestions have already been integrated into the on-going work programme.

The ITU's ISO 9001 certification was extended in May 2000 to cover the institutional activities. The project management practices were further developed and benefited from an internal JRC assessment in June 2000. The ITU strives for continuous improvement and, in 2000, created four improvement teams within the framework of the Total Quality Management programme.

ITU's customers in 2000 included:

- Belgonucleaire
- Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials (ABACC)
- British Nuclear Fuels Ltd (BNFL)
- CEA (the French atomic energy commission)
- COGEMA
- ENEA (Ente per le nuove tecnologie, l'energia e l'ambiente, Roma)
- ENRESA (Empresa Nacional de residuos radioactivos, S.A.)
- European Safeguards Office
- Framatome
- German Cancer Research Centre
- International Atomic Energy Authority (IAEA)
- Japanese Central Research Institute of Electric Power Industry (CRIEPI)
- Korean Atomic Energy Research Institute (KAERI)
- Los Alamos National Laboratory (LANL)
- NRG (private company, Petten (NL))

- Siemens
- SKB (Swedish nuclear fuel and waste management Co.)
- US Electric Power Research Institute (EPRI)

as well as a number of Eastern European research centres and authorities involved in nuclear safety and security.

### **Alpha-immunotherapy**

As a spin-off from the Institute's experience in radiochemistry and radionuclide separation, safe and reliable quality-controlled production and separation techniques are being developed for several alpha- and beta-emitting radionuclides with application in nuclear medicine (mother nuclides actinium-225 and strontium-90 and daughter products bismuth-213 and yttrium-90 respectively). The high interest in the cancer-killing potential of these isotopes when coupled to specific targeting carriers led the ITU to elaborate dedicated production processes, and focus on the development of high performance radionuclide generators and on the efficient chelation of the compounds.

#### **Validating the production of significant quantities of alpha-emitting isotopes for use in nuclear medicine**

The irradiation of 30mCi of radium-226 in the FZK cyclotron, producing around 15 mCi actinium-225, was a major breakthrough for the large-scale isotope production. This was made possible through a series of technological achievements:

- handling large amounts of radium-226 in the ITU hot cells;
- automated leak-tight welding of the Ag capsule, using a new, tailor-made welding machine; and
- commissioning a flexible containment at the FZK cyclotron (with on-line surveillance of possible radon release in the cooling circuit).

Pre-clinical testing of these isotopes continues in collaboration with a network of European hospitals. In April 2000 a first patient was treated in Europe. In the Kantonspital Basel, a total of 10 mCi Bi-213 was administered to a patient with glioblastoma, in four subsequent doses. Due to the nature of the test and type of cancer, no prognosis can be made on the healing – but the administration of Bi-213 coupled to a peptide was judged by the neurosurgeon to be encouraging. The latter case was reported during an international symposium on alpha-immunotherapy, organised by ITU in Karlsruhe on 15-16 June 2000. Over 50 specialists in nuclear medicine and oncology, drawn from various countries (including US, Canada, Australia...), participated in this event. They confirmed their need and interest to see the ITU continuing to play a leading role in the fostering of the upcoming clinical trials.

### **Basic actinide research**

A good knowledge of the fundamental physical, chemical and material properties of the actinides and actinide-containing products, such as nuclear fuels and nuclear waste, is a prerequisite for the study of nuclear issues at the ITU.

ITU scientists aim to understand the properties of actinides and actinide compounds, including the electronic structures. Activities range from preparing and purifying the elements' to studying single crystals and thin films by dedicated physical techniques – some of which involve the use of intense synchrotron beams, neutron or muon beams.

Theoretical research into the electronic properties of the actinides supports experiments and suggests new avenues for investigation. With discussions underway regarding new fuel materials for advanced reactors, materials science data are urgently required. The supply of data such as phase diagrams, thermal properties, and behaviour under pressure and irradiation is a genuine task for basic actinide research. Findings also help to answer questions arising in connection with the management of highly active waste.

#### **Surface and thin film research**

The 5f electronic states in plutonium are on the border between localised and delocalised (bonding) character, and are thus very susceptible to any external variable. Using a newly developed method for preparing thin actinide layers by sputtering from a microsample, ITU researchers were able to prepare a plutonium monoatomic layer. Photoelectron spectroscopy analysis of the 5f localised states around 1.7 eV below the Fermi energy shows that, due to the reduced presence of neighbouring atomic layers, only the preferentially oriented orbitals take part in the bonding. The study of these effects contributes to a more comprehensive interpretation of interface phenomena. It finds application, for example, in the investigation of fuel/cladding interactions and the leaching behaviour of spent fuel.

#### **Safety of nuclear fuel**

The extended use of nuclear fuel in existing reactors (i.e. high burn-up) is a major element in the sustainability of nuclear energy production. It contributes to the optimal use of energy resources, a minimisation of the interventions and associated risks, a lowering of the dose for the workers and an overall reduction of nuclear waste production. With respect to the safety of nuclear fuel at higher burn-up, especially under transient conditions, the ITU concentrates on mechanical and chemical interactions at the fuel/cladding interface, and on enhanced fission gas release and related modifications of the microstructure of the fuel.

Modelling is an integral part of these safety studies. The use of the Transuranus (fuel modelling) code, both by safety authorities and by other research centres is progressing. The ITU is interacting intensively with the European users of the code, and has started three new projects in collaboration with Hungary, Bulgaria and Slovakia. These focus on the validation of existing data sets, thus providing additional training and expertise to future Member States of the European Union.

#### **Successful start of new European network collaborations**

In 2000, a number of new projects were started with European partners in the context of the Research DG shared-cost actions. Running over the next three to four years, they include fabrication of MOX with a new microstructure, production of coated particles for the HTR, evaluation of thorium fuel for plutonium incineration, and a study of nitride inert matrix fuel.

In these projects, the ITU covers both the manufacturing of new types of nuclear fuel (using innovative methods such as sol-gel) and the analysis of such fuels after irradiation (by employing the equipment of the ITU hot cells). The gathered data enables researchers to understand and optimise the fuel behaviour, and to analyse e.g. the safety in transient conditions in a power reactor.

Two programmes of the EU Fourth Framework Programme were successfully completed, respectively addressing the interaction between molten nuclear material and structural materials in a severe nuclear accident, and the behaviour of the fission products when released in the primary system and in the reactor building. These led in 2000 to a new project studying the behaviour of the nuclear materials in the event of a loss of core cooling in a power reactor.



Based on its experience in this area, the ITU offers assistance to other DGs – for example in the evaluation of the possibilities/strategies for the burning of plutonium stockpiles. Participation in International Science and Technical Centre (ISTC) projects also provides for technology transfer and knowledge sharing with Eastern Europe and Russia.

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

The behaviour of irradiated fuel under conditions of direct long-term disposal requires further investigation with regard to the basic processes involved. Safety-relevant data on the corrosion and dissolution behaviour of waste under realistic conditions are of utmost importance in determining the radiotoxic potential and assessing the consequences of storage over extended periods of time.

After about 500 years of storage, the radioactivity of the spent fuel stems mainly from alpha decay. Alpha radiolysis then plays a key role, damaging the structure of the fuel and influencing its dissolution behaviour.

To explore the influence of radiolysis on spent fuel dissolution, the ITU prepares and studies samples of uranium oxide containing different concentrations of short-lived actinides (e.g. specimens with uranium-233). The studies in 2000 were extended to the case of higher fuel surface areas exposed to water. Property changes caused by the accumulation of alpha-decay damage in the structure of the fuel were investigated. The influence of agglomerates rich in plutonium oxide on the dissolution mechanisms of mixed oxide fuels was also investigated.

#### **Alpha-radiolysis studies for spent fuel characterisation in view of long term storage**

Leaching experiments on alpha-doped uranium oxide under anoxic conditions, with continuous monitoring of pH and redox potential, allowed a direct measurement of effects associated with the alpha-radiolysis of the water. With increasing leaching time, progressively higher redox potential values, i.e. more oxidising conditions, occur in the solutions for the alpha-doped samples, due to the radiolytic production of oxidising species. Correspondingly, higher fractions of uranium were dissolved in the case of alpha-doped uranium oxide compared with undoped oxide. A clear dependence of this process on the alpha-activity of the materials was observed by adopting relatively low values of the S/V (sample surface/solution volume) ratio. However, a relatively small alpha-activity, led to dramatically increased leach rates under experimental conditions characterised by a high S/V ratio, as could be expected in some real storage scenarios.

### **Partitioning and transmutation**

Lowering the radiotoxicity of waste by reducing the quantity of actinides and other long-lived radioactive elements in the fuel cycle means also reducing potential long-term hazards arising from growing stockpiles of spent fuel and separated civil and military plutonium. Separating long-lived nuclides from the waste and recycling them in reactors for transmuting – or ‘burning’ them by neutron capture or fission – are therefore considered to be important waste-management options. Under its partitioning and transmutation programme, and in close co-operation with its European partners, the ITU will test and evaluate processes that permit an efficient separation (partitioning) of radiotoxic elements from spent fuel with a minimum of losses. Advanced aqueous and dry reprocessing techniques will both receive particular attention.

### **Demonstration of pyrochemical reprocessing of nuclear fuels by electrorefining**

In a co-operation between the ITU and CRIEPI, non-aqueous (molten salt) reprocessing of irradiated spent nuclear fuels is being studied. This process is considered a major part of a partitioning and transmutation strategy for nuclear waste management. Its goal is to demonstrate the feasibility of recovering actinides from irradiated fuel and HLW (high level waste), e.g. waste from the PUREX plutonium uranium extraction process. In the ITU laboratories, a hot cell facility for up to 1 kg of melt has been constructed and its performance successfully tested. The installation operates under a highly pure argon atmosphere (<10ppm O<sub>2</sub> and <10ppm H<sub>2</sub>O). First demonstrations of the electrorefining process have generated deposits of up to 10 g of metallic uranium.

The ITU studies the appropriate techniques for producing irradiation targets from the reprocessed material. It aims at optimising fuel fabrication technology for novel, minor-actinide-containing fuels for the transmutation or 'incineration' of long-lived actinides and fission products. It is, therefore, testing existing and new fabrication techniques for fuels and targets used in irradiation experiments. The ITU is member of the High Temperature Reactor Technology Network and is chairing the working group on fuel design for the Accelerator Driven System Team.

As part of the work on inert matrices, zirconia beads infiltrated with plutonium were produced for the first time in 2000. Production of alpha-doped material, both for in-house experiments and for external customers, continues to gain interest. The characterisation of existing samples of inert matrix materials doped with americium and the measurement of their properties have continued, as well as the study of radiation damage with fission products.

The construction of the Minor Actinide Laboratory continued, with installation of the water walls and delivery of the major equipment now completed. A workshop team was dedicated to the construction of the first series of glove boxes. These efforts will be pursued in the coming years, since a significant workload for this laboratory is planned from 2002 onwards.

### **Radioactivity in the environment**

"We agree to prevent pollution of the maritime area from ionising radiation through progressive and substantial reductions of discharges, emissions and losses of radioactive substances ...." is the objective of Art.15 of the SINTRA (Ministerial meeting in Sintra (PT)) statement released by the Ministerial meeting of the Oslo Paris (OSPAR) Commission on 23 July 1998 for the Protection of the Marine Environment of the Northeast Atlantic. In response, the ITU is applying its expertise in trace analysis to tasks of verification of radioactive discharges and emissions from nuclear installations, and the identification and characterisation of radioactive scrap material and sources.

Major improvements were achieved in 2000 in the preparation of particles for trace analysis (in synergy with the institutional programme on safeguards) and on the automated evaluation of the SIMS results. Control particles of uranium oxide (1µm size) have been produced starting from reference material having certified uranium isotopic composition. A procedure for the production of particles of U/Th oxides has also been developed. These particles will be used for the implementation of methods for the localisation of radioactive particles in environmental samples, as well as for safeguards.

In collaboration with DG Environment, ITU supported the MARINA project and the environmental remediation of the Karachay lake and contributed to the meeting "Protection of the Environment from the Effects of Ionising Radiation: International Perspectives", organised by the IAEA.

## **Nuclear safeguards**

Preventing proliferation of nuclear material is a worldwide task shared by the European Commission's Euratom and the IAEA inspectorates. They are responsible for implementing safeguards measures to control the use of nuclear materials within the European Union and worldwide. As a long-time partner, the ITU continues to provide assistance with expertise on plutonium handling facilities, such as reprocessing or MOX fuel fabrication plants. As the Commission's analytical reference laboratory in safeguards, the ITU develops and perfects new analytical tools to analyse and characterise different nuclear materials, to permit forensic analysis and identification of seized, illicit material.

In 2000, the ITU fulfilled its commitment to design and install *in-situ* laboratories for measuring safeguards. In addition, it began to operate on-site laboratory at BNFL's Sellafield reprocessing plant in the UK and at COGEMA's La Hague plant in France.

### **Inauguration of La Hague on-site laboratory**

A new on-site laboratory, the so-called 'Laboratoire Sur Site'(LSS) was inaugurated on 6 June 2000 at the La Hague Reprocessing Plant. This second laboratory was designed, installed and commissioned by ITU's staff at the request of the Euratom Safeguards Office. Now in routine operation, it efficiently safeguards the COGEMA plant on a timely basis. The throughput of samples foreseen is 1,600 per year, covering the whole process from input to product samples. A team of four analysts travelling on a weekly basis from Karlsruhe to La Hague will run three laboratories housing four analytical sections including hot cells. Analytical techniques were developed in order to reduce operators' workload and operational costs. A high degree of automation was introduced, leading for instance to a waste reduction of 1/3 in the hot cells. Following the installation of the on-site laboratory at Sellafield, the ITU now has a unique experience in design, implementation and operation of on-site safeguards analytical laboratories.

The ITU is closely involved in the international efforts to detect clandestine activities and to combat the illicit trafficking of nuclear materials. The Institute's activities in this area are co-ordinated through participation in the P-8 (Group of seven major industrial nations (G7) and Russia) international technical working group. Together with IAEA, the ITU contributed significantly in 2000 to the development and implementation of a model action plan for the seizure of diverted nuclear material in the future Member States to the European Union and the former Soviet Union.

The ITU nuclear materials databank is continuously extended by integrating data received from industry in the Member States. Analytical skills in nuclear forensics science were further expanded in 2000 e.g. by age determination of particles.

### **Age determination for nuclear forensics**

Whenever diverted nuclear material is seized, it is analysed in order to determine its origin and intended use. In this context, exact determination of the age of nuclear material is of key interest. A methodology for age determination in bulk samples and particles was developed, making use of the radioactive decay of several plutonium isotopes. The method was validated against NBS reference materials and applied to seized plutonium-containing materials available at the ITU. Applications beyond nuclear forensics, namely for verification measurements in the context of the fissile material cut-off treaty, will be investigated.

In view of the implementation of the Comprehensive Nuclear Test Ban Treaty and the Fissile Material Cut-off Treaty (including wide area monitoring), the ITU focuses on the environmental monitoring of nuclear materials and radioactive substances. The same approach is used in the areas of illicit trafficking of nuclear materials, illicit waste dumping and environmental impact of radioactive releases.

The ITU continued to adopt trace and particle measurement technology as a means of identifying, as far as possible, the potential 'polluter'. In 2000, the main emphasis was put on the recovery of particles from swipes, e.g. from enrichment plants. Studies have been started into the localisation of hot particles in soils, using alpha and beta autoradiography.

## Institute for Advanced Materials (IAM) - Petten

### *Institute Director*

1. Management support
2. Energy production and conversion
3. Safety of industrial components
4. Clean technologies
5. High flux reactor
6. Scientific and technical support

### *Kari TÖRRÖNEN*

Kari TÖRRÖNEN (f.f.)  
Johan BRESSERS  
Roger HURST  
Juha-Pekka HIRVONEN  
Joël GUIDEZ  
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 (IAM) focused its research on safe and clean technologies in energy and transport application areas. 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 within boron neutron capture therapy (BNCT) facility at the High Flux Reactor (HFR). The IAM consolidated the HFR supplementary programme and extended its support for the Technical Assistance for the Community of Independent States and Georgia (TACIS) and Poland, Hungary: Aid for the Reconstruction of the Economy (Phare) programmes.

IAM's institutional research programme was carried out in ten projects, grouped in three main clusters:

- Safety and integrity of nuclear and non-nuclear 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 policy-making and in the promotion of industrial competitiveness.

### **SAFETY AND INTEGRITY OF NUCLEAR AND NON-NUCLEAR INDUSTRIAL COMPONENTS**

All projects in the safety and 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.

Highlights of activities from the projects within this cluster include:

- ***The Network for the Evaluation of Steel Components (NESC)***: Over 100 delegates attended the seminar Structural Integrity Assessment - How Safe Is It?, held in Paris at the end of March – which showcased the results of the unique NESC-1 spinning cylinder study, designed to evaluate the integrated approach to structural integrity assessment of industrial plant suspected to contain defects.

The focal point was a large-scale test that showed that defects of up to 74-mm depth in material related to that of an ageing reactor pressure vessel would not propagate to cause catastrophic failure under a severe pressurised thermal shock. This outcome underlines the benefits of the network approach to tackling multi-disciplinary problems. It was fully in line with the pre-test analysis forecasts, which combined the defect sizing information supplied from blind inspections trials, a comprehensive materials data set and a range of structural analysis tools.

The NESC-1 results can benefit non-nuclear as well as nuclear industries, by providing benchmark data relevant to a wide spectrum of structural integrity applications.

- ***The European Network for Inspection Qualification (ENIQ)*** is particularly concerned with underpinning the internationally recognised European Methodology for Inspection Qualification. Following the successful first pilot study with its numerous recommended practices, a second study has been launched in order to explore the potential of technical justifications, aiming at reducing the need for expensive qualification test blocks.

In March 2000, ENDEF, the networks extension concerning Eastern Europe, held a meeting with Ukrainian experts to discuss Non-destructive Evaluation-related training, qualification, and equipment maintenance issues in Ukraine. In June 2000, a joint European Plant Life Assessment Forum/European Non destructive Evaluation Forum (EPLAF/ENDEF) meeting was organised in JRC Petten to discuss two new Tacis/Phare projects prepared by the IAM as part of a technical assistance contract with External Relations DG.

- ***AMES***: During 2000 AMES continued with the Definition of new Task Groups and R&D tasks including: the successful start of 4 new SCA projects on Irradiation embrittlement mechanisms, NDT for steel ageing monitoring, Validation of Master Curve, VVER-440 surveillance temperature.

Studies on model alloys have been successfully completed and interesting results were obtained on 32 Fe-based alloys with parametric contents of Ni, Cu, P. The alloys were irradiated at the HFR and tested by Charpy-impact and NDT methods. The results represent the basis for the understanding of the influence of P, Cu and Ni on neutron embrittlement and vessel lifetime management.

The Development of the STEAM Techniques (Seebeck and Thomson Effects on Aged Materials) for ageing monitoring was continued, with in parallel the development of instrumentation for electrical resistivity measurements, and encouraging results are obtained.

The Involvement of non-EU partners is progressing to Bulgaria, the Slovak Republic and Turkey. Involvement of Russia and Ukraine has been further developed.

IAM Irradiation facilities for embrittlement studies were updated to improve their loading and operational capabilities.

- ***The European Pressure Equipment Research Council (EPEC)*** has performed a study aimed at establishing guidelines for applying design by analysis to typical pressure vessel structures. This was one of series of measures to promote the Pressure Equipment Directive (97/23/EC). A manual has been issued and distributed to EPEC members at the beginning of 2000. Dissemination of these important results through seminars is now organised throughout Europe.

In January 2000, the decision was taken to create a new technical task force (TTF7) on hydrogen damage. The main target of TTF7 is to support safe and sustainable industrial development in those fields where hydrogen-related processes are involved, or damage and hazards can arise from hydrogen-related problems. This research theme is therefore an important issue to various industrial sectors such as energy production, petroleum refining, chemical, petrochemical, transport, steel production and others. The launch of TTF7 was arranged for 26 and 27 October 2000 at Petten.

Finally – in response to automotive, gas and tank manufacturing industries –the IAM initiated in May 2000 the procedure to identify European key R&D issues in the field of storage tank technologies for alternative-fuels vehicles (hydrogen, natural gas). This new activity in the transport sector will be supported by the two new IAM facilities: High Pressure Gas Cycling, and Gas Permeation of full-scale vehicle tanks for alternative fuels, to be installed in the IAM reference laboratories at the end 2000/early 2001.

- **EPG-Fossil:** In a concerted effort to improve the efficiency of fossil-fired steam plant within Europe, the IAM has secured key roles in two multinational networked projects:

1. The first of these is COST 522, geared towards increasing the steam temperatures of plant by at least 50°C – hence increasing efficiency by some 5%, with concomitant major economical and environmental benefits. Here, the IAM has been able to take on the role of co-ordinating and executing the high pressure verification testing on newly developed large-scale components constructed by welding advanced high temperature alloys. These tests will commence before the end of 2000, lasting between one and two years and are expected to provide confidence in the approach of the international network.

2. An even more ambitious networked project, sponsored largely by the Energy and Transport DG, promises a potential rise in steam temperatures of 150°C above the most efficient European plants of today. Bringing an efficiency increase of up to 15%, this could lead to the construction of a pilot plant by around the year 2015. Yet again, the IAM is involved in verification testing of newly developed austenitic and nickel- based alloys, which will be required to survive the very high temperatures and pressures envisaged.

- **Plant Life Assessment Network (PLAN):** In a network embracing both nuclear and non-nuclear applications, the 70-member PLAN was launched under IAM co-ordination to initiate, maintain and monitor a fruitful co-operation process between completed and on-going Commission-funded projects promoting industrial exploitation of R&D results.

In addition to many useful deliverables, the network has developed further in forging strong links with the innovation process via the horizontal marketing theme. The goal was to provide project leaders and the Commission with a guide for marketing project results.

The activity has grown from strength to strength via surveys and presentations, as well as through interaction with the EC LIFT initiative (linking innovation with finance), and with the Enterprise DG (encouraging innovation among SMEs). Now awaiting approval is a proposal submitted by PLAN for a major EC-sponsored innovation project developing the methodology needed to link research results with the market place in strong co-operation with SMEs.

## **EMISSION REDUCTION TECHNOLOGIES AND INCREASED EFFICIENCY IN ENERGY AND TRANSPORT**

The Emission Reduction Technologies cluster comprises two projects related to energy production, two related to transport and one related to waste treatment. The major highlights for this cluster in 2000 were the signature of a Memory of Understanding (MoU) between the European Council for Automotive Research and Development (EUCAR), CONCAWE (the oil companies' European organisation for environment, health and safety) and the JRC supporting the establishment of the Performance, Reliability and Emissions Reduction in Waste Incinerators (PREWIN) network.

### **- Technologies for emission abatement in transport and non-road sectors (TEMAT)**

Increasingly stringent regulations for the reduction and control of vehicle emissions aim at environmental and health protection. To be able to better meet the challenges that these regulations raise for the car and oil industries, EUCAR and CONCAWE have decided to collaborate pro-actively with the JRC. This collaboration, ultimately leading to reduced vehicle emissions, will thus support both industrial competitiveness and European legislation.

On 12 May 2000, Mr. H.J. Allgeier (Director General of the JRC), Mr. F. de Charentenay (Chairman of EUCAR), and Mr. B. van Holk (Chairman of CONCAWE) therefore signed a MoU that defines the main elements of the collaboration. The IAM was the body within JRC responsible for the preparation of this MoU.

The collaboration of JRC, EUCAR and CONCAWE concentrates on technologies for reducing emissions. It includes engine technologies, types and qualities of fuels and lubricants, and their interactions. The partners will develop capabilities for measuring low emissions in order to monitor progress and meet future vehicle requirements. Co-operative technical efforts will focus on evaluation of the performance of alternative fuels, and on advanced future gasoline and diesel fuels in connection with future engines technologies (including fuel cells). All these evaluations will be compared with existing vehicle/fuel systems.

This co-operation brings together three key players in the field of emissions: EUCAR and CONCAWE as research and technical representatives of the industries involved, and the JRC as a centre of scientific and technical reference for the EU. The ultimate objective is to create a common knowledge base on issues of engine and vehicle emissions. This will help both the involved industry and the EU policy makers to manage a topic that is increasingly challenging to society.

As well as drawing on the expertise of other European laboratories, the tripartite agreement will make use of the Engine and Vehicle Testing Laboratory, which is to be set up in Petten in 2002. This facility will be the European reference laboratory for emission reduction technologies. It will be equipped with a capability to use the thin layer activation (TLA) method in studies of component performance and its impact on emissions. The TLA facility will be commissioned at the end of the year 2000, leading to a combination unique in Europe.

### **- Safety and reliability of high temperature systems (SAFTS)**

The main objective of the SAFTS project has been to assemble industrial and research organisations involved in waste incineration, for the purpose of addressing technical problems that exist within the industry. The aim is not to promote the incineration of waste per se, but to ensure that – where waste incineration is used within the total scope of waste management – emissions are minimised (and in any case kept below legal limits) while plants operate in a reliable and efficient manner for the purpose of ensuring the clean and efficient operation of incinerator plant.



Following two exploratory meetings in 1999, the European PREWIN network was launched in May 2000 with four technical task groups (plant characterisation, materials characterisation, repair and maintenance methods and emissions reduction) and a membership of about 35 organisations.

#### **- Gas turbines for efficient power generation and for aircraft propulsion**

The sectors of energy production and transport are major sources of pollutant emission and greenhouse gases (GHG), the reduction of which has been identified as a priority action for the Commission. Fossil-fuel-based power generation in the EU accounts for nearly 30% of all GHG emissions. This is one of the reasons for the rapid shift from high carbon-intensive fuels like coal to low carbon-intensive natural gas, with a concomitant change to gas turbines for power generation. Emissions from gas turbines in air transport are projected to grow to 15% of the total transport emissions by 2020.

The IAM's work on gas turbines supports two main thrusts of the EC Environmental Action Programme. The first is that environmental policy must concentrate on the root causes of environmental damage, and that more technological efforts are warranted for emission abatement. The second is that greater attention has to be paid to the introduction of more energy-efficient and clean technologies.

Within this framework the projects Efficient Power Generation - Gas and Emissions Reduction in Air Transport projects provide the scientific and technical infrastructure, as well as reference laboratory facilities, for specific testing and measurement aspects of advanced materials systems such as thermal barrier coatings and ceramic matrix composites, with higher temperature capability than those currently used in turbine engines. Their application in stationary power generation and air transport will enable step increases in temperature capability and emission reduction.

The experimental efforts are accompanied by support to standardisation activities, the setting up of appropriate databases and lifetime modelling based on damage mechanism information. Cross-border networking linking original equipment manufacturers, material suppliers, gas turbine users, research institutes and universities within COST 522, and a watch-and-alert function on technological developments, complement institutional work.

The latter has expanded into an Energy Technology Observatory (ETO) that acts as the main interface to the policy maker by providing factual information on a continual basis to DGs on both environmental and industrial competitiveness aspects of technical developments in the energy and transport sectors.

Participation in eight related shared cost actions, some of which are led by the IAM, firmly anchors the projects in a web of networks.

#### **- High flux reactor - supplementary programme**

The Commission manages the High Flux Reactor (HFR) at Petten in accordance with the Euratom (European Atomic Energy Community)/the Netherlands agreement of 25 July 1961. The Council adopted the 2000-2003 programme for the High Flux Reactor operation in December 1999. It is supported by three countries: the Netherlands, Germany and France.

The first year of operation of this programme ended without operating problems and with a high availability of the plant (>280 days). That allows a year-on-year increase in the production of medical radioisotopes – especially for the short-life products used in diagnosis, of which HFR remains the main European producer.

The major highlights in the year 2000 were a series of successful events in the fuel cycle:

- In January, diplomatic notes were signed with US authorities, confirming a commitment to convert the reactor from highly enriched Uranium (HEU) to low enriched Uranium (LEU) in four years;

- In August, an export license was obtained for four years of HEU fuel supply;
- In September, the first transportation of HEU from USA to French fuel element Manufacturing Plant could begin;
- The Dutch National Nuclear Waste Repository (HABOG) facility building for a permanent storage of 1400 HFR elements began and should be completed in 2003;
- Prior to this availability, a provisory storage with four MTR2 containers has been arranged and four transportations from Petten to Covra site were made between September and November; and
- An extra budget of ~ € 3 Mio has been allocated for a shipment to USA of 120 elements in 2001.

Another important highlight is the increase of the European programs around the HFR. Following the examples of the AMES network, BNCT (for research on cancer treatments by neutrons) and EFFTRA (transmutation tests for nuclear waste), two new networks were created.

1. The first, on high temperature reactors (HTR-TN) involves 18 main companies. It has nine task groups and its kick-off meeting was held in April 2000 in Petten.
2. The second, on nuclear medicine (EMIR) will cover the main subjects of research and co-ordination in this field, including research on radioisotopes, transport license standardisation, reactors planning co-ordination and rules of operation. The launch meeting was held in December in Brussels.

**- The IAM reference laboratory for ageing materials evaluation and studies (AMES)**

AMES developed a comprehensive strategy for projects including shared cost actions. It conducted a key action study on the influence of the chemical composition on irradiation embrittlement. A matrix of 32 different model alloys, with parametric variation of copper, nickel and phosphorus, has been investigated before and after irradiation in the HFR. The results demonstrate the role of the copper, nickel and phosphorous on embrittlement, and can serve as a basis for the modification of the Russian Guide for plant life prediction for high-nickel steels.

Furthermore STEAM and destructive measurements (Hardness, Charpy, etc.) were correlated, demonstrating the potential for monitoring of ageing. The AMES project organised a successful workshop in Madrid on plant life management and together with IAEA, another in Petten on non-destructive methods for monitoring ageing.

## **NUCLEAR AND RADIATION APPLICATIONS IN MEDICINE**

BNCT is based on the ability of the isotope boron-10 to capture thermal neutrons, producing two highly energetic particles, – a He ( $\alpha$  particle) and Li ion – which, if occurring selectively, can ultimately destroy the cell in which the event occurs. It is thus a very promising and effective modality for cancer treatment.

During the handling of the second cohort for the treatment of glioblastoma, the procedures developed and used in the first cohort had been slightly modified to improve the study. With this improvement, which enabled the staff to perform their tasks more efficiently, it was even possible during one of the treatment weeks to treat two patients per day, which had never previously been achieved anywhere in the world. Of the five patients that were treated in the second cohort, three came from Germany, one from France and one from Austria.

Within the ‘Quality of Life and Management of Living Resources’ programme in the Fifth Framework Programme, an application to perform two new clinical trials at the HFR in support of boron imaging development was successful. The two trials are designed to study the toxicity of boron by means of increasing the boron concentration in blood and therefore in

the tumour. The second trial will perform BNCT for brain metastases of malignant melanoma. This is intended to be prepared in common with the European Organisation for the Research and Treatment of Cancer (EORTC) BNCT Group and the EORTC Melanoma Co-operative Group. The Principal Clinical Investigator will again be Prof. Wolfgang Sauerwein of the University of Essen. Participating hospitals and institutes are the Universities of Münster, Reims and Essen, together with VU Amsterdam, Nice, Graz and München.

### **Support for Tacis/Phare programmes**

Within the framework of administrative agreements in place since 1997, the IAM is providing the External Relations and Common Service for External Relations DGs with JRC technical and scientific advice on the implementation of the Tacis and Phare nuclear safety programmes. These programmes aim to bring dramatic improvements in the safety of ageing reactors in Central and Eastern Europe and the Community of Independent States.

The policy of JRC technical and scientific support to the External Relations and Common Service for External Relations DGs has been underlined in the Commission Communication on nuclear safety assistance to CEEC and NIS to the Parliament and Council approved on 6 September 2000.

The JRC technical expertise for on-site assistance to the Tacis (EU support programme for transition in the new independent states) nuclear power plants in Russia, Ukraine, Armenia and Kazakhstan involved the participation of IAM experts in all procurement processes for safety-related equipment. Several nuclear power plants in Russia, Ukraine and Armenia were also visited, to assess and facilitate the implementation of Common Service for External Relations DG projects. Furthermore, the IAM participated as the European Commission representative to the evaluation committee of the Chernobyl Industrial Complex for Radioactive Waste Management – which is the largest project of the Common Service for External Relations DG, with a value of € 40 mio.

In 2000, the IAM signed an agreement with the Common Service for External Relations DG for the execution of a project on dissemination of Tacis project results. The works are carried out at the IAM and at the Russian Nuclear Institution VNIIAES in Moscow.

Finally, the IAM prepared, in close co-operation with European industry experts and members of the AMES network, the project description sheets of a large new project on embrittlement of the Russian Pressurised Water Reactor (VVER) vessels, which will start in 2001.

These actions allow the JRC to assist the European Commission services during all preparation and implementation phases of the Tacis/Phare (EU support programme for pre-accession countries in central and eastern Europe) programmes in nuclear safety, as well as to assess the results of the individual projects for the beneficiaries.

### **Management aspects**

Following the achievement of the ISO 9001 certification in 1999, efforts were concentrated on the implementation of the European Foundation for Quality Management (EFQM) Excellence Model within the IAM.

The Institute conducted an intensive self-assessment in April. This led to the identification of six major areas for improvement, which are now being elaborated by dedicated teams.

### **Competitive activities**

The projects grouped into the three 'Institutional Programme' clusters account for approximately 85% of IAM's budget. A further 21 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 Fifth Framework Programme's 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 direct requests or calls for tender outside the research programmes.

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

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

### *Institute 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*

*ISIS supports EU policies with systems-oriented research in areas where the safety and security of the citizen is of concern including:*

- *safeguards, non-proliferation and international security;*
- *cyber-security, knowledge access and assessment, the fight against fraud;*
- *natural and technological risks and emergencies.*

*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 strong cross-fertilisation between its nuclear and non-nuclear activities strengthens the expertise it can bring to the benefit of customers in both domains.*

## **SAFEGUARDS, NON-PROLIFERATION AND INTERNATIONAL SECURITY**

With its well established role as a reference centre for the technology of safeguarding fissile material and its growing presence as a European focus for initiatives to provide more efficient ways of reducing the threat from anti-personnel land mines, the Institute for Systems, Informatics and Safety (ISIS) is able to provide a solid support to the EU's efforts to develop an effective Common Foreign and Security Policy (CFSP).

### **Nuclear safeguards**

The Euratom Treaty of 1957 gives responsibility to 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 IAEA were signed in 1977 and further challenges are expected in the future from the entry into safeguards of material released from excess weapons and from the enlargement of the Union. The ISIS provides direct support to both EURATOM and to IAEA and undertakes longer-term research into techniques for meeting future requirements.

In 2000 the main achievements were:

- The development of a prototype for integrating and structuring site declaration data (both from traditional accountancy-based declarations and declarations under the additional protocol) and analysing these data against open source data (including high resolution satellite images and geographical information);
- Co-ordination of the European Safeguards Research and Development Association (ESARDA) network of safeguards laboratories, including organisation of the annual symposium and two workshops;
- Within the PERformance LABORatory (PERLA) non-destructive assay laboratory, an analysis of gamma spectra of reference samples, a feasibility study for passive measurements on bulk uranium samples and performance testing of a small-sample calorimeter for plutonium measurement;
- Accreditation of the thermal, electromagnetic and physical equipment stress testing (TEMPEST) calibration laboratory under quality standards EN 450001 and ISO 9002;
- Research and development of seals and tags, including study of ultrasonic sealing for underwater MOX fuel assemblies, investigation of radio frequency transponders and study of automatic verification of E-metal seals using colour cameras;
- Development and test in the Taux Measurement laboratory (TAME) tank measurement laboratory for volume measurement of a prototype pressure instrument module and improved diagnostic software for volume measurement;
- Development of a prototype for 3D modelling of nuclear facilities of medium and large dimensions;
- Study and assessment of advanced tele-operation techniques in a nuclear storage mock-up using the robotics facility (RIALTO). This included the use of remote real-time monitoring through computer simulation tools; and
- Authentication and accreditation of video surveillance systems.

### **The landmine threat**

The ISIS continues to be a European focus in supporting EU efforts to eliminate the landmine threat.

In order to promote a better-informed procurement process, the international test and evaluation project (ITEP) has been set up. This is a global network of test and evaluation capabilities for scientifically measuring performance, evaluating effectiveness and assessing suitability of all forms of humanitarian demining equipment, systems and methods under conditions that are as realistic as possible. The USA and the European Commission joined first, followed by Canada, the Netherlands, Belgium, Sweden, the UK and Germany. The secretariat will be based at Ispra.

Meanwhile a longer-term effort to use more advanced technology is focused on the ARIS (action for research and information support in civilian demining) network of excellence. This is a forum for information exchange between users, researchers, developers and producers of detection devices and systems, coordinated by ISIS on behalf of over 150 members worldwide.

In order to improve the visibility, transparency and efficiency of EU mine actions, the ISIS maintains the EU mine action website and has linked it to databases of EU mine actions and geographical information systems. A prototype decision support tool has been developed to guide the development of operational requirements for demining technology in south-eastern Europe.

## **CYBER-SECURITY, KNOWLEDGE ACCESS AND ASSESSMENT, THE FIGHT AGAINST FRAUD**

The explosive growth of information and communication technology is bringing undoubted benefits to society. But there are concerns about risks of fraud, threats to privacy, worries that a society increasingly dependent on global communications might be vulnerable to systematic malicious attacks on its infrastructure, and concerns that citizens who are poorly educated, disabled or monolingual might be excluded from the benefits. As well as supporting EU policy on these issues, the ISIS has been applying the new technologies as weapons in the fight against fraud.

### **Cyber-security**

The ISIS continued to provide technical support to the Information Society DG's on-going effort to improve trust and confidence in e-commerce. Studies and workshops on issues of public concern were held to integrate and assess scientific knowledge. The first area to be covered was out-of-court dispute settlement systems for e-commerce, to provide an understanding of how effective cross-border and on-line redress mechanisms could be developed. Secondly, the requirements for technologies to support and implement privacy of personal data within the context of EU data protection legislation were examined. An on-line e-confidence forum was set up to stimulate discussion among all stakeholders: Commission services, industry and consumers.

A number of projects are concerned with developing infrastructure and methodology for benchmarking and testing – for interoperable security applications, for medical imaging, for smart cards and web-filtering techniques. The secure communication of medical images through ISDN telephone lines has successfully been tested and a start has been made in developing the knowledge base necessary for defining effective measures to combat cybercrime. Open source information on Internet abuse is being collected and classified, and the vulnerability of large, complex, unbounded systems is being studied.

### **Knowledge access and assessment**

The ISIS is providing the technology to promote EU educational policy. This includes the development of a Gateway to the European Learning Area and on-line tools for PROMETEUS – an EU initiative encouraging collaboration and standards between 400 companies and organisations in developing educational multimedia.

Efforts to improve the quality and timeliness of European statistics are increasingly focusing on financial and economic issues. ISIS's main contribution is through sensitivity analysis and time-series analysis.

The ISIS led the effort to develop a strategy for knowledge management at JRC and provided input for JRC's science and governance initiative.

### **The fight against fraud**

The ISIS supports efforts to improve compliance with EU regulations and reduce fraud on both income and expenditure on behalf of the Agriculture DG, the European anti-fraud office, OLAF and the Fisheries DG. Techniques used include data fusion and data mining, satellite remote sensing, multilingual language engineering, advanced statistics and tamper-proof electronic seals.

The feasibility of checking the movements of livestock by giving them unique tamper-proof identifiers is being studied in the three-year pilot Identification électronique des Animaux (IDEA) project, covering one million animals. During 2000, ISIS's TEMPEST testing laboratory issued 80 certificates and more than 240 certificate updates. The central data base for the IDEA project and the related data collection and transmission systems were

implemented and maintained. On average, the system collected around 20,000 data records per day from the ten participating organisations in six countries.

A preliminary evaluation of results between 1998 and 2000 has shown that losses of ruminal bolus and electronic eartags are less than 1%, which marks a significant performance improvement over traditional plastic eartags.

The ISIS is continuing to use advanced statistical methods to improve the efficiency of the procedure whereby agricultural subsidy accounts, together with the certifiers' reports, are sent from Member States to the Agriculture DG for 'clearance'. Analysis has begun to prepare the way for the planned application of Bayesian methods for incorporating prior experience into a relatively objective framework for estimating total overpayment.

Work to support the European anti-fraud office, OLAF, has the general objective of improving the office's effectiveness and efficiency by enabling it to visualise, sift and analyse the huge amount of available information so as to detect and identify trends and anomalies. The work focused on four areas: information systems support; data analysis and risk analysis; computer communications and security; and education and training. Increasing use is being made of the technology of the Internet and the world wide web. For instance, web-interfaces have been implemented to a Geographic Information System for Early Warning Systems, web-crawler agents have been set searching on-line newspaper articles; and techniques have been developed for automatic data downloading from commercial web-sites to aid understanding of the past movements of containers.

Work continued on determining the feasibility of integrating space-borne synthetic aperture radar imagery with present systems for monitoring the position of fishing vessels. New software was developed for vessel detection and identification. Applying this in the North West Atlantic, the North Sea and the Azores showed that more than 95% of vessels were detectable using relatively coarse imagery and that results could be available two and a half hours after the satellite overpass.

## **NATURAL AND TECHNOLOGICAL RISKS AND EMERGENCIES**

The ISIS has developed a considerable expertise in the management of natural and technological risks and, in a number of important areas, is the main adviser to those services of the Commission responsible for managing these risks. ISIS work can be divided into three broad areas:

- Harmonised European reporting systems;
- Nuclear reactor safety; and
- The application of structural mechanics to improve safety.

### **Harmonised European reporting systems**

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 – in particular the Seveso II Directive (96/82/EC). 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 2000, a new integrated version of the MARS accident-reporting database was produced incorporating the Seveso Plant Information Retrieval System (SPIRS), and the substance database DSDMS. An updated local version is distributed to each National Competent Authority every six months.



The natural and environmental disaster information exchange system (NEDIES) is being built up to support the Member States in the area of natural and environmental disasters. Implementation of a new version of the NEDIES website includes an interactive part for disaster reporting and disaster database interrogation, restricted to authorised users. Reports have been produced on lessons learned in recent European avalanche disasters, train accidents, flood disasters and earthquakes.

The ISIS is continuing to develop a European co-ordination centre for aviation incident reporting system (ECCAIRS) This makes available a standard reporting system software for all aviation authorities in the EU and integrates the resulting data in a single information system, accessible from all Member States. The Nordic, German, Italian, French and Dutch authorities, as well as Eurocontrol (the European organisation for the safety of air navigation), will be basing their future systems on ECCAIRS.

A system is being designed on behalf of the Italian Environment Ministry that is capable of integrated environmental monitoring and the management of risk and emergency situations in industrial areas. Work on the development of software allowing the public to participate better in the assessment of risk has begun to broaden from issues of environmental sustainability towards a more general application.

### **Nuclear reactor safety**

Within the nuclear safety area, there has been more emphasis on integrating European research, ensuring the dissemination of knowledge and on issues related to enlargement.

To meet these objectives a web-based information system has been set up for the storage and retrieval of experimental data acquired in the ISIS experimental programmes Fuel Melting and Release Oven/Small scale steam explosion facility – Italy (FARO/KROTOS) and (LOBI). This is being extended to include the thermal-hydraulic data bases acquired in other European integral system test facilities.

Work to disseminate and add value to the results of the ‘benchmark exercise on expert judgement (EJ) techniques in level 2 probabilistic safety assessment’ continued. A new international benchmark exercise for dependability assessment of safety critical software is under preparation.

ISIS work on severe accidents concentrated on support to the French test Reactor (Cadarache, FR) (Phebus-FP) tests and on the improvement of the computational tool for hydrogen combustion, REACFLOW. The main achievement during 2000 was the successful completion of the Phebus FPT-2 test.

### **Structural mechanics research for mitigation of technological risks**

The European laboratory for structural assessment (ELSA), with its reaction wall facility, is a centre of reference for European earthquake engineering. It has become the main link in a network of earthquake engineering laboratories working towards common agreed goals.

In addition to the pre-normative work in support of European design specifications for new buildings, there has been some emphasis on developing and assessing new technologies to improve the seismic resistance of existing ones – especially those with some cultural, historical or architectural importance. Two full-scale buildings were retrofitted using carbon fibre composite materials and tested at ELSA in 2000. Experimental research on old brick masonry buildings is now underway following the completion of an analytical feasibility study.

A combined effort involving computational modelling and tests in the Large Dynamic Test Facility has started, with the objective of understanding how structural components of cars and crash barriers behave under accident conditions. A study on improving pedestrian safety has been made and it is expected that this will be the foundation of future work in the area.

## Environment Institute (EI) - Ispra

### *Institute Director*

1. Management support	Jean-Marie MARTIN
2. Environmental impact	Emanuela ROSSI
3. Air quality	Peter PÄRT
4. Atmospheric processes in global change	Dimitrios KOTZIAS
5. Soil and waste	Frank RAES
6. Water research and monitoring	Giovanni BIDOGLIO
7. Renewable energies	Peter PÄRT f.f. 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 the 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 2000, the Environment Institute (EI) focussed 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 radioactive environmental monitoring and environmental integrity and human health.

### **Air quality**

The air quality unit is working on two major projects:

- **Integrated air quality assessment (IAQA)**

The IAQA project includes all essential methodologies needed for exposure-based urban air quality assessment – from sources identification, micro-environmental and personal monitoring to the development of modelling tools for the analysis of data, the assessment of abatement scenarios and the development of measures. The key elements in this concept are total human exposure assessment (indoor and outdoor) and the identification of sources and source apportionment for a range of priority pollutants.

IAQA includes the work of the European reference laboratory for air pollution (ERLAP), as well as a range of studies on urban air-quality impact assessment (AUTO-OIL). The project links regional, urban and micro-scale air-quality analysis, in order to develop strategies and models for assessing total human exposure to indoor/outdoor pollutants.

During 1999/2000, In view of the implementation of the Air Quality Framework Directive, **ERLAP** organised a series of three inter-comparison exercises for sulphur dioxide, NO<sub>x</sub>, ozone and carbon monoxide. Their purpose was to harmonise calibration procedures in the Member States and to control the accuracy of national reference standards. New monitoring techniques such as diffusive sampling have been developed and validated, and are used in measuring campaigns in four major European cities to examine the AUTO-OIL results with experimental data.

The **AUTO-OIL II** project was finalised in 2000. Eleven European city domains of differing characteristics form the core of the database for AUTO-OIL II: Athens, Berlin, Cologne, Dublin, Helsinki, London, Lyon, Madrid, Milan, Reggio nell'Emilia and Utrecht. These domains represent 47% of the urban population living in the 15 Member States. Current air-quality standards and emission-reduction objectives of these European cities were reviewed and the functional relationships between emissions and air quality were established for all the pollutants of interest, as well as the tools for projecting regional and urban emission inventories up to 2010.

- **European reference laboratory on waste incineration and vehicle emission measurements (ERLIVE)**

ERLIVE provides reference studies in support of the preparation, implementation and assessment of new EU-directives and standards on emissions from both stationary (industry) and mobile (on-road transport) sources. ERLIVE consists of a pilot incinerator equipped with all the necessary instrumentation for gaseous and particulate emission control at the stack, and a full-scale vehicle laboratory for the simulation of urban and non-urban driving conditions. Philippe Busquin, the European Commissioner for research, and Ortensio Zecchino, the Italian Minister for Research, officially inaugurated the vehicle laboratory in July 2000.

In particular, the research programme carried out during the year 2000 focused on the following scientific problems:

- Chemical-physical analysis of regulated and unregulated particulate matter (PM) pollutants emitted from new fuels and advanced engine technologies;
- Harmonisation/standardisation of measuring methods; and
- Assessment of advanced measurement and cleaning techniques during waste incineration process.

#### **The AIRPECO project**

Another project of the air quality unit concerns the PECO countries. The AIRPECO project aims at the harmonisation of ambient air quality assessment methods and techniques in PECO countries. Through the organisation of workshops, measuring campaigns in Central and Eastern European cities and the participation of laboratories to European quality assurance programmes, the PECO countries will improve their knowledge in view of the implementation of the existing EU Directives on air quality. During one week in October 2000, the first inter-comparison exercise for the measurement of the priority pollutants sulphur dioxide, NO<sub>x</sub>, ozone and carbon monoxide was carried out by ERLAP in Ispra with the participation of laboratories from Estonia, Slovenia, Hungary, Poland and the Czech Republic.

#### **Atmospheric processes in global change**

In the atmospheric processes in global change unit, investigations are 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 the Environment DG, complement Research DG shared-cost-action programmes on environment and climate, and contribute to international environmental programmes – e.g., the international geosphere biosphere programme (IGBP).

Several activities have been carried out within PHAMA (links between photo-oxidants, aerosols, and specific meteorological patterns through experimental and modelling studies in the Mediterranean area):

- A detailed laboratory study of the atmospheric photo-oxidation of emissions from vegetation showed that these compounds are an important source of particulate matter and carbonyl compounds in the troposphere.
- Project members wrote highly publicised review papers in a chapter on aerosols in the ‘integration and synthesis of 10 years of international global atmospheric chemistry (IGAC/IGBP) research’ and a ‘millennium’ review paper on aerosols, for the journal *Atmospheric Environment*. In addition, 20 papers in international peer-reviewed journals were published during 2000.

#### **Studying the link between ozone and particulate matter**

A year-long measurement campaign at the JRC Ispra site produced a unique data set to study the link between ozone and particulate matter formation, and the role of biogenic emissions in ozone and PM formation. First results showed a clear link between the hygroscopicity of aerosols and the ozone level.

The Atmospheric processes in global change unit has become increasingly involved in supporting the EU policymaking process. An example was the setting-up of a single JRC system for air pollution modelling on urban-to-regional/global scales. The system is ready for application in the Environment DG’s, Clean Air For Europe (CAFE) programme.

#### **Soil and waste**

##### **European inland and coastal watershed observational network**

The European observational network of inland and coastal watersheds, intended to assess impacts of EU policy and legislation on the quality of soil and water resources and establish a correlation between goals and measures, has become operational. Nodes of the network have been established in Finland, France, Greece, Italy, Spain, UK and Eastern Europe, in collaboration with the Environment DG and with regional and national institutions.

During 2000, the main focus has been on the continuing development of the project on impacts of waste emissions on soils (IWES). 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.

The unit has significantly expanded its activities in the field of environmental modelling, in order better to assess the risks associated with the problems of chemicals in soils and groundwater. In particular, the Unit is focusing on the use of fertiliser, pesticides and sewage sludge applications in agricultural lands. Part of this activity has been started to support the Environment DG in the upcoming revision of the European Directive on sewage sludge.

Modelling activities at the observational network of research watersheds included the validation of the harmonised quantification and reporting procedures for nutrients (HARP) guidelines on well-instrumented watersheds in Finland and France. The HARP guidelines provide grounds for estimation of normalised values of nitrogen and phosphorus losses from

both point and non-point sources, and help in assessing the effectiveness of the pollution reduction strategy.

An activity to assess the regional component of greenhouse gas emissions from European soils using GIS-based models was also started. This project will build on experimental work carried out in the unit and will draw from a variety of ground observations and remotely sensed data sets. The unit is also providing support to the Health and Consumer Protection DG by developing an information system to support the validation and improvement of risk assessment models for pesticides in groundwater (FOCUS).

A research action on the environmental impact of mining waste was developed in collaboration with the Environment DG and the European Environmental Agency (EEA), also with the involvement of pre-accession countries. The aim is to compare criteria for safe disposal of mining waste in candidate countries with the existing EU legislative framework in the area of waste, and to contribute to the assessment of the consequences of mining accidents (e.g. Baia Mare, Aznalcóllar) in a perspective of ecosystem protection. In this context, a second field campaign was organised with the JRC Space Applications Institute (SAI) along the Guadiamar River, following the discharge of toxic slurry from the Aznalcóllar mine (South Spain).

The high-resolution gas chromatography/mass spectrometry (HRMS) laboratory for the measurement of polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/Fs) and other persistent organic pollutants (POPs) entered into operation. This facility has been providing support to the ERLIVE project as well as to the JRC Institute for Health and Consumer Protection (IHCP) on PCDD/Fs in fish and on preparation of standard reference material for PCDD/Fs in animal tissue. An activity to develop methods of waste characterisation in order to estimate the flux of dangerous substances associated with selected waste streams was started. One aspect of this study will be an investigation of the role of waste recycling in the contamination of animal feed by dioxins and other POPs.

### **Water research and monitoring**

During 2000, the regulators group on construction products in contact with drinking water (CPDW) agreed that harmonised tests on the potential to promote microbial growth, cytotoxicity and gas chromatography-mass spectrometry for non-target compounds and the potential to form disinfectant by-products research had to be developed before the European acceptance scheme (EAS) could be implemented. The European testing laboratory for CPDW took charge of the scientific co-ordination of this research.

In addition, contributions were made to the workshops on EAS protection level for consumers, EAS on paper and EAS metallic products. Since metals can occur in various oxidation states, and toxic effects are related to speciation, work is in progress on the speciation of metals by hyphenated techniques such as high-pressure liquid chromatography-inductively coupled plasma-mass spectrometry (HPLC-ICP-MS). A facility has been set up for the analysis of polar compounds in water.

Criteria were compared to identify eutrophicated or threatened fresh water used in the Member States, and a possible strategy suggested for developing nutrient criteria in standing and running waters. This study was done in the framework of the urban wastewater treatment Directive and the nitrate Directive, which allow Member States to select their own criteria.

In the framework of sustainable wastewater management, the laboratory of micro-calorimetry and respirometry proceeded in studying activated sludge physiology. The fate of selected organic micro-pollutants such as phthalates and commercial detergents were studied in sub-surface flow reed beds. So far, two contaminated sites in Italy have been characterised.

In the area of data quality, a series of collaborative laboratory performance studies has been prepared. The matrices and related determinants were: tobacco, compost, incineration ash, road dust powder and sewage sludge powder for metal analysis; plants and sewage sludge powder for the analysis of persistent organic chlorine compounds and polycyclic hydrocarbons.

For the European scientific coastal observational network, the main efforts focused on setting up the proposed network. A number of potential test sites have been identified and contacts made with local authorities and institutes to discuss collaboration. A list of relevant monitoring parameters has been developed.

### **Renewable energies**

The solar electricity (SOLAREC) project is designed to support the implementation of photovoltaic solar energy by providing the technology reference for quality assurance in renewable-energy research, manufacturing, implementation and services; particularly in the areas of:

- Reference measurements;
- Materials supply and cost reduction;
- Systems integration in the built environment and rural electrification; and
- Synergies between renewable and electricity efficiency programmes.

As part of maintaining the direct traceability of solar radiation by its two absolute cavity radiometers to the World Radiometric Reference (WRR), EI participated in the five-yearly inter-comparison held at the Physikalisch-Meteorologisches Observatorium Davos (PMOD), Switzerland. This inter-comparison ensures worldwide homogeneity of solar measurements.

In support of European research and development on improved cell technologies, the European solar test installation (ESTI) now offers precise cell calibration to universities and research groups.

To meet the ever-growing demand for solar electricity, which cannot be satisfied by crystalline silicon alone, a number of thin-film technologies have progressed from research programmes and are now commercially available. In order to provide consumer confidence in these new technologies, various experimental techniques have been developed for the characterisation of the resultant structures, both in terms of their power outputs and their projected lifetimes.

Wide-scale integration of solar electricity in the built environment requires the development and implementation of quality codes for photovoltaic (PV) products, which are a combination of existing PV standards with European construction industry codes. An outdoor test facility has been constructed for this purpose.

The production of electricity from renewable sources is one way of reducing man's impact on the environment. Hand-in-hand with this approach is the efficient use of electricity. The group has characterised electrical appliances and electric-motor systems in terms of their efficiency, and has produced the EuroDEEM database to promote energy-efficient use. Similarly, research, demonstration and dissemination on advanced lighting/daylighting technology is performed (including technical follow-up of the EU Greenlight Programme).

Within the advanced electricity storage (ADELS) project, a battery test facility for the conditioning and analysis of batteries has been set up. The facility performs precise measurements of battery voltage, current and temperature under controlled charge and discharge conditions. Moreover, it is used for performing and developing test procedures to predict the long-term performance of batteries.

Indoor and outdoor tests have been carried out on six solar home systems (SHS) as part of an international effort to increase the quality of SHS by validating a draft international performance standard. This activity thus contributes to the establishment of standardisation and certification procedures that match those already existing for Photovoltaics (PV) modules. Consequently, it will boost consumers' confidence in the use of decentralised PV systems.

Single-walled carbon nanotubes (SWNT) and multi-walled carbon nanotubes (MWNT) have been produced by chemical vapour deposition (CVD) and modified CVD methods. Characterisation of the materials produced by several methods has provided technical data on the sample quality (especially nanotube yields and their diameter distribution). The focus has been directed towards improving the production and purification of the material as the main means for increasing its hydrogen storage capacity.

#### **New IEC standard for photovoltaic stand-alone systems**

After two years, a procedure has been concluded for the design qualification and type approval of small domestic DC photovoltaic power systems, the so-called 'solar home systems', in collaboration with laboratories from Europe and the US (GENEC, TÜV-Rheinland and NREL). This procedure has been accepted by the relevant IEC TC82 working group (Photovoltaic (PV) stand-alone systems - Design qualification and type approval, IEC 62124 82/243/CD). This means that local accredited institutions in developing countries will be able to evaluate the main characteristics of a solar home system by performing this test in outdoor conditions, recording the battery voltage and current, irradiance and ambient temperature with a simple data acquisition system.

#### **Environmental impact**

##### **• Radioactivity environmental monitoring**

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

##### **– Radioactivity environmental monitoring data bank (REMdb)**

The Easy-Proteo software (data input processor) was further improved and the new release has been made available to all Member States. The Easy-Proteo manual was also updated and will shortly be published.

##### **– European Community urgent radiological information exchange (ECURIE)**

Three working group meetings were organised with DG Environment and a selected group of MS experts to explore how ECURIE and EURDEP procedures can be integrated. This resulted in a number of actions, amongst which the most important ones are a new EURDEP data exchange format and a study on how to establish a consistent European radiological monitoring network. The CoDecS (coding decoding software) was installed and its operation explained at the IAEA.

##### **– European Union radiological data exchange platform (EURDEP)**

Currently 22 European countries send daily gamma dose rate measurements by means of this system. A first version of the EURDEP website was created for graphical access and presentation of this information.

##### **– MESOCOM**

MESOCOM, which was finalised in 2000, aimed at understanding the reasons for, and quantifying the differences in, mesoscale modelling in simple and controlled conditions.



## – ENSEMBLE

ENSEMBLE was launched during 2000 and is designed to support decision-makers during nuclear accidents, by making results of various long-range atmospheric dispersion models available in a comprehensive manner and in real-time. Currently 15 real-time modellers from Europe and the USA are involved.

### **Environmental integrity and human health**

The toxicity of groups of environmental pollutants has been assessed *in vivo* and *in vitro* on sensitive target species. Research on endocrine-disrupting chemicals (EDCs) has progressed. Screening for prioritisation of EDCs from selected chemicals by means of the *in vitro* E-screen assay in MCF-7 cells and the *in vivo* uterotrophic assay in immature rats have been carried out. This research activity has also contributed to the EDAEP (endocrine-disrupting ability of environmental pollutants) project, whose final report has been submitted to the Research DG. Moreover, the EI has engineered mammalian cells with new DNA constructs (SF-1 as promoter and GFP as reporter gene) for the detection of EDCs. Aquatic toxicology facilities have been assembled and research on biomarkers (i.e. vitellogenin) of endocrine disruptors (ED) in fish species has also begun. Finally, toxicological assessment of environmental mixtures (drinking water, vehicle emissions) has been done in co-operation with other EI units. The Institute's leading role in the JRC's cluster on hormone and endocrine disruptors and the implementation of the endocrine web site (<http://endocrine.ei.jrc.it>) enlarges EI activities in seeking fruitful collaborations with other JRC units and external research bodies.

The EI has an active role in several European and worldwide co-ordination activities, in particular in the field of EDCs. In particular, it has worked in the areas of EU-US science and technology collaboration in the field of EDCs (together with the Research DG), contributed to the strategy paper on EDCs, and given input for the implementation of the Commission strategy in this area (mainly through the Environment DG). Moreover, it has prepared documents on ED for the Commissioner and for the European Parliament hearing on ED (18 April 2000), as well as a presentation of EDs, pharmaceuticals and microbiological contamination in water for the STOA (scientific and technological options assessment) panel of the European Parliament. The EI has also been particularly active in the inter-service group on EDs co-ordinated by the Environment DG.

### **Involvement in WHO chemical safety programme**

In the field of new approaches to risk assessment, the EI is involved in the WHO-IPCS (World Health Organisation's international programme on chemical safety) Group on integrated risk assessment. The EI is planning an international workshop on this subject to be held at the JRC site in Ispra in Spring 2001.

## 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

Jean MEYER-ROUX

4. Agriculture and regional information systems

Jean MEYER-ROUX (f.f.)

5. Global vegetation monitoring

Alan BELWARD

6. Marine environment

Peter SCHLITTENHARDT

7. Strategy and systems for space applications

Peter CHURCHILL

### *Mission*

*The primary mission of SAI is to develop and promote the use of space-derived data in the service of EU policies, especially those relating to agriculture, fisheries, transport and anti-fraud. SAI also seeks to make the best use of information from space systems, to maximise the return from European investments in space and to help the Union reinforce its role in international action on the environment and sustainable development.*

During the reporting year, the project portfolio of the Space Applications Institute (SAI) was refocused as a consequence of budgetary and strategic changes within the JRC. The most significant change affecting the SAI was the closure of the centre for earth observation project. In addition, the Sampling for Information on Genetically Modified Organisms (SIGMO) project was cancelled, and the support to air quality monitoring using space techniques project was integrated into another project in order to reduce management overheads and hence increase overall efficiency.

Three new projects have been created, either in order to enhance the visibility of already on-going activities, or to react to emerging policy priorities within the JRC:

- European Soil Bureau;
- Population dynamics and security; and
- Galileo technical support.

Last but not least, the global monitoring for environment and security (GMES) project was redefined and renamed as global environmental information systems (GEIS), addressing the creation of information systems related to the implementation of treaties such as the Kyoto Protocol.

The SAI has contributed significantly to the rapid advancement of GMES, closely involving European space and user organisations. Although SAI's input concentrated on the evolution of the technical aspects, the institute also supported the political and organisational progress of GMES. Regular consultations with GMES partners in the EU Member States have resulted in consolidated GMES products, which form the technical basis for the progress achieved on the political level.

Individual projects have also reached some significant milestones, including:

- The adoption of the urban monitoring methodology and products by the EEA and the Regional Policy DG;
- Signing of an international agreement on civilian demining between the US and the EU by Commissioner Busquin;
- Launch of the pre-operational European forest fire risk forecasting system in support to the Environment DG, acknowledged in a recent EP Resolution
- Provision of a pan-European 1-km forest proportion database
- Invitation by the Environment DG to contribute to the drafting of guidelines for the Kyoto Protocol monitoring; the delivery of a European soil erosion risk assessment map to EEA and the Environment DG
- Provision of technical support to Galileo, based on the signing of the MoU between the JRC and the Energy and Transport DG; and
- Delivery of Geographic Information System (GIS) for Natura 2000 prototypes to the Environment DG, among others.

### **Monitoring natural and man-made hazards**

The Institute has further developed its activities in the fields of natural and man-made hazards, using space- and ground-based techniques focusing mainly on civilian demining, forest fires and floods.

Following recent events, the External Relations DG identified South-East Europe as a priority area for actions intended to re-establish stability (Stability Pact) in demining. At the request of External Relations DG, the SAI established contacts with the regional network of organisations responsible for mine action (Slovenia, Croatia, Bosnia and Herzegovina, Serbia, Macedonia, Albania and Kosovo) as a means of gaining detailed understanding of the needs. This approach should not be viewed as a single initiative, but as part of a co-ordinated process, designed to enhance and develop regional co-operation and collaboration during the life of the mine action programmes. The goal is to provide a foundation portfolio that creates a platform for further development and future funding on a wide range of inter-linked activities.

In the field of specifying and contracting the supply of mine-like objects, the outline test methodology has been defined. It was reported that the Italian ministry of defence would support this activity by providing live mines for electromagnetic assessment. The electromagnetic assessment of real mines will allow the SAI to compare the characteristics of the surrogate mines with real mines – after which, the test procedures will be finalised.

The overall objective of the natural hazards project remained unchanged. There have nevertheless been calls for urgent improvement of civil protection action at Community level. The European Parliament has also adopted several Resolutions inviting the Commission to take such initiatives. The main common elements in these forceful expressions of the need for improvement are demands for a strengthened structure for interventions and for a more efficient co-ordination of the intervening civil protection teams from Member States in case of disasters occurring both within and outside the Union.

The reactions also take account of the Presidency Conclusions from the Santa Maria da Feira European Council, 19-20 June 2000, in which was noted that the Commission would shortly submit an operational inventory of actions already led by the Union, as well as proposals in the civil protection area.

Moreover, in the context of the GMES initiative, natural hazards have gained increasing importance for the citizens of Europe. Beside the technical work already under development, links will be created with other SAI projects in order to work out synergies between the ongoing applications, and telecommunication and navigation studies. This could lead to a new crisis-support element within the natural hazards project.

### **Supporting regional development**

At the beginning of the reporting year, the Institute launched a new population dynamics and security project with the objective of producing quantitative information on specific phenomena related to: human settlement and population dynamics; human health and air quality; resources degradation; and crisis management and humanitarian aid. Work focused on the analysis of environment dynamics, ranging from land-use evolution to atmospheric pollution – and in a broad range of situations such as urban growth, population migrations, trans-border interchange and pressure, the setting-up or decline of infrastructures for transport and energy, regional disparities, and emergency situations.

The EURO-LANDSCAPE project – which aims at the development of criteria and indicators for sustainable development, environmental conditions and bio-diversity – was modified with the creation of a new sub-project called Studying Complex Landscapes Structures (SCALE). This examines complex land-use issues such as urban development, forestry, and agriculture. Algorithms have been developed for the extraction of spatial information from a variety of satellite imagery, including: IRS-1C, IKONOS and Landsat-7, and for the improvement of classification procedures using both spectral and spatial information. In addition a pan-European forest proportion database, a 200-m resolution image mosaic for forest mapping in Europe, and a pan-European catchment and river network database were concluded, resulting in a significant number of scientific publications.

The European Soil Bureau, a previous SAI activity, was re-launched as an Institute project during the reporting year. The objectives were clearly re-identified during the last meeting of the European Soil Forum (Berlin, November 1999), where customer DGs, the EEA and Member States discussed future strategies concerning soils in Europe. The joint JRC-EEA strategy on soil identifies as the major objective the establishment of an effective interface between policy makers and the scientific community in order to collect policy-relevant soil information for Europe.

The major instrument for achieving this task is the network of soil-related national institutions currently co-ordinated by the European Soil Bureau. Three major areas of action have been identified, namely soil erosion, organic carbon, and heavy metals. Consequently, the European Soil Bureau focused on the preparation of a pan-European soil erosion risk assessment; on assessment of the organic carbon content in European soils, and on evaluation of the background levels of heavy metals in European soils. There has also been a shift in priorities from the geographic extension of the European soil information system to the newly independent states (NIS) and Mediterranean Development (MEDA) countries.

### **Developing environmental information systems**

The Coastal Monitoring and Management (COAST) project, demonstrating an end-to-end utilisation of Earth observation data from satellites in an operational context, continued its activities. Its work concentrated mainly on new/modified requirements emerging from the new Water Framework Directive (a European Parliament and Council Recommendation concerning the implementation of integrated coastal zone management in Europe) and on the work programme of EEA's European Topic Centre "*Water*".

To avoid confusion with the GMES initiative, the global monitoring for environment and security project was renamed as the global environmental information systems. Its prior objective remained unchanged; i.e. to provide the services of the Commission with relevant, timely and accurate information on changes in the location and condition of global vegetation types and oceanic primary production.

The information requirements for the implementation and verification of environmental treaties/conventions on climate change, biodiversity, and desertification were specifically addressed. Key actions were:

- Development of methods to reduce uncertainties in inventory, mapping and monitoring of global land-cover types, especially forest resources;
- Development and testing of methods to identify significant events heralding land-cover change, such as fires and short term climatic variations, and determine their impact;
- Development and testing of methods to identify oceanic sinks and reservoirs of greenhouse gases; and
- Participation in the development of an operational Earth Observations (EO) capability in Europe, with particular reference to the requirements of the Kyoto Protocol.

The on-going Geographic Information and Geographic Information System (GI&GIS) project has reflected the increasing awareness of the importance of spatial aspects in European policies (e.g. European Spatial Development Perspective, Common Agricultural Policy, Integrated Coastal Zone Management) and decision-making – focusing on technical aspects related to spatial information and spatial information systems).

Geographic information is now recognised as a key element of the Information Society. The GI&GIS project continued its support to the actions taken to create a European geographic information infrastructure (EGII), recognised as priority for the year 2001 by the Information Society DG.

At the request of the main customer DGs (Eurostat, Information Society, Environment, Agriculture) and Committee of Geographical Information (COGI), some new priorities were taken into account without changing the general objectives. The project can thus act as reference centre for GI&GIS, addressing problems such as European spatial reference system, GI metadata standard and European geographic projection systems, including links with international standards organisations (e.g. liaison with ISO).

A survey financed by Eurostat was performed to determine the availability of pan-European geographic information fulfilling the Commission department's needs. The project further supported the European contribution to global initiatives such as: Climate Change, Global Monitoring for Environment and Security, GSDI, OGC, ISO, and JTC. Its geographic area was extended to include the countries affected by EU enlargement. Last but not least, the GI&GIS project co-managed the European Project I&CLC2000 (IMAGE2000 and Corine Land Cover (CLC2000)).

### **Supporting the common agricultural policy**

The well-known monitoring agriculture with remote sensing (MARS) project continued to provide technical support and expertise to the Agriculture DG for the implementation, management and follow-up of the Common Agricultural Policy (CAP). Know-how developed within MARS has embraced the operational use of remote sensing (satellite/airborne data), geographical information systems (GIS), global positioning system (GPS), and more generally geomatics and area frame techniques. The main application areas of MARS over the reporting year were the fight against fraud, i.e., technical control of farmers' declarations for

area-based subsidies; and the production of pan-European statistics and information systems related crop yield monitoring forecasts (MARS bulletin).

During the year, MARS undertook a number of initiatives to explore and develop its expertise in the GMES field. Pilot projects were carried out over Kosovo, and there are plans to gather datasets on four pilot regions in the world in order to develop prototypes.

In the meantime, new partnerships are underway with organisations such as Food & Agricultural Organisation (FAO), and contacts are now established with the External Relations and Development DGs. Another large part of the MARS activities has been fully integrated within the fight against fraud campaign. Moreover, future synergies have been clearly identified with the development of orthophotos and digital land-parcel identification systems. Foreseen by the new regulation for the CAP, this data will in the medium term revolutionise the availability of large-scale maps and of web-accessible land registry data in rural areas. On the initiative of the JRC, and with the support of the Agriculture DG, a proposal for a MARS PECO project on the fight against fraud has been submitted, approved and readjusted.

### **Supporting Europe's space strategy**

The SAI has strongly supported European space strategy, mainly by providing technical contributions in the fields of Earth observation (GMES) and satellite navigation (Galileo). It has also continued to promote the synergy of these space technologies with telecommunications under applications on the synergy of earth observation with satellite telecommunications and navigation Applications on the Synergy of Telecommunications Earth Observations and Navigation (ASTRON) project.

ASTRON demonstrates innovative services and applications based on the convergence of digital information from satellites and terrestrial technologies. Presentations showing the potential for synergistic use of the various satellite technologies were selected in accordance with the results of a series of market studies carried out during the reporting year. The first demonstration was in the field of Info-mobility Moreover, a satellite navigation monitoring station was installed and operated within the framework of the project.

Through the newly launched Galileo technical support project, the Institute provided technical backing to the Galileo programme during its definition phase. The support provided can be grouped into three main areas: applications and pilot projects; systems definition and implementation, and service definition and market-related assessments. Effectively, this included:

- Project management of Task 8 (Pilot Projects) of the Overall Architecture contract (GALA);
- Co-operation with on-going Trans-European Network (TEN), and other FP5 activities; and
- Liaison with the Galileosat project; and continued assistance to the technical management of the Service Definition contract (GEMINUS), including project management of tasks – business models, service definition, market analysis.

## **MAJOR SUCCESSES IN 2000**

### **Global Monitoring for Environment and Security (GMES)**

The most significant single success of the SAI has been its contribution to the rapid advancement of GMES. As project leader, the Institute has contributed at all levels to the further evolution of the programme, closely involving European space and user organisations.

At the Fifth SAI Annual Users' Seminar in Stresa (IT) in May 2000, Commissioner Philippe Busquin stressed for the first time that "GMES could be the next theme for a cross-European co-operation". Triggered by this endorsement, GMES has progressed rapidly on the political level. A GMES conference was organised in Lille under the auspices of the French EU Presidency in October 2000, at which the SAI was invited to provide a keynote speech. A high-level follow-up conference under the Swedish EU Presidency is in preparation, and Commissioner Wallström, responsible for the environment, is expected to attend. In addition, GMES has become the representative for Earth observation in the joint European Space Agency (ESA)-EU European strategy for space, which is currently in its final consultation process before being put forward to the respective ESA and EU Councils for decision.

### **European forest fire risk forecasting system**

Within the forest fire work-package of the natural hazards project, the required fire risk indices were delivered on time and are available to the customers via the Internet. In June 2000, the delivery of daily fire risk forecasts for the Mediterranean countries was launched. In the meantime, Germany, Luxembourg, Finland and Austria have also requested to be linked to the system. The overall activity is co-ordinated with the Environment DG.

Burnt-area mapping started at the end of last year. Reports on important fires, such as those in northern Spain and southern France were already sent to the national authorities and the Agriculture DG. The fire mapping methodology was tested in Portugal for the entire Mediterranean basin.

### **World fire web**

The world fire web is a system for globally mapping fires in vegetation. It is being developed in response to a call from scientists and policy-makers for globally consistent information on the distribution and behaviour of fire in the environment.

Satellite images National Oceanographic and Atmospheric Administration Advanced Very High Resolution Radiometer (NOAA AVHRR) are acquired by a worldwide network of receiving stations. Each station operates a data-processing chain for detecting fires in the satellite imagery. Daily global fire maps are built up at each station from this regional data by automatically sharing regional fire maps over the Internet. Global fire information is then made available on-line from each station, in near real-time.

A pilot network with partial coverage of the globe is in its implementation phase. The network now provides a virtually complete global coverage of vegetation fire.

### **City navigation**

A personal assistant screen emulator was developed within the framework of the ASTRON project covering the JRC Ispra site. This was based on a development carried out over Stockholm. The JRC site emulator is a proof-of-concept demonstration in the field of city navigation. It shows the potential arising from the synergistic use of space- (Earth observation, navigation and telecommunications) and ground-based technologies.

In particular, the personal assistant can be used further to support users with information on demand, providing personal guidance in unknown environments such as an unfamiliar city. It can, for example, provide help to find the next underground station, or guide a backpacker to the nearest camping site in a rural area. The prototype is available for demonstration at the Institute.

## Institute for Health and Consumer Protection (IHCP) - Ispra

### *Institute Director*

*Barry McSWEENEY acting*

- |   |                    |
|---|--------------------|
| 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         | Hermann STAMM      |

### *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.*

The year 2000 was the second year of operation for the Institute for Health and Consumer Protection – the newest institute of the JRC. The IHCP continued to progress with a natural evolution of its working areas under the influence of elements such as the rapid development of life science, the Commission's legislative programme and the future chemicals policy.

The appointment of Barry McSweeney on 1 March 2000 as the Institute's first Director accelerated the focusing and prioritisation of activities. Prior to Mr McSweeney's appointment, JRC Director-General Herbert J. Allgeier had also acted as the IHCP's Director.

The focusing exercise, among other factors, led to a significant expansion of the GMO (genetically modified organism) activity.

Demand for food safety and quality activities continued at a high level, and actions in this area were also expanded in the context of the Commission White Paper on Food Safety and the proposal to establish a European Food Authority. A close and co-operative working relationship between the Health and Consumer Protection DG and the JRC (under the leadership of the IHCP) and the planning process of the food authority will ensure the avoidance of unnecessary duplication between the authority and related activities of the JRC.

The IHCP has been central to the development of the JRC competence pillar on food, chemical products and health, the most relevant growth area in the JRC future strategies. This is a good example of how the Institute collaborates across the JRC, particularly with the Institute for Reference Materials and Measurements (IRMM) and the Institute for Prospective Technological Studies (IPTS).

The European centre for the validation of alternative methods (ECVAM) and the European Chemicals Bureau (ECB) continued their work related to the safety of chemicals and chemical products. ECVAM has seen three of its validated methods incorporated into European legislation – a historic first for any *in vitro* methods – while ECB continued as the central activity in the European regulatory system of chemicals. The emerging White Paper on chemical safety will have a significant influence on the future development of these activities.

The IHCP continued its work on telematics, related to the regulation of pharmaceuticals. The support given to the European medicine evaluation agency (EMEA) was strengthened, as well as the development of the medicine information network for Europe (MINE).



The biomedical research activities have been re-oriented and focused on the reliability of medical devices, including implants. Exciting interdisciplinary work is now concentrated on hips, knees and cardiac stents. The present situation and the future evolution in this area are based on the requirements of an ageing European population and consumer demand for better medical tools.

A key horizontal activity in 2000 was the development of the IHCP networking and training activities. The establishment of the European network of GMO laboratories, and the manner in which the European validation of methods relating to the release of phthalates (plasticisers) were undertaken, served as key examples. Additionally, the IHCP has approximately 200 on-going collaborative research partners, throughout Europe and beyond.

Training is concentrated on the transfer of key competences to scientists from candidate countries for EU membership and developing countries, and on research mobility training of young researchers. The existence of an excellent research infrastructure, a high potential for multi-disciplinary activities and the involvement in many 'hot' issues should ensure an active development of this work.

### **Food products and consumer goods**

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 feedstuffs – as well as other consumer items such as childcare products and cosmetics. Harmonisation and validation of analytical methods in the fields of food safety and quality are carried out through networking with Member States' laboratories.

#### **Natural toxicants**

A simple and environmentally friendly method based on thin layer chromatography (TLC) was developed and validated for the quantification of aflatoxins in food and animal feed.

- ***Food contact materials***

A study on the effects of the composition of can coatings on migration of ether – BADGE (bisphenol-a-diglycidylether), - degradation products was completed, as a part of monitoring of contaminants from food packaging (i.e. can coatings, baby bottles, baby food jar sealants, etc.). Comparison of methods for the migration of bisphenol A in baby bottles was also completed.

In connection with the dissemination of information and database, 10 new substances were received from suppliers for the reference collection of monomers and additives. The website was correspondingly updated (<http://cpf.jrc.it/webpack/>).

#### **Validations for plasticisers and pesticides**

Validation of two methodologies to test the migration of certain plasticisers from toys and childcare articles was carried out. Two rapid screening methods for the determination of pesticides in food (also suitable for animal feed) were also developed and validated.

Further activities have continued in relation to food quality, which is one of the growing concerns of consumers, critical to determining the perception, acceptance and attraction of a product.

For the control of European wines by the European Office for wine, alcohols and spirit drinks (BEVABS), development of the database on authentic European wines continued and the software was updated. Moreover, the work on the development and validation for carbon-13 measurements is progressing.

Various methods were investigated for the quantification of foreign oils in olive oils. Additionally, a method for the detection of cocoa butter equivalents (CBEs) in cocoa butter (CB) has been developed.

- ***Genetically modified organisms***

Biotechnology is one the most important scientific, technological and industrial sectors (including trade issues) of European society, and is of primary importance on the European policy agenda. The principal objectives of the GMO project are to:

- Reply to challenges related to biotechnology regulatory actions for environmental development, consumer protection and technological/industrial development;
- Provide assistance to the Commission, to the relevant competent authorities and to the European and national expert Committees in their work on the implementation of the Biotechnology Directives;
- Provide a demand-driven active food control by the harmonisation and validation of analytical methods for the detection of GMOs in food products through networking with Member States' laboratories;
- Propose and validate sampling plans;
- Organise training courses for control laboratories, so that appropriate methods for GMO detection will be used; and
- Elaborate technical feasibility studies to comply with legal provisions.

This area received a tremendous boost in the year 2000, under the impulse of the Commission legislative programme. A recruitment campaign and the construction of new laboratories are underway. The IHCP is increasing its activities in the range of certified reference materials and in the establishment of a molecular register relevant to the identification of GMOs.

Through the IHCP, the JRC will co-ordinate the established network of GMO laboratories, which held the kick-off meeting at the JRC site in Ispra on 13 June 2000, involving a total of 38 experts from national enforcement laboratories and 18 European Commission representatives.

### **SNIF notification system**

Notification system/electronic SNIF has been developed as a specific scientific and technical support offered to DG Environment for implementation of Directive 90/219/EEC on the contained use of GMOs and Directive 90/220/EEC on the deliberate release into the environment of GMOs, including all amendments and adaptations to the technical progress.

To date, 104 dossiers dealing with deliberate field trials for research and development have been received, processed and checked for compliance with the European Biotechnology Directives. The website (<http://food.jrc.it/gmo/>), updated at weekly intervals, now contains the overview of all notifications received so far.

The development of an extranet initiated in 1999 to link Member States and the EC in a secure network has continued. A prototype version is ready, allowing Member States to have direct on-line access to the summaries of the dossiers that report on the notified deliberate field trials, as well as to the full dossiers that are submitted to request commercialisation of a GMO.

A qualitative screening method was validated for the detection of GMOs in various processed food matrices (cooked maize grit, infant formula, biscuits, acidified soybean meal). This has proved to be suitable for the screening of GMOs even when extreme temperature conditions are applied or when multiple components are present.

The GMO laboratory has been put into operation. GMO-containing reference materials produced by the IRMM were extensively analysed by direct polymerase chain reaction (PCR), by nested PCR and by the application of a large variety of PCR primers. This enabled the design of new production protocols and the start of collaboration in the production of new types of material.

A total of three training courses have been organised in collaboration with the World Health Organisation. Applications for a further ten courses are being processed.

### **Toxicology and assessment of chemical substances**

The ECB provides scientific and technical support to the conception, development, implementation and monitoring of EU policies on dangerous chemicals. It represents the focal point for collecting information on new and existing chemicals, and manages the assessment of risks posed to workers, consumers and the environment. It supports the implementation and updating of Directives and Regulations concerning dangerous new and existing chemicals, biocides, plant protection products and related environmental influences. Aspects such as legal classification and labelling, notification of new substances, and development and harmonisation of testing methods are included.

In 2000, the ECB organised and hosted several working group meetings in the classification and labelling area, dealing with health matters and effects on the environment. As major specific achievements, ECB has introduced 11 new or revised testing methods into Annex V of Directive 67/548/EEC.

### **IUCLID – global reference database**

The international uniform chemical information database (IUCLID), already adopted in 1999 by the International Council of Chemicals Associations (ICCA), has become the world chemical industry's de facto reference database for the collection and distribution of chemical data. It has now been enlarged and contains the finalised section on biocides. The second IUCLID CD-ROM was released in August 2000. In its present form, it contains data on 2604 volume-production chemicals, including all available information on the toxicological and eco-toxicological effects of these substances – together with summaries of risk assessment reports, where available, and other background information.

Moreover, 100 existing chemicals and 150 new chemicals have been classified and labelled as dangerous. More than 40 risk assessment reports on existing substances have been finalised and 400 notifications on new substances distributed. A consistent effort was made to disseminate information, while the construction of the web page with information on the biocides review regulation was completed. In collaboration with United Nations Environment Programme (UNEP), more than 20 national profile homepages have been created and published on the Internet.

### **Validation of biomedical testing methods**

ECVAM 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, intended to replace, reduce or refine the use of laboratory animals, is applicable to various fields of biomedical science.

It involves a number of different measures:

- Co-ordinating the pre-validation/validation of alternative test methods at the European level, by performing research and new test development;
- Implementing and maintaining the ECVAM database – Scientific Information System (SIS) – a specialised tool concerning the state of the art of alternative test development and validation;
- Organising workshops and task forces to review the current status of alternative tests in specific areas; and
- Making recommendations about the best way to promote the integration of *in vitro* tests and other testing methods into the regulatory process.

### ***In vitro* methods accepted**

Three scientifically validated *in vitro* methods (two for skin corrosivity and one for phototoxic potential) were accepted by the EU Member States, as Annex V test guidelines in relation to the Directive 67/548/EEC. The ECVAM Scientific Advisory Committee endorsed the local lymph node assay for skin sensitisation and the EpiDerm skin corrosivity test as validated methods. An ECVAM formal validation also showed that three *in vitro* tests for embryotoxicity had met the validation criteria for the study.

Other highlights during the year include:

- The development of a prototype for an innovative, medium-throughput HPLC/MS system for measuring metabolism-related enzyme activities;
- A prize for the best paper published in ATLA (Alternatives to Laboratory Animals) was awarded to the members of the group working on reprotoxicity and cardiotoxicity, who participated in successful validation of the embryonic stem cell test;
- The Tecnomouse system for long-term *in-vitro* studies was successfully transferred to ECVAM by contract, and a multi-system for transepithelial resistance measurement has been optimised. HPLC and luminescence methods for nucleotide measurement have been developed in-house, and an external contract has been awarded to optimise Caco-2 cell methods for studying intestinal absorption *in vitro*;
- Active collaboration has been established on the absorption by the Caco-2 cell and on the embryotoxicity of metals;
- *In-vitro* assays for pesticide haematotoxicity in both human and animal cells are successfully being applied. Techniques for the establishment of long-term cultures of human bone-marrow cells have been refined. Standard operating procedures for the use of human spinal cord blood cells in clonogenic assays have also been produced;
- An important contribution to the derivation of structure-activity relationships for predicting the corneal permeability of chemicals and pharmaceuticals has been published;
- Collaboration to provide standardised protocols for the safe and ethical use of non-invasive measurements in human volunteer studies has begun, as a basis for comparing *in-vitro* test data and human *in vivo* test data; and
- In the field of information systems, progress has been made on the production of a thesaurus of terms to be used in relation to alternative methods to laboratory animal use and has been incorporated into the database.

## **Support to pharmaceutical regulation**

Through its support to pharmaceutical regulation (SPR) unit, the IHCP provides management information/communication systems to the regulatory process for pharmaceuticals. These activities are of enormous help for the safety validation of medicinal products such as pharmaceuticals, vaccines, blood derivatives, radio-pharmaceuticals and homeopathic medicines, as well as biotechnological derivatives, to ensure protection of citizens' health. Regulators are supplied with all required information tools to monitor the evaluation of the scientific, efficacy and safety aspects of medicinal products and to track the marketing authorisation processes of medicinal products throughout the EU.

The aim is to develop the unified tracking system (UTS) integrating the presently distinct marketing authorisation procedures with up-to-date telematic solutions – EudraTrack mutual recognition (EMR) and application tracking system (ATS). UTS is a telematic system that enables all marketing submissions of medicinal products in Europe to be tracked, and is capable of monitoring improper submissions. In addition the activities in this area include the design and implementation of a centralised database service (named MINE), which gathers all scientific, efficacy and safety information on medicinal products authorised within the EU.

A new classification into five levels of MA application has been introduced (i.e. new active substances, initial application, full dossier, herbal and prescription). The procedure header is now editable allowing the update of the contents of the following fields: CMSs, MA holder, Product name, Active substances, Pharmaceutical form, ATC code and RMS contact.

The EudraNet network (EudraNet II) is being upgraded. It is composed of virtual private network (VPN) modules, including public key infrastructure (PKI), and aims to increase the use of the current EudraNet I dedicated network services.

EudraSafe, which provides secure transfer capability for confidential documents between users who are not directly connected to the private EudraNet network, has been improved. Desktop video conferencing (DVC) capabilities are being implemented within the system, to increase the interactivity between the VPN users.

### **A European socio-economical system dedicated to consumer health and protection**

A new web-based prototype version of MINE<sup>1</sup> has been defined. This is related to both human and veterinary medicinal products, and is equipped with adequate access control tools. As soon as the MINE system is linked automatically to the UTS databases, and when the tracking covers all medicinal products authorised in the EU market, then MINE will become the first Europe-wide socio-economical system dedicated to consumer health and protection.

All activities related to electronic commerce carried out at the IHCP have been transferred to the JRC Institute for Systems, Informatics and Safety (ISIS).

## **Biomedical materials and systems**

The biomedical materials and systems (BMS) unit groups experts in materials science, surface engineering, nuclear and optical techniques applicable to a broad range of health-related issues – particularly in the areas of biocompatible implants and medical imaging technology. This orientation responds to the needs of an ageing European population and consumer insistence on tools for early diagnosis and better planning of therapies. Diagnostic tools that lead to the minimisation of surgery are especially needed to improve patient care and the cost-effectiveness of public health systems.

Specifically, the work in these areas encompasses the following main priorities:

- Functional materials and systems, involving the development and characterisation of biocompatible and bioactive surfaces to improve haemocompatibility of cardiovascular grafts, stents, and catheters; and osteointegration of hip and knee replacement prostheses.
- Performance testing of biomedical devices in support of harmonisation of test methodologies on release from, and performance of, orthopaedic and dental implant materials and medical devices under clinically relevant conditions, using a combination of advanced techniques in support of the Directive 93/42/EEC.
- Medical imaging and therapy, using radiotracers and radio-pharmaceuticals. This involves, amongst other activities, contribution to the development of standards for the distribution of radiotracers (e.g. FDG) at European level, and participation in European networks.

#### **FDG production started**

A fluorodeoxyglucose (FDG) production facility has been installed at the Cyclotron premises. The module, complete with target, synthesis module and quality control unit, can deliver about 40 GBq at the end of each run. Clean rooms (class C and B) are also available for handling the tracers and to comply with GMP (good manufacturing practices) guidelines related to radiopharmaceutical production.

The European network for optical methods of medical diagnosis and monitoring of diseases (MEDPHOT) as part of a shared cost-action.

A two-axis dynamic loading station for a hip joint simulator was designed and constructed. Test programmes with up to three million simulated walking cycles can be performed.

Three different types of nacre coating have been plasma sprayed onto several substrates, and on hip joints and dental implants. Osteoblast cells have been grown on the ceramic before and after spraying, as well as on titanium and PE sheets. Results demonstrate the clear osteoinductive properties of nacre both before and after spraying, and the clear advantage of the coatings over pure titanium. This opens a new development route for biocompatible coatings.

Pre-normative research in support of the Nickel Directive 94/27 was carried out; with the definition and publication of selected test methods (EN 12472) being adopted by the European Committee for the Standardisation (CEN).

During the year it has been decided to phase out the activities on release and to concentrate on biomaterials, as described above.

## 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          | .....            |
| 4. Technologies for life science, information and communication | Bernard CLEMENTS |

### ***Mission***

*IPTS' mission is to provide prospective techno-economic analyses in support of the European Union's policy-making process. IPTS monitors and analyses science and technology-related developments, their cross-sectoral impact, the inter-relationships between technology and society, and their future policy implications. IPTS operates international networks, pools the expertise of high level advisors and presents information in a timely and synthetic fashion.*

The core business of the Institute for Prospective Technological Studies (IPTS) is to identify challenges in the complex interaction between technological progress and societal needs, providing sound data to support the analysis, and offering original methodologies for devising alternative paths allowing policy-makers to address those challenges.

One of the key IPTS assets is the ability to pool expertise from an array of international sources, analyse it and translate it into policy-relevant information. IPTS will therefore retain and develop its in-house knowledge as a way of playing its 'critical filter' function role to the full.

IPTS 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. Drawing on the resources and competences of experts in 35 major 'think tanks' and other institutions across Europe, it functions as a virtual network-based 'European office of technology assessment'.

Furthermore, the wide customer base within EU institutions (including the European Parliament as well as the Environment, Enterprise, Information Society, Agriculture, Energy and Transport, Research, Health and Consumer Protection, Education and Culture DGs.) helps IPTS in maintaining a cross-policy perspective and constant direct contact with the various frontlines of EU policy-making. This is an important asset for IPTS and one that it strives to preserve.

IPTS' activity focuses especially on the area of critical geopolitical and economic importance for the EU, namely geographical Europe (with special attention to candidate EU accession countries) plus the Mediterranean basin.

### **The IPTS work programme**

The Institute's work programme is based around 11 main projects:

- ***The ‘Futures Project’***

The Futures Project is the IPTS prospective flagship. It investigates the impact of the major drivers of change on technology, employment and competitiveness in Europe over the next ten years. During 2000 it completed its first cycle with a major conference at which active participants included Commissioner Busquin, the Portuguese Research Minister (President in office of the Research Council), the Vice President of the European Parliament and a Nobel Prize-winner. Some 650 people attended, and the event was publicised in more than ten major press articles.

The success of the conference raised awareness of IPTS at a general level and led to considerable interest in terms of requests for the projects’ 16 reports (12,000 hard copies have been distributed), for advice to the international foresight community and for policy support to the EU institutions. Publications appearing during 2000 included: the Futures Project Synthesis Report, the Conference Proceedings and six refereed academic papers.

The new Futures Project has mainly been occupied with handling the high level of interest and direct demands for policy support in the lead-up to Framework Six, for example:

- The Information Society technologies programme advisory group (ISTAG) request for the development of scenarios on ambient intelligence in the year 2010. Two workshops have been held and the final report will be delivered in early 2001.
- Support for the Research DG, at the behest of Commissioner Busquin, entailing advice on thematic priorities for the European Research Area (ERA). The work aims to identify research themes and structuring rationales for the ERA. Involving both IPTS and ESTO) background analysis of foresight results and expert panels, it was completed by the end of 2000.
- FOREN (foresight for regional development) project workshop on reconciling foresight with policy-making at regional level. IPTS is scientific co-ordinator of this Research DG STRATA project, in which 26 network members combine prospective and/or regional development policy research expertise.

Development of a new cycle of work for Futures Two has included:

- A seminar on quantitative modelling of Europe’s social expenditure, which will result in a special issue of an academic journal during 2001; and
- A workshop on ‘Mobile Europe’.

- ***Building the Information Society***

The objectives of this project are assessment of the socio-economic impact of Information-Society-related technologies (especially in the area of new media technologies) and of the impact of emerging ICT technologies and applications on innovation, research and other EU policies. Deliverables in 2000 included:

- Conference and final study report entitled ‘Alliances for Sustainable Information Society’
- Final report and workshop on the convergence of consumer electronics; and
- Workshop and report on the employment impact of new media technologies.

### **Electronic business**

This activity focuses on the analysis of the implications of e-business for EU policies, more specifically by measuring the economic impact of e-commerce on businesses, as well as on employment and social cohesion. During 2000, a series of workshops brought together policy-makers and researchers from Europe and the US, to discuss the regulatory framework for e-commerce and taxation issues.



Three major activities were launched in the same year: the observatory on electronic payment; e-commerce security/privacy – concentrating on technological solutions for combating cybercrime and its impact on ethical and citizen's rights issues; and assessment of business impact of e-commerce at a sectoral level.

### **Environment and society**

The main objectives of this project are:

- To support the development of an EU strategy for sustainable development, as well as the overall integration of environmental requirements in the definition and implementation of Community policies and activities; and
- To monitor technological developments and their economic, social and environmental implications, in particular regarding selected cases of 'clean technologies'.

During 2000, final reports were released on the following subjects:

- The introduction of process integrated biocatalysts in companies – effects of dynamics in internal and external networks;
- Innovation and cleaner technologies as a key to sustainable development: the case of the chemical industry;
- The impact of environmental regulations on innovation in:
  - the area of end of life vehicles,
  - the recycling industry,
  - the chemical industry; and
  - the EU Eco-Audit Regulation.
- Eco-design and integrated product policy, and strategies for dissemination of Eco-design to SME;
- Towards an European solution for the management of waste from electric and electronic equipment; and
- Science and precaution in the management of technological risk.

### **Life sciences and impact on society**

The objective of this project is to provide policy support and prospective analysis in areas particularly affected by progress in life sciences – mainly biotechnologies, agri-food and health – taking into account the scientific, social and economic context. Activities were recently launched along the following lines:

- Analysis of the development and use of genetically modified organisms
- Evaluation of the application and use of the Precautionary Principle
- Technical support to the WTO-case EU/US on hormones in meat/endocrine disrupters
- Analysis of the development of the agri-food industry.

In 2000, a study was completed on GMO regulations applied in Member States and third countries. It pointed out the difficulty of access to information, lack of harmonisation in risk assessment between Member States, absence of standard methodology and differences in risk evaluation processes performed in the EU and in the USA.

## **European IPPC bureau**

The specific goal of the European IPPC bureau is to support the implementation of the integrated pollution prevention and control Directive by producing a series of best available technique (BAT) reference documents for the activities covered by annex I to Directive 96/61/EC.

During 2000, final drafts (or final reference documents) have been completed in the sectors iron and steel; cement and lime; pulp and paper; cooling systems; ferrous metals processing; non-ferrous metal processes; manufacture of glass; and chloralkali.

Work has also proceeded in fields of textiles, tanneries, monitoring of emissions, refineries, smithies and foundries, large volume organic chemicals, inorganic chemical manufacture, intensive livestock farming, emissions from storage, common waste water and waste gas treatment/management in the chemical sector, economic and cross-media aspects, slaughterhouses and animal carcasses, food and milk processing, and large combustion plant.

## **Energy and climate change**

The project is performing prospective analysis on energy/sustainability relations and analysing the impact of carbon emission regulatory measures on business, energy policies and sustainable development. The analysis concentrates on trends in energy use, the related carbon emissions and possible mitigation strategies. Examples of scenario-building actions targeted to EU policy support included:

- Baseline carbon emissions projections delivered for (UNFCCC),
- Impact on energy producer countries, and
- Implications of different carbon trading regimes.

## **Sustainability in transport and mobility**

This project addresses main issues raised by the need to minimise the environmental impact of transport while ensuring an efficient transport system. Activities focus on the analysis of:

- Emerging transport and related technologies, innovation processes and factors controlling the market uptake of technologies; and
- Interactions of transport with the environment, economy and society.

Completed in 2000 were a comparative study report assessing the different information system alternatives for pan-European intermodal freight transport operations, assessment of three different instances of good practice in urban mobility; and two studies on transport economics.

## **Knowledge and skills: perspectives for Europe**

The objective of this activity is to investigate the factors and monitor their effects in the European economic system and of the corresponding needs for knowledge and human skills, as the essential assets of the EU to improve its position in terms of innovation and competitiveness.

One important component of the project is a feasibility study now under implementation on gateway to the European learning area. Activity in 2000 included studies on new demands for skills and knowledge emerging from organisational changes in value-added services to industry, methodology for the identification and evaluation of emerging technologies (now incorporated into the IPTS-TIM<sup>®</sup> software tool), and the impact of corporate spin-offs on competitiveness and employment in the European Union.

## **Enlargement: building linkages on prospective activities**

This project is a prospective analysis of EU enlargement and its impact in three policy fields: research and development, employment, and competitiveness.

A series of workshop were organised in 2000 with pre-accession countries (PACs) to exchange best practices in foresight between EU Member States and the new candidates. The subjects were: raising awareness and stimulating the policy debate (Cyprus); best practices in national foresight (Warsaw); and foresight on regional issues: the Baltic Sea (Tallin).

The project's work programme includes:

- Developing a major foresight project for the pre-accession countries over the next two years;
- Stimulating mobility of foresight researchers and training researchers from PACs in foresight methodology and work; and
- Extending the quantitative analysis activities of IPTS to pre-accession countries.

### **Mediterranean and regional perspectives**

The goals of this project are to determine the socio-economic, scientific and technological priority issues that are relevant to policies for the region, and to analyse their policy implications. Involvement of most Mediterranean partner countries is sought by building up networks for co-operative actions with EU member States.

Accomplishments in 2000 included:

- A Mediterranean and regional perspective meeting that served as the starting point for a new foresight initiative on the Mediterranean region, with a time horizon of 2010;
- Research initiatives from the techno-economic analysis network in the Mediterranean (TEAM) working groups on the health sector and diabetes mellitus in the Mediterranean, and food technologies in the Mediterranean;
- Co-operation with the Enterprise DG on technology innovation in the Mediterranean; and
- Co-operation with the Research DG on the Euro-Mediterranean information system.

### **Science and governance**

IPTS played an active role in the preparation of the international 'Science and Governance in a Knowledge Society: The Challenge for Europe' conference that was jointly organised by the JRC and the Research DG in Brussels on 16-17 October 2000. Over 450 delegates attended. The presence of policy-makers (in particular Members of the European Parliament), government officials, RTD managers, academics, industrialists, and representatives of the civil society – including high-level participants from Russia, China, Japan and the USA – testified to the timeliness of the debate. Commissioner Busquin joined on the second day and delivered a closing speech.

Above all, the conference focused on concrete attempts to involve stakeholders – decision-makers, scientists, citizens, industry and the media – in a structured dialogue. It also formulated proposals on the way that Europe should organise itself to anticipate and manage crises better, develop common scientific and technical references for policy-making and nourish the democratic process.

## GLOSSARY

ABACC	Brazilian-Argentinean Agency for Accounting and Control of Nuclear Materials
ADELS	Advanced Electricity Storage
AMES	Ageing Materials Evaluation and Studies
ARIS	Action for Research and Information Support in civilian demining network
ASTRON	Applications on the Synergy of earth observation with satellite Telecommunications and Navigation
BADGE	Bisphenol-a-diglycidylether
BAT	Best Available Technique
BCR	Bureau Communautaire de Référence
BEVABS	European Office for wine, alcohols and spirit drinks
BNCT	Boron Neutron Capture Therapy
BRI	Japanese Building Research Institute
BSE	Bovine Spongiform Encephalopathy
CAFE	Clean Air For Europe
CAP	Common Agricultural Policy
CCQM	Comité Consultatif pour la Quantité de Matières
CCRI	Consultative Committee for Ionizing Radiation / Comité consultatif des Rayonnements Ionisants
CDCIR.	Community Documentation Centre on Industrial Risks
CEA	French atomic energy commission
CEEC	Central and Eastern European Countries
CEN	European standards committee
CERCLE	Chief Executives of Research Centres and Laboratories in Europe
CERN	European laboratory for particle physics
CFSP	Common Foreign and Security Policy
CIP	US Department of Agriculture
CIPM	Comité International des Poids et Mesures / International Committee for Weights and Measures
CITAC	Co-operation on International Traceability in Analytical chemistry
CNES	French national centre for space research
CNRS	French national centre for scientific research
COAST	Coastal zone inventory
CoDecS	Coding Decoding Software
COGI	Committee of Geographical Information
COLUTEQ	Consortium of the Teledetection Laboratories of Quebec

CONCAWE	Oil companies' European organisation for environment, health and safety
COST	Coopération européenne dans le domaine de la Recherche Scientifique et Technique
CPDW	Construction Products in contact with Drinking Water
CRIEPI	joint research organisation of the Japanese electricity producers
CSIC	Spanish national research centre
CSIC-CNM	Spanish national centre for microelectronics
CVD	Chemical Vapour Deposition
DERA	UK Defence Evaluation and Research Agency
DG	Directorate General
DLR	German space agency
DoE	US Department of Energy
EA	European Accreditation
EAS	European Acceptance Scheme
EC	European Community
ECB	European Chemicals Bureau
ECCAIRS	European Co-ordination Centre for Aviation Incident Reporting System
ECIS	European Centre for Innovation and Spin-offs
ECURIE	European Community Urgent Radiological Information Exchange
ECVAM	European Centre for Validation of Alternative Methods
EDAEP	Endocrine-Disrupting Ability of Environmental Pollutants
EDC	Endocrine-Disrupting Chemical
EEA	European Environmental Agency
EFFTRA	Transmutation tests for nuclear waste
EFQM	European Foundation for Quality Management
EGII	European Geographic Information Infrastructure
EI	Environment Institute
EIPPC	European Integrated Pollution Prevention and Control Bureau
ELSA	European Laboratory for Structural Assessment
EMIR	European network for Medical Radioisotope Research
EMR	EudraTrack Mutual Recognition
ENDEF	European Non Destructive Evaluation Forum
ENEA	Ente per le nuove tecnologie, l'energia e l'ambiente
ENIQ	European Network for Inspection Qualification
ENRESA	Empresa Nacional de Residuos Radioactivos S.A.
ENSEMBLE	Methods to reconcile disparate national forecasts of medium and long-range atmospheric dispersion

EO	Earth Observations
EP	European Parliament
EPA	US Environmental Protection Agency
EPERC	European Pressure Equipment Research Council
EPG-Fossil	Efficient Power Generation: Advanced Fossil Power Plant
EPLAF	European Plant Life Assessment Forum
EPRI	US Electric Power Research Institute
ERA	European Research Area
ERLAP	European Laboratory for Air Pollution
ERLIVE	European Reference Laboratory on waste Incineration and Vehicle Emission measurements
ESA	European Space Agency
ESARDA	European Safeguard Research and Development Association
ESTI	European Solar Test Installation
ESTO	European Science and Technology Observatory
ETO	Energy Technology Observatory
ETTL	European Technology Transfer Initiative
EU	European Union
EUCAR	European Council for Automotive Research and Development
EUMETSAT	The European organisation for the exploitation of meteorological satellites
EURACHEM	European Analytical Chemistry
Euratom	European atomic energy community
EURDEP	EU Radiological Data Exchange Platform
Eurocontrol	European organisation for the safety of air navigation
EUROMET	European Organisation of Metrology
EXSIF	Expertise for the Setting-up of Innovative firms
FAO	Food & Agriculture Organisation
FDA	US Food and Drug Administration
FDG	Fluorodeoxyglucose
FOREN	Foresight for Regional development
GEIS	Global Environmental Information Systems
GHG	Greenhouse Gases
GI&GIS	Geographical Information and Geographical Information Systems
GIS	Geographical Information systems
GMES	Global Monitoring for Environment and Security
GMO	Genetically Modified Organism

GMP	Good Manufacturing Practices
GPS	Global Positioning System
HARP	Harmonised quantification and Reporting Procedures for nutrients
HEU	Highly Enriched Uranium
HFR	High Flux Reactor
HPLC/MS	High-Pressure Liquid chromatography-Mass Spectrometry
HPLC-ICP-MS	High-Pressure Liquid Chromatography-Inductively Coupled Plasma-Mass Spectrometry
HRMS	High-Resolution gas chromatography/Mass Spectrometry
HTR	High Temperature Reactor
IAEA	International Atomic Energy Authority
IAF	International Astronautical Federation
IAM	Institute for Advanced Materials
IAQA	Integrated Air Quality Assessment
ICCA	International Council of Chemicals Associations
ICRM	International Committee for Radionuclide Metrology
ICT	Information and Communications Technologies
IDEA	Identification Electronique des Animaux
IDF	International Dairy Federation
IFCC	International Federation of Clinical Chemistry
IFI	International Forestry Institute
IGBP	International Geosphere-Biosphere Programme
IHCP	Institute for Health and Consumer Protection
IMEP	International Measurement Evaluation Programme
IPPCB	Integrated Pollution Prevention and Control Bureau
IPTS	Institute for Prospective Technological Studies
IRMM	Institute for Reference Materials and Measurements
ISIS	Institute for Systems, Informatics and Safety
ISO	International Standards Organisation
ISTAG	Information Society Technologies programme Advisory group
ISTC	International Science and Technology Centre
ITEP	International Test and Evaluation Programme
ITRE	European Parliament committee on Industry, external Trade, Research and Energy
ITU	Institute for Transuranium Elements
IUCLID	International Uniform Chemical Information Database
IUPAC	International Union of Pure and Applied Chemistry

IVD	<i>In-vitro</i> Diagnostic
IWES	Impacts of Waste Emissions on Soils
JAERI	Japan Atomic Energy Research Institute
JEFF	Joint European Fusion File
JEPPIM	Joint European Programme for Primary Isotopic Measurements
JIFSAN	Joint Institute for Food Safety and Applied Nutrition
JRC	Joint Research Centre
JTC	Joint Technical Committee
LEU	Low Enriched Uranium
LIFT	Linking Innovation with Finance initiative
MAHB	Major Accident Hazards Bureau
MAREL	Management of Reactor Life
MARINA	EC project on the Radiological Exposure of the population of Community from Radioactivity in Northern European Marine Waters
MARS	Major Accident Reporting System
MARS	Monitoring Agriculture with Remote Sensing
MEDA	Mediterranean Development countries
MEP	Member of the European Parliament
MITI	Japanese Ministry for International Trade and Industry
MoU	Memorandum of Understanding
MOX	Mixed plutonium/uranium Oxide nuclear fuel
MWNT	Multi-Walled carbon nanotube
NAA	Neutron Activation Analysis
NASA	US National Aeronautics and Space Administration
NASDA	National Space Development Agency of Japan
NBS	US National Bureau of Standards
NDE	Non Destructive Evaluation
NEA	Nuclear Energy Agency (OECD)
NEDIES	Natural and Environmental Disaster Information Exchange System
NESC	Network for the Evaluation of Steel Components
NGO	Non-Governmental Organisation
NIS	Newly Independent States
NIST	US National Institute of Standards and Technology
NMCC	Nuclear Material Control Centre
NOAA	National Oceanic and Atmospheric Administration (USA)
AVHRR	Advanced Very High Resolution Radiometer



NRG	Nuclear Research and Consultancy Group
NSF	US National Science Foundation
OECD	Organisation for Economic Co-operation and Development
OLAF	European Commission's Anti-Fraud body
OPOCE	Office for Official Publications of the European Communities (EUR-OP)
OSPAR	Oslo Paris Convention for the Protection of the Marine Environment of the North East Atlantic
PACs	Pre-Accession Countries
PCB	Polychlorinated Biphenyl
PCDD/Fs	Polychlorinated dibenzo-p-dioxins and dibenzofurans
PCR	Polymerase Chain Reaction
PECO	Central and eastern European Countries
PERLA	Performance Laboratory (non-destructive assay)
Phare	Poland, Hungary: Aid for the Reconstruction of the Economy
PIGS	Primary Isotopic Gas Standards
PLAN	Plant Life Assessment Network
PMOD	Physikalisch-Meteorologisches Observatorium Davos
POPs	Persistent Organic Pollutants
PREWIN	Performance, Reliability and Emissions reduction in Waste Incinerators Network
PV	Photovoltaic
REM	Radioactivity Environmental Monitoring
REmdb	Radioactivity Environmental Monitoring data bank
RR	Roundup-Ready
RTD	Research and Technological Development
SAFTS	Safety and reliability of high Temperature Systems
SAG	European Commission Space Advisory Group
SAI	Space Applications Institute
SHS	Solar Home Systems
SIGMO	Sampling for Information on Genetically Modified Organisms
SIS	Scientific Information System
SKB	Swedish Nuclear Fuel and Waste Management Co.
SME	Small and Medium size Enterprise
SNIF	Summary Notification Information Format
SOLAREC	Solar Electricity project
STA	Science and Technological Agency
STOA	European Parliament Scientific and Technological Options Assessment unit

SWNT	Single-walled carbon Nanotube
TACIS	EU support programme for transition in the New Independent States
TACIS	Technical Assistance for the Community of Independent States and Georgia
TAME	Tank Measurement laboratory
TEAM	Techno-economic Analysis network in the Mediterranean
TEMAT	Technologies for Emission Abatement in Transport and non-road sectors
TEMPEST	Thermal, Electromagnetic and Physical Equipment Stress Testing
TEN	Trans-European Network
TLA	Thin Layer Activation
TLC	Thin Layer Chromatography
UNEP	United Nations Environment Programme
UNFCCC	United Nations - Framework Convention on Climate Change
UTS	Unified Tracking System
VRML	Virtual Reality Modelling Language
VVER	Russian Pressurised Water Reactor
WFW	World Fire Web
WHO	World Health Organisation
WHO-IPCS	WHO International Programme on Chemical Safety
WRR	World Radiometric Reference
WTO	World Trade Organisation

## JRC BOARD OF GOVERNORS

### LIST OF MEMBERS AND PARTICIPANTS

<b>CHAIRMAN</b>	
Prof. Fernando ALDANA Oficina de Innovación y Tecnología Empresarial E. Técnica Superior de Ingenieros Industriales C/José Gutiérrez Abascal 2 - E - 28006 Madrid	<b>ESPAÑA</b>
<b>MEMBERS</b>	
Dr. Jacques WAUTREQUIN Secrétaire Général Honoraire Services Fédéraux des Affaires Scientifiques, Techniques et Culturelles Rue du Pinson 162 - B - 1170 Bruxelles	<b>BELGIQUE</b>
Dr. Hans Bjerrum MØLLER Consultant, Ministry of Research Frederiksborgvej 71 - DK - 4000 Roskilde	<b>DANMARK</b>
Ministerialdirektor Dr. Karsten BRENNER Bundesministerium für Bildung und Forschung Heinemannstrasse 2 - D - 53175 Bonn	<b>DEUTSCHLAND</b>
Professor Michalis S. SKOURTOS Director of Postgraduate Studies University of the Aegean, Department of Environmental Studies Karantoni 17 - GR - 81 100 Mytilini Replaced Dr. Dimitrios Niarchos on 13.7.2000	<b>ELLAS</b>
Prof. Félix YNDURÁIN Director General of CIEMAT Avda. Complutense 22 - E - 28040 Madrid	<b>ESPAÑA</b>
Mr. Philippe GARDERET Directeur des Ressources humaines et des Relations sociales Commissariat à l'Énergie Atomique (CEA) 31, rue de la Fédération - F - 75752 Paris CEDEX 15	<b>FRANCE</b>
Dr. Killian HALPIN Director Office of Science & Technology - Policy Division Forfás, Wilton Park House Wilton Place - IRL - Dublin 2	<b>IRELAND</b>
Ing. Paolo VENDITTI Ambassade d'Italie Bureau du Conseiller Scientifique 51, rue de Varenne - F – 75007 Paris – France Replaced Ing. Carlo Mancini on 13.11 2000	<b>ITALIA</b>

Mr. Pierre DECKER Conseiller de Gouvernement 1ère classe Ministère de la Culture, de l' Enseignement Supérieur et de la Recherche 20 Montée de la Pétrusse - L – 2273 Luxembourg Replaced Mr. Paul Lenert on 13.7.2000	<b>LUXEMBOURG</b>
Mr. Jan W. WEEHUIZEN Director of Energy Production - Ministry of Economic Affairs Bezuidenhoutseweg 30, P.O. Box 20101 - NL - 2500 EC Den Haag	<b>NEDERLAND</b>
Ministerialrat Dr. Kurt PERSY Bundesministerium für Wissenschaft und Verkehr, Gruppe III/A Minoritenplatz 5 - A - 1014 Wien	<b>ÖSTERREICH</b>
Prof. José CARVALHO SOARES President Ministério da Ciência e da Tecnologia, Instituto Tecnológico e Nuclear Estrada Nacional N° 10, Apartado 21 - P – 2686-953 Sacavém	<b>PORTUGAL</b>
Prof. Jarl FORSTÉN VTT Technical Research Centre of Finland Vuorimiehentie 5, Espoo P.O. Box 1000 - FIN - 02044 VTT	<b>SUOMI-FINLAND</b>
Prof. Janne CARLSSON External Relations Royal Institute of Technology, KTH Valhallavägen 79 - S - 100 44 Stockholm	<b>SVERIGE</b>
Prof. Sir John CADOGAN Imperial College of Science, Technology and Medicine Department of Chemistry, Room 103B UK - London SW7 2AY	<b>UNITED KINGDOM</b>
<b>PARTICIPANTS</b>	
Mrs. Albena VUTSOVA Director Ministry of Education and Science Blvd. Dondukov 2A - BG - Sofia 1000	<b>BULGARIA</b>
Dr. Karel AIM ICPF Scientific Board Chair Academy of Sciences of the Czech Republic Institute of Chemical Process Fundamentals Rozvojová 135 – CZ - 165 02 Praha 6	<b>ČESKÁ REPUBLIKA</b>
<i>To be nominated</i>	<b>CYPRUS</b>
Dr. Toivo RÄIM Ministry of Education of Estonia Department of Research and High Education Tõnismägi 9/11 – EE - Tallinn 15192	<b>ESTONIA</b>

Dr. Axel BJÖRNSSON Professor in Environmental Sciences, University of Akureyri Thingvallastræti 23 - IS - 600 Akureyri	<b>ISLAND</b>
Prof. Arnon BENTUR Samuel Neaman Institute for Advanced Studies in Science and Technology Technion City - IL - 32000 Haifa	<b>ISRAËL</b>
Prof. Andrejs SILIŅŠ Secretary General Latvian Academy of Sciences 1 Akademijas laukums - LV - 1050 Riga	<b>LATVIA</b>
Ms. Karin ZECH Amt für Volkswirtschaft Gerberweg 5 - FL - 9490 Vaduz	<b>FÜRSTENTUM LIECHTENSTEIN</b>
Dr. Habil. Antanas ČENYS Chairman of Senate (Board), Semiconductor Physics Institute Goštauto 11 - LT - 2600 Vilnius	<b>LITHUANIA</b>
Prof. László KEVICZKY Member of the Academy Vice-President, Hungarian Academy of Sciences Roosevelt tér 9 - H - 1051 Budapest	<b>MAGYARORSZAG</b>
Mr. Andreas MORTENSEN Ministry of Trade and Industry Einar Gerhardsens plass 1, P.O. Box 8014 Dep. - N - 0030 Oslo	<b>NORGE</b>
Prof. Michal KLEIBER Director Institute of Fundamental Technological Research of the Polish Academy of Sciences ul. Świętokrzyska 21 - PL - 00-049 Warszawa	<b>POLSKA</b>
Mr. Petru FILIP National Agency for Science, Technology and Innovation Office for European Integration in R&D Programmes 21-25 Mendeleev Str. - RO - 70168 #1 Bucharest	<b>ROMANIA</b>
Dr. Vladimír ŠUCHA Associated Professor at Faculty of Sciences Department of Geology of Mineral Deposits, Comenius University Mlynska dolina – SK – 842 15 Bratislava	<b>SLOVAKIA</b>
Dr. Miloš KOMAC State Secretary – Ministry of Science and Technology Trg OF 13 - SL – 1000 Ljubljana	<b>SLOVENIJA</b>

**Secretary of the JRC Board of Governors:**

Ms. Piedad GARCÍA de la RASILLA  
European Commission  
rue de la Loi, 200 - SDME 10/66 - B-1049 Brussels  
Tel.: +32-2-295.86.35  
Fax: +32-2-299.23.01  
e-mail: piedad.garcia-de-la-rasilla@cec.eu.int  
Secretary: Ms. C. Tajchman

## ORGANISATIONAL CHART

### Directorate-General

Brussels

#### *Director-General*

*Barry MCSWEENEY*

#### *Deputy Director-General*

*Hugh RICHARDSON*

01. Secretariat of the Board of Governors

Piedad GARCIA DE LA RASILLA

02. Internal audit

Freddy DEZEURE

03. Advisor, representative of the Director General for Ispra (Ispra)

Roberto CUNIBERTI

04. Advisor, in charge of relations with local Authorities (Ispra)

Alberto AGAZZI

05. Advisor, in charge of internal communication (Ispra)

Holde LHOEST

06. Advisor, in charge of security matters (Ispra)

Domenico SEVI

07. Information and public relations (reporting to the Deputy Director-General)

Gülperi VURAL

Assistant to the Director-General

Marc BECQUET acting

(1)

### A. Programmes Directorate

Brussels

#### *Director*

*Lena TORELL*

1. Programmes Co-ordination

Marc BECQUET

2. Policy support strategy

Giancarlo CARATTI di LANZACCO

3. Co-operation strategy and technology transfer

Robin MIEGE

4. Inter-institutional and international relations

Pierre FRIGOLA

#### *Group of Advisors in charge of Programmes management*

Adviser (Health and food safety)

.....

Adviser (Dependability of information systems and services)

Ettore CARUSO

Adviser (Nuclear activities)

Serge CRUTZEN

Adviser (Environment)

Jean-Paul MALINGREAU

(2)

-----

(1) Riccardo PETRELLA: Adviser ad personam

(2) Alejandro HERRERO MOLINA: Seconded to Yale University

**B. Directorate for Resources**

**Ispra**

***Director***

***Bruno DE BERNARDI acting***

Adviser, in charge of TQM for the Directorate for resources

Kenneth WEAVING

1. Human resources
2. Contracts
3. Budget and resources programming (Brussels)
4. Analytical accounting and finances
5. Technical services
6. Safety, security, physical and radiological protection
7. Knowledge Management and training

Bruno DE BERNARDI  
.....  
Eric FISCHER  
Adriano ENDRIZZI  
Dolf VAN HATTEM  
Celso OSIMANI  
Richard ROSS

**C. Ispra service attached to the Director of ISIS**

**Ispra**

1. Nuclear decommissioning and waste management

Pietro BASTIANINI

**D. Institute for Reference Materials and Measurements**

**Geel**

***Institute Director***

***Manfred GRASSERBAUER***

1. Management support
2. Reference materials
3. Analytical chemistry
4. Isotope measurements
5. Neutron physics
6. Informatics and electronics
7. Commercialisation of materials and reference methods and scientific liaison

Michael FAHY  
Jean PAUWELS  
Adela RODRIGUEZ FERNANDEZ  
Philip TAYLOR  
Peter RULLHUSEN  
.....  
Doris FLORIAN

**E. Institute for Transuranium Elements**

**Karlsruhe**

***Institute Director***

***Roland SCHENKEL***

1. Management support
2. Hot cell technology
3. Materials research
4. Nuclear fuels
5. Nuclear chemistry
6. Actinides research
7. Nuclear safety and infrastructure

Jean-Pierre MICHEL  
Jean-Paul GLATZ  
Hans Joachim MATZKE  
Didier HAAS  
.....  
Gerard LANDER  
Werner WAGNER

## **F. Institute for Advanced Materials**

**Petten**

### ***Institute Director***

1. Management support
2. Energy production and conversion
3. Safety of industrial components
4. Clean technologies
5. High flux reactor
6. Scientific and technical support
7. Nuclear safety

### ***Kari TÖRRÖNEN***

.....  
Johan BRESSERS  
Roger HURST  
Juha-Pekka HIRVONEN  
Joël GUIDEZ  
.....  
Horst WEISSHAEUPL

## **G. Institute for Systems, Informatics and Safety**

**Ispra**

### ***Institute Director***

Head of unit acting as Institute Deputy Director

1. Management support
2. Reliable information technologies
3. Risk management and decision support
4. Safeguards and verification techniques
5. Safety in structural mechanics
6. Methodologies for Information Analysis
7. Detection and positioning technologies

<sup>(3)</sup>

### ***David WILKINSON***

Marc CUYPERS  
.....  
Fernand SOREL  
Alfredo LUCIA  
Marc CUYPERS  
Michel GERADIN  
Martyn DOWELL  
Alois SIEBER

## **H. Environment Institute**

**Ispra**

### ***Institute Director***

1. Management support
2. Environmental impact
3. Air quality
4. Atmospheric processes in global change
5. Soil and waste
6. Water research and monitoring
7. Renewable energies

### ***Jean-Marie MARTIN***

Emanuela ROSSI  
Peter PÄRT  
Dimitrios KOTZIAS  
Frank RAES  
Giovanni BIDOGLIO  
.....  
Heinz OSSENBRINK

-----

<sup>(3)</sup> Jean-Pierre AUBINEAU: Adviser ad personam



## **I. Institute for Space Applications**

**Ispra**

### ***Institute Director***

Head of unit acting as Institute Deputy Director

1. Management support
2. Environment geo-information
3. Agriculture and regional information systems
4. Global surveillance of vegetation
5. Marine environment
6. Strategy and systems for space applications

### ***Rudolf WINTER***

Jean MEYER-ROUX

Albert JERABEK

Jean MEYER-ROUX

.....

Alan BELWARD

Peter SCHLITTENHARDT

Peter CHURCHILL

## **J. Institute for Health and Consumer Protection**

**Ispra**

### ***Institute Director***

1. Management support
2. Food products and consumer goods
3. Validation of biomedical testing methods
4. Toxicology and chemical substances
5. Support to pharmaceutical regulation
6. Biomedical materials and systems

### ***Barry MCSWEENEY acting***

Giacinto TARTAGLIA

Elke ANKLAM

Michael BALLS

Gerald VOLLMER

Flavio ARGENTESI

Hermann STAMM

## **K. Institute for Prospective Technological Studies**

**Sevilla**

### ***Institute Director***

1. Management support
2. Technologies for sustainable development
3. Technology, competitiveness, employment and society
4. Technologies for life science, information and communication

### ***Jean-Marie CADIOU***

Claude TAHIR

Per SØRUP

.....

Bernard CLEMENTS