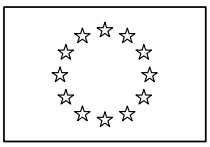

COMMISSION OF THE EUROPEAN COMMUNITIES

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REPORT FROM THE COMMISSION

JRC Annual Report - 2003

CONTENTS

THE JOINT RESEARCH – MISSION AND STRUCTURE

MISSION OF THE JRC

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

1. FOREWORD FROM THE COMMISSIONER FOR RESEARCH

The Joint Research Centre (JRC) has made many important contributions to supporting EU policies in 2003, the first year of the Sixth Framework Programme. Increasingly, Community legislation is science-based and therefore requires sound scientific underpinning. Among the examples described in this report is the support provided to the new chemicals policy, particularly with reference to the registration, evaluation and authorisation and restriction of chemicals.

The nomination of the JRC as the Community Reference Laboratory for support to GM0 food and feed legislation is a concrete example of how the JRC is contributing to the development of scientific and reference systems to support policy-makers. This is one of the building blocks of the European Research Area (ERA) and a key component in the JRC's ERA Action Plan. Such support is not provided solely by the JRC but rather through the European Network of GMO laboratories, managed by the JRC.

Other key elements in the JRC ERA Action Plan include networking, enlargement, training and mobility, and increasing access to specialised facilities. The signing of a collaboration agreement between the Research DG and JRC's Institute of Prospective Technological Studies (IPTS) and the creation of a dedicated ERA unit, is a welcome development and highlights the importance I attach to the European Research Area.

Making a success of enlargement is the major challenge for 2004 and the coming years. One of the issues facing the New Member States is the need to comply with the body of EU legislation, the 'acquis communitaire'. Through a comprehensive programme of hosting scientists, organising technical workshops and training courses, and actively involving national laboratories from the New Member States in its workprogramme, the JRC has continued to contribute significantly to accelerating compliance with the scientific and technical aspects of the acquis.

I am confident that in 2004 the JRC will continue to play a unique and valued role as the Commission's in-house research based policy support organisation.

Philippe Busquin

Research Commissioner

2. DRAFT OBSERVATIONS FROM THE BOARD OF GOVERNORS

In 2003, the new workprogramme of the JRC emphasised delivery of scientific and technical support to major Community policy areas such as chemicals, food safety, health, environment, nuclear security and enlargement. The relevance of JRC's work to policies was demonstrated to the Board by interaction with the JRC's High Level User Group during the year.

The Board noted JRC's compliance with the requirements of the Commission's administrative reform: the Strategic Planning and Programming (SPP) cycle and the Activity Based Management (ABM) system. These systems were set up to improve transparency, accountability and efficiency through better planning, implementation and monitoring of objectives and measurement indicators at every level of the organisation.

A restructuring of Directorates was endorsed by the Board in Autumn 2003. This reorganisation has the advantage of bringing the management of resources and workprogramme into one Directorate. A separate Directorate was created to cover institutional and scientific relations. All aspects associated with management and logistics of the Ispra site were consolidated into one dedicated Directorate to improve the efficiency and effectiveness of such operations.

Main Issues in 2003

The Board has followed the JRC Specific Programmes as carried out by the JRC under the obligations of EU Research Framework Programme. One of these requirements is an external expert evaluation, the Five Year Assessment of the JRC covering the period 1999-2003. The Board was actively involved in defining and approving the terms of reference and in the selection of the panel of experts. A presentation by the panel chairman was also made to the Board during the closing stages of the panel visits which provided the Board with first-hand information on the initial conclusions of the assessment.

The progress made by JRC in contributing to the aims of the European Research Area and the targets set in the accompanying implementation plan are being closely followed by the Board.

Board Members and Participants expressed a positive opinion on actions conducted by the JRC towards Enlargement. Technical support to complying with EU legislation, partnership in research projects of the Framework Programme, training and opening up of JRC-led networks of competence were strongly acknowledged as were JRC information days, dedicated workshops, the network of JRC contact points and specific targeted projects.

The Board noted the contributions made by the JRC during various crises, including forecasting of forest fires and the estimation of effects of drought on crop forecasts. The Board also acknowledged the development of a JRC crisis response mechanism to ensure a co-ordinated and professional in-house response on request.

The Board appreciates the evaluation and granting of excellence awards for JRC young scientists and welcomed this year's inclusion of a technical assistance prize.

The JRC strategy for the continued management and exploitation of the Communities' intellectual property portfolio was endorsed by the Board which continues to follow progress and results in this area. The need to communicate science and its results effectively was emphasised by the Board and a revised JRC strategy on public relations was produced in response to this request.

The Board closely followed JRC nuclear decommissioning activities and endorsed the transfer of the licence of the High Flux Reactor licence operation to the Dutch Nuclear Research and Consultancy Group.

3. MESSAGE FROM THE DIRECTOR-GENERAL

In 2003 the JRC made good progress in consolidating its reputation as a research-based policy support organisation, capable of providing support to a range of Commission policies while maintaining a strong science base. The new Multi-Annual Workprogramme of the JRC for the Sixth Framework Programme, adopted in March 2003 reflects this user emphasis while also allowing the development of new scientific competence in order to meet emerging needs.

Examples of JRC support are cited throughout this report but I should like to single out in particular the input JRC provided to the new chemicals policy, jointly led by the Commission's Environment and Enterprise DGs. The designation of JRC as the Community Reference Laboratory for GMOs was a recognition of our efforts over a number of years in establishing and leading the European Network of GMO Laboratories (ENGL). The JRC has played the role of catalyst in developing a new large-scale collaborative project on envirogenomics examining links between environmental effects and individual susceptibility in childhood asthma.

The above examples indicate the longer-term nature of JRC support. However, the JRC also demonstrated its ability to respond rapidly and professionally to a number of crises. These included support provided to France and Portugal during the forest fires of summer 2003.

Much of the work performed by the JRC ultimately supports the Member States, the Council and European Parliament, and is carried out in close collaboration with some 2000 scientific partners throughout Europe and beyond. In acknowledgement of this, a new Directorate was created in late 2003 to focus on JRC's external stakeholders.

Measuring the relevance of JRC's work to users is important and for this reason the JRC conducted its first corporate user satisfaction survey in 2003. This survey targeted both internal (Commission) and external (ministries, national authorities, etc) users and overall a high degree of satisfaction with the JRC was expressed. A formal assessment of JRC's scientific and technical output, the 5 Year Assessment (1999-2003), was also performed by an external expert panel and the results will be available in 2004.

In carrying out its workprogramme the JRC continued to contribute to the European Research Area, the major research policy initiative in recent years. The need for additional support to this policy was underlined by the signing of a collaboration agreement between the Research DG and JRC's Institute of Prospective Technological Studies.

The JRC is an ideal place to carry out research where scientists can see the relevance and uptake of their work in EU legislation. The importance of research training is stressed at JRC and a significant number of our scientists are at early stages of their careers. To highlight this, a section of this report has been dedicated to young scientists' awards and a recognition scheme has also been introduced for technical achievement.

I acknowledge the efforts of all JRC staff, which together with the support of the JRC Board of Governors and Commissioner Busquin, have contributed much to our achievements in 2003, and look forward to the challenges of 2004.

Barry Mc Sweeney

4. SUPPORT TO COMMUNITY POLICIES

Examples of support to EU legislation

As support for Regulations (EC) No 1829/2003 and (EC) No 1830/2003, the JRC was appointed Community Reference Laboratory (CRL) for GM food and feed legislation with the mandate to evaluate the fitness of methods for the purpose of regulatory compliance.

Commission Recommendation C2003/556/EC on guidelines for the coexistence of GM and non-GM crops was largely based on JRC work.

As support for Council Decision 2000/766/EC and Regulation 1774/2002 EC imposing a total ban on meat and bone meal as feed ingredients, the JRC co-ordinated an inter-comparison study with about 50 laboratories.

To amend Regulation (EEC) No 3508/92 and support the new Regulation for the identification and registration of ovine and caprine animals (sheep and goats), the JRC co-ordinated a large-scale field test.

In formulating Commission Proposal COM(2003)644 final (for the Registration, Evaluation and Authorisation and Restriction of Chemicals - REACH), the JRC played a key role – more details on pages 6 and 30.

As support for Commission Directive 93/67/EEC on risk assessment for new notified substances, Commission Regulation (EC) No 1488/94 on risk assessment for existing substances and Directive 98/8/EC of the European Parliament and of the Council concerning the placing of biocidal products on the market, the JRC finalised and published the "Technical Guidance Document of risk assessment"

Revisions of the Seveso II Directive 96/82/EC for the prevention of major-accident hazards involving dangerous substances were substantially guided by the results of focused expert workshops organised by the JRC.

The JRC supported Directive 2003/42/EC related to the European Co-ordination Centre for Aviation Incident Reporting Systems on occurrence reporting in civil aviation. This was formally adopted by the European Parliament and Council on 13 June 2003.

As support to Commission Decision 1999/847/EC (Community Action Programme on Civil Protection), the JRC's European Flood Alert System provided successful flood warnings for the Ebro (Spain), Iskar (Bulgaria), Upper Oder and Vistula basins (Poland and Czech Republic), Siret River (Rumania) and Sicily.

As support to Commission Proposal COM(2002)404 for a new Regulation on "monitoring of forests and environmental interactions in the community", the JRC has been appointed to the Scientific Co-ordination Body.

Commission Communication COM(2003)354 final entitled "On the Road to Sustainable Production Progress in implementing Council Directive 96/61/EC concerning integrated Pollution Prevention and Control", refers to the JRC work as "a key driver for improved environmental performance".

To prepare for the Commission Communication COM(2003)250, the JRC provided data to the Environment DG in the area of energy recovery from waste, published with a view for possible revision of the Waste Framework Directive 75/442/EEC.

As support for the Water Framework Directive COM(1997)49, the JRC co-led the Common Implementation Strategy Working Group on 'Ecological Status and Inter-calibration'

In signing the US-led international charter C(2003)1911/1 on "Carbon Sequestration Leadership Forum (CSLF)", the JRC supported the formulation of the Commission's position.

The JRC supported Commission Communications COM(2002)179 and COM(2002)539 on the "Thematic Strategies on Soil Protection and on the Marine Environment" by participating in the respective working groups.

The JRC supported the Commission Communication COM(2003)17 on the emerging European Space Policy, building on its contributions to the Global Monitoring for Environment and Security (GMES) Initiative

As support for Commission Communication COM(2001)245 entitled the "Clean Air for Europe initiative", the JRC organised and implemented a model intercomparison study and provided forecasts of ozone and particulate matter concentrations for 2010 in various European cities.

For Directive Proposal COM (2003)453 on establishing a framework for the setting of Eco-Design requirements for Energy-Using Products, the JRC provided input data for the assessment of the potential energy and carbon savings resulting from the efficiency requirements in different types of end-use devices.

For Directive Proposal COM(2003)739 on Energy End-Use Efficiency and Energy Services, the JRC explored the present market and policy situation for Energy Service Companies and provided input to other measures proposed in the directive such as, energy efficiency certificates, demand response, advanced meters and informative billing.

As support to Commission Communication COM(2002)263 on the eEurope 2005 Action Plan, the JRC presented the draft pilot exercise on the "composite indicator of e-business readiness" at a meeting between Eurostat, and the Enterprise and Information Society DGs.

Commission Communication COM(2003)265 final was the first report on the implementation of the data protection Directive 95/46/EC and refers to the JRC report entitled "future bottlenecks in the information society".

Commission Communication COM(2003)301 entitled "Towards a thematic strategy on the prevention and recycling of waste", specifically referred to the JRC "Pay as you Throw" project.

As support for the implementation of Directive 96/61/EC on "Integrated Pollution Prevention and Control", the JRC provided data for waste incineration and reviewed the draft document. The definition of the best available techniques (BAT), through the drafting of the "BAT Reference Documents (BREFs)", is handled by the JRC.

4.1. Safety of Chemical Products

In October 2003, the European Commission proposed new legislation for the Registration, Evaluation and Authorisation of CHemicals (REACH) to enhance health and environmental protection while promoting innovation and competitiveness of the European chemicals industry. The JRC has co-ordinated the EU notification scheme and risk assessment for new chemical substances and, with its know-how in data collection, priority setting and risk assessment, will help develop the guidance documents, software tools and infrastructure for REACH.

The JRC European Chemicals Bureau (ECB) is the focal point for collecting information on new and existing chemicals. In 2003, 350 new substances were classified, 30 risk assessment reports on existing substances were produced and 5 testing methods were developed. The ECB also established the European Chemical Substances Information System, which now openly offers a single search tool on chemicals and associated legislation.

According to REACH, about 20,000 substances will be tested. If relying solely on traditional risk assessment methods to obtain chemicals data, this would involve testing of several million laboratory animals. At the JRC's European Centre for the Validation of Alternative Methods (ECVAM), methods are being validated that aim to reduce the need for animal testing and yet enhance the throughput of testing and costs. Likewise the implementation of the 7th Amendment to the Cosmetics Directive calls for the validation of methods replacing animal testing for cosmetic ingredients. Responding to these needs, ECVAM has focused on key areas targeting those animal tests that need to be replaced. A report produced by the JRC in 2003 estimates that the direct testing costs resulting from the implementation of REACH can be reduced by more than 900 million € if Quantitative Structure-Activity Relationships ((Q)SARS) are used. These are theoretical models able to predict the physicochemical and biological (e.g. toxicological) properties of molecules from knowledge of their chemical structure. In light of this, ECVAM has started to validate, together with the OECD, the most promising of some 3000 computer models and programmes.

Human exposure data, essential for the implementation of REACH, are scarcely available at present. In order to assess the total human exposure to substances emitted from products and articles, the JRC has completed a range of experiments using its unique “Indoortron” facility. Experiments were carried out to identify additives and pesticides in tobacco products and further studies indicated that changes in the ventilation rate during tobacco smoking do not significantly influence the air concentration levels of smoke constituents such as CO, NOx and aromatic compounds.

4.2. Food Safety

The JRC provides scientific and technical support for the establishment and implementation of EU food and feed legislation. It does this by developing, harmonising and validating analytical methods to monitor various chemical, physical and biological parameters. It includes the production and certification of Certified Reference Materials and proficiency testing materials to support EU food and feed legislation eg. maximum levels for contaminants, withdrawals of authorisations concerning various additives, food labelling (nutritional properties) and antifraud measures (food authenticity). Some selected highlights from 2003 include:

Acrylamide

The presence of acrylamide, formed by heating of carbohydrate-rich food (e.g. french fries) and classified as a probable human carcinogen, has led to a worldwide surveillance of this compound in various food products. To support the standardisation of acrylamide measurements, the JRC validates methods, produces certified reference materials and maintains an "acrylamide monitoring" database. An first interlaboratory test on the determination of acrylamide in crisp bread and in butter cookies was organised in 2003 to check laboratories' performance and identify potential problems associated with the methods applied.

The Community Reference Laboratory for Feed Additives

The new regulation ((EC) 1831/2003) on additives for use in animal nutrition requires all such additives to be authorised according to a new procedure. Whilst this process is handled by the European Food Safety Authority, from November 2004 the JRC, in its capacity as Community Reference Laboratory, will assume responsibility for storage of the reference samples and the analytical methods proposed by the applicants.

Transmissible spongiform encephalopathies (TSE)

As support to the Health and Consumer Protection DG for the implementation of EU legislation on TSE, the evaluation of newly developed post-mortem TSE tests, the quality assurance of rapid TSE tests and performance testing have all been actively continued in 2003. As the ban on Meat and Bone Meal (MBM) in food/feed is important to TSE, the JRC conducted a proficiency test which revealed that the ban can be enforced only by using microscopy – all other methods showed very poor results. This JRC study also showed, in order to fine-tune the MBM ban, that there is a strong need for methods that allow for animal specific detection.

Mercury in Tuna Fish

A species-specific methyl-mercury (CH_3-Hg) spike isotopic reference material was produced (IRMM-670; isotopic enrichment of about 98 % in ^{202}Hg). A measurement procedure was developed, extensive stability tests were performed and the new spike was used to certify the content of methyl-mercury in a tuna fish sample.

4.3. Rapid Reaction to Emergencies

4.3.1. Forest Fires

The summer of 2003 was one of the hottest summers in Europe. Temperatures exceeding 40 degrees contributed to some of the worst forest fires ever seen. In Portugal, the government declared a state of natural emergency as some 20 people lost their lives and vast areas of forest were destroyed by fire.

Figures derived from satellite observations by the JRC indicate that some 355,976 ha of land had been burnt in Portugal by 20 August 2003. By 15 September 2003, this figure had increased to 379,038 ha. These figures show that almost 6% of the forest area in Portugal was damaged which is equivalent to the total annual burnt area of all 5 EU Mediterranean countries in recent years.

Until recently, fire risk calculations were performed at local level but now, thanks to the European Forest Information Centre (EFFIS) established by the Environment DG and the JRC, a coherent forest fire information system exists for Europe. All fire risk forecast maps computed by EFFIS are distributed every morning via internet to the civil protection and forest fire services in the Member States, as well as to the civil protection services of the Environment DG.

The JRC will continue supporting the Environment DG, Member State experts and national authorities, to develop and apply appropriate terrestrial and satellite data-collection and visualisation tools as well as modelling systems for prevention, damage assessment and post-crisis analysis.

4.3.2. Forecasting the effects of drought on EU crops

To parallel the record temperatures, 2003 also saw the worst drought in Europe for more than a quarter of a century. The JRC used its advanced crop yield forecasting system to predict the effects of the unrelenting drought on this year's harvest in the EU – a useful prerequisite for agricultural planning and decision making. JRC crop-yield forecasting combines agro-meteorological models and satellite indicators supporting the needs of the Agriculture DG for detailed information on Europe's planted areas, crop yields and production volumes.

The JRC provides quantitative forecasts, producing objective, timely and accurate crop-yield assessments. Yields are calculated bi-monthly and the main cereals (wheat, barley, maize), oil seeds (rapeseed, sunflower), sugar beet and potato are published for the entire European continent, North Africa and Turkey.

The expected drop in EU main crop yields ranged from about 6% for potatoes to 25% for sunflowers. The loss in wheat production was approximately 10 million tonnes compared with the previous agricultural campaign (the UK's wheat yield was predicted to be down by 10%) with a drop of about 4 million tonnes for grain maize.

4.4. Safety of Hydrogen as a Transport Fuel

Reduction of greenhouse gas emissions and improvement in security of energy supply has motivated considerable interest in alternative fuels for road transport in the EU. The most recent Commission initiative to promote hydrogen as a future energy carrier is the "European Hydrogen Technology Platform", which aims at accelerating the development and deployment of hydrogen and fuel cell technologies in Europe. Although hydrogen is one of the most promising alternative fuels, significant research and development is still needed before it can be exploited in the same way as petrol, diesel or hydrocarbon gases. Hydrogen performance, end-use efficiency and safety must all be assured before mass use becomes possible. The JRC is engaged in this Platform initiative and part of its hydrogen-related activities focuses on safety, risks evaluation and performance assessment of hydrogen storage and transportation systems.

In 2003, the JRC issued a comprehensive report on safe technologies for hydrogen storage and organised a dedicated workshop for Acceding Countries on the "Safety, efficiency and performance of innovative hydrogen storage technologies for road transport". Specific test facilities for hydrogen storage are currently being installed, including a full-scale vehicle tank testing to assess hydrogen high-pressure cycling and permeation (for gas storage studies) and a set of complementary test facilities to assess the storage efficiency of hydrides and carbon structures (for solid-state storage studies). In this field, the JRC collaborates in the "Safety of Hydrogen as an Energy Carrier" and "Hydrogen Systems for Automotive Applications" networks and is partner with the International Energy Agency (IEA).

JRC efforts focus on harmonising test methods and providing technical and scientific support for the development of safety standards, and best practices guidelines for industry-wide standardisation. The experimental efforts are complemented by simulation techniques to study the consequences of hydrogen explosions following a severe accident and to define effective countermeasures. The Commission Communication on alternative fuels of November 2001 suggests a hydrogen development scenario of 2% road transport fuel market share in 2015 and 5% in 2020. This JRC work contributes to enabling the implementation of these policy goals.

4.5. Safety of Eastern Nuclear Reactors

In the Commonwealth of Independent States (CIS) and the Central and Eastern European Countries (CEEC), 61 nuclear power reactors of Soviet design are presently operating with a capacity of 47 electric giga watts. However, by 2007, 75% of current Soviet designed nuclear power plants will be over 20 years old. Thus, support towards continuous monitoring, surveillance and research is vital to ensure that safety standards are maintained.

With over 40 years experience in the field, the JRC is engaged in plant management studies of ageing nuclear installations and in improving safety assessment methods for critical damage mechanisms. Topics covered apply to both Eastern and Western reactor designs. Via JRC networks, operated within a JRC project called SAFELIFE, subjects addressed range from the assessment of reactor pressure vessels, studying residual stress fields on welds, risk-informed inspection procedures, thermal fatigue, to advanced irradiation studies and optimisation of maintenance procedures.

In 2003, extended analysis of all available pressurised water reactor vessel surveillance data was continued and research into the provision of new materials (e.g. model steels) have been carried out. A reference base metal was characterised with the International Atomic Energy Agency, corrosion studies of reactor core irradiated internals commenced, and the Safety of Eastern European Nuclear Facilities network steering committee arranged the signature of a collaboration agreement by 9 organisations, 7 of which are from CEEC and CIS. The JRC has also launched a new TACIS (Technical Assistance to the Commonwealth of Independent States) project that aims to provide the Russian and Ukrainian nuclear power operators with conclusions on demonstrated safety margins and remaining expected lifetimes. The JRC analyses the thermal and mechanical behaviour of Soviet designed Pressurised Water Reactor fuel rods. Through the JRC Enlargement action, training workshops were organised on neutron embrittlement and nuclear safety.

The JRC provides technical and scientific expertise in all areas of the PHARE and TACIS nuclear safety programmes devoted to the improvement of nuclear facility safety in CEEC and CIS. This work contributes to one of the key challenges for the enlarged Europe – the establishment of an affordable, sufficient and safe energy supply for European citizens.

4.6. Exploratory Research

Exploratory research at the JRC helps to anticipate S&T needs, or to chart new paths for undertaking projects designed to support complex future policy issues. Some 6% of the JRC's budget is devoted to exploratory research and the example given here is dedicated to nanobiotechnology.

Nanobiotechnology

Nanobiotechnology is an emerging area of scientific and technological opportunity that integrates nano/microfabrication and biosystems. Major applications in the field of health are related to biosensors, protein chips, cell on a chip, and in vivo monitoring. For example, medical devices such as heart pacemakers, artificial joints, scaffolds for tissue engineering and stents used to dilate clogged blood vessels can provoke a variety of biological effects such as irritation, inflammation, blood clotting and encapsulation. The JRC is working to alleviate these problems by developing functional surfaces at micro and nano scale that interact with biological systems to trigger responses such as increasing user comfort, healing and safety.

The JRC is currently developing interfaces between biological and non-biological systems with specific activity allowing controlled biological responses. Such precisely engineered surfaces must be designed and constructed at the nano or molecular level.

It is hoped that this research will lead to the development of a new generation of biosensors and biochips and these will be used, for instance, in health and environmental monitoring, food analysis and/or toxicology studies. The production of polymer surfaces with a controlled level of chemical functional groups (e.g. amine, carboxyl, thiol, etc) with micro and nano patterns is developed to study the effect of morphological and chemical patterning on protein adsorption and activity. At the same time, protein adsorption studies on, for example, antibodies, enzymes or peptides are made in conjunction with optical and electrical end point detection, in order to apply these developments to biosensors.

Networking forms an integral part of JRC’s research and although nanobiotechnology in its infancy, the JRC is involved with over 80 partners from both EU and Acceding Countries thereby keeping pace with current developments, evolving technologies and future perspectives in this area.

5. JRC EXCELLENCE AWARDS

The JRC Excellence Awards were initiated in 2002 to recognise the achievements and contributions of JRC staff, and in particular those of young scientists. In addition to the three young scientists described on the following pages, awards were also given for the best scientific publication and for technical assistance.

5.1. JRC Young Scientist of the Year - Dr. Dolores Ibarreta

Genetic testing is used to identify DNA sequence alterations that correlate with disease or possible disease development. As such, it can predict the future onset of (severe) disorders not only for the patient but also for the patient's relatives. The information obtained from genetic tests, namely DNA sequence, remains constant and thus genetic testing results can have far-reaching consequences on an individual's life. These facts alone render the quality assurance of genetic testing services an issue of utmost importance.

As part of its prospective role, the JRC already identified genetic testing as a service requiring quality assurance back in 1999. Dolores and her colleagues then started working on the issue and collaborated with the Research DG in carrying out a prospective study on genetic testing services in Europe. This JRC study, which aimed to provide support for a Europe-wide consistency in quality, safety and efficacy standards of genetic testing for common and rare diseases, was completed in 2003.

The study showed, notwithstanding Europe's renowned expertise in this area, the poor state of quality assessment practices in the EU. It identifies shortcomings and proposes measures to ensure the highest quality of such services, thereby providing a good foundation to begin. In fact, the JRC co-ordinated an "expression of interest" in June 2002, bringing together the main stakeholders in the field. This was not only positively evaluated but was also transposed into a priority line for a genetic testing reference system for the second call in the Sixth Framework Programme. The proposal, now co-ordinated by one of the main centres promoting quality of genetic testing in Europe, was presented in November 2003 with attendance from top scientific experts in the EU.

Furthermore in an EC/OECD joint colloquium with several international bodies (WHO, Council of Europe, etc) when aiming to create an international exchange platform to pave the way towards a common framework to guarantee the quality of the increasingly used genetic diagnostic services, Dolores' study served as the main background discussion material. It is available via the publication reference "Towards quality assurance and harmonisation of genetic testing services in EU Ibarreta D, Bock A.K., Rodriguez-Cerezo, E. ESTO Report, Joint Research Centre, European Commission, EUR 20977 EN, 2003".

Dolores studied biology at the University of Maryland, doing undergraduate research at the National Cancer Institute (NCI-NIH), US. She obtained a Ph.D. in Genetics from the Universidad Complutense de Madrid, Spain and the experimental research work was carried out at the Centro de Investigaciones Biologicas (CIB-CSIC), also in Madrid. As a postdoctoral fellow, she worked at Georgetown University Medical Centre in the USA, focussing on the molecular pathology of Alzheimer's disease. In 1999, she moved away from the lab bench to desk-based research and at JRC she focused on the analysis of the impacts of new biotechnologies on the human health sector.

5.2. JRC Young Scientist Prize for Scientific Innovation - Dr. Nicole Erdmann

International governmental organisations for the control of nuclear material have implemented new and more stringent safeguards programmes to strengthen and improve compliance checks of nuclear facilities and detection checks of undeclared nuclear activities.

A release of radioactive material often results in the formation of small particles consisting of uranium oxide matrix containing trace amounts of plutonium and americium. The analysis of such single particles can enable one to deduce the origin, age and history of the material. However, the standard technique for analysing such particles, secondary ion mass spectrometry (SIMS), suffers from isobaric interferences (^{238}U/^{238}Pu, ^{241}Am/^{241}Pu). For example, measurements of ^{238}Pu are affected by the presence of ^{238}U and vice versa. For this reason, resonance ionisation mass spectroscopy (RIMS) in combination with "ion gun sputtering" was suggested to overcome the problem.

A RIMS feasibility study was performed in collaboration with the universities of Münster, Mainz (Germany) and Leuven in Belgium and the results[1] demonstrated an increase in detection efficiency of two orders of magnitude for uranium particles as well as enhanced selectivity and sensitivity. Today the realisation of a RIMS facility is planned at the University of Mainz, Germany in collaboration with the JRC.

Nicole graduated in 1994 from the University of Mainz, Germany, with a degree in physics and went on to complete her Ph.D. at the Institute of Nuclear Chemistry of Mainz University in 1998. She worked in the JRC both as grant-holder and research scientist until 2003 and today she is working at Mainz University as a research scientist.

[1] * N. Erdmann, M. Betti, F. Kollmer, A. Benninghoven, C. Grüning, V. Philipsen, P. Lievens, R.E. Silverans, E. Vandeweert. Resonant and non-resonant laser ionization of sputtered uranium atoms from thin films and single micro-particles: Evaluation of a combined system for trace and particle analysis. Anal. Chem. 75 (13), 3175 - 3181 (2003).

5.3. JRC Young Scientist Prize for Major Scientific Contribution to Food Research - Dr. Hubert Chassaigne

Selenium is an essential, yet toxic, element and an average human requires an intake of between 50 and 200 micrograms per day. This narrow concentration range demands an in-depth understanding of this element's speciation.

Selenised yeast is used as a food supplement to help regulate selenium intake and several producers are now supplying the European market. However, little or no information is given concerning the chemical forms of the minerals likely to be present in such supplements.

Thus the JRC is now developing a methodological approach to carrying out a feasibility study for selenium speciation in a yeast material. In 2003, a sequential extraction procedure was set up to assess the solubility of dietary Se in yeast material. An analytical approach for low-molecular weight Se species was chosen and a novel integrated approach was proposed for the analysis of intact proteins. This consisted of three components: (1) two-dimensional gel electrophoresis for proteins, (2) laser ablation-based technique for Se detection and (3) protein characterisation by mass spectrometry.

These results[2] will help pave the way towards the speciation of selenium and selenium-containing proteins in a yeast candidate reference material.

Hubert graduated in analytical chemistry from the University of Bordeaux (France) in 1996, completed his Ph.D. in 1999 and joined the JRC as a research fellow from 2001-2003. Since September 2003, Hubert is working as a research scientist at the JRC

[2] H. Chassaigne, C.C. Chery, G. Bordin, A.R. Rodriguez. *2-Dimensional gel electrophoresis technique for yeast selenium-containing proteins - Sample preparation and MS approaches for processing 2-D gel protein spots* Journal of Analytical Atomic Spectrometry, 2004, 19(1), 85-95.

5.4. JRC Scientific Publication Prize – Dr. Yannis Drossinos

Recent interest in aerosol particles derives partly from increasing evidence of adverse effects on human health and from their influence on the earth's climate. A process called homogeneous nucleation governs the formation of nanoparticles in engine emissions, thereby contributing to the high concentration of ultrafine particles emitted by modern low-mass emission engines. By comparison, ice nucleation in supercooled water droplets is the controlling mechanism for the formation of high clouds in the upper troposphere.

Classical nucleation theory is the most frequently used theory to calculate nucleation rates. However one limitation is the implicit assumption of a stationary nucleating droplet, an assumption that leads to the so-called "translation-rotation" paradox. The publication addresses this inconsistency and proposes a resolution of the paradox by deriving a consistent correction to the classical theory. The correction is shown to be a consequence of translational invariance of the nucleating droplet and the approach adopted is based on an application of quantum mechanical considerations developed in studies of Bose-Einstein condensation.

The resulting modified classical nucleation theory has applications in modeling nanoparticle emissions from modern car engines, an area of considerable concern for possible environmental and health impacts, and in urban air quality models. Environmental applications include its use to describe the formation of cloud condensation nuclei in the atmosphere - an essential ingredient when estimating the indirect aerosol effect on climate.

Yannis graduated from Yale University, obtained a Masters degree in mathematics from Columbia University, completed his Ph.D. in chemical physics at Harvard University and joined the JRC in 1990.

5.5. JRC Technical Assistance Prize - Heinz Stutz & Joachim Küst

The JRC, in focusing on the safety of nuclear fuel, performs microstructural level research on the mechanical and chemical interactions of the fuel at various stages. This requires the characterisation of irradiated fuels and recently a new programme for characterising lattice structure variations of high burn-up fuel has been initiated.

For such analyses, fine X-ray beam is the preferred tool and up to now, the X-ray beam concentrator has applied a lead-glass capillary. The 2003 JRC technical prize has been awarded to H.-M. Stutz and J. Küst for their contribution towards the development of a new type of X-ray beam concentrator called the "metallic iris capillary". The new device, which was conceived, fabricated and tested at the JRC, has significant advantages over the conventional lead-glass capillary. It can be used for high-resolution X-ray techniques, such as micro-diffraction, spectroscopy, small-angle X-ray scattering, etc.

The metallic iris capillary, presently being patented, will have potential applications in the fields of lithography, synchrotron radiation, metal purification and even medical procedures. Already two prototypes have been specially designed for use at the Belgian Nuclear Centre and with this new and innovative system, the structural characterisation of different nuclear and non-nuclear thin interface materials will also be possible.

Heinz joined the JRC in 1974, has a strong background in the development of equipment and glove boxes for laboratories and hot cells and is head of one of the JRC technical workshops.

Joachim, with a background in craftsmanship and mechanical engineering, joined the JRC in February 2002 and is deputy head of the same workshop as Heinz.

6. 2003 HIGHLIGHTS FROM JRC INSTITUTES

The JRC Multi-Annual Work Programme (2003-2006), adopted on 20 March 2003 (Commission Decision C(2003)819), consists of four core areas, namely:

(1) Food, chemical products and health;

(2) Environment and sustainability;

(3) Nuclear safety and security; and

(4) Horizontal activities: technology foresight, reference materials and measurements and public security and antifraud.

The activities within these core areas, selected to represent the best match between policy needs and JRC competencies, are categorised according to Integrated Scientific Areas (ISAs) and on the following page, the ISA breakdown per Institute is shown. The ISA structure was developed for the Sixth Framework Programme (FP6) such that activities are shared between the Institutes, aiming at enhancing the cohesion and focus of the JRC.

This chapter of the report contains a brief overview of activities that have taken place in 2003 at each of the 7 JRC Institutes. For example, extracts will reveal breakthroughs ranging from the determination of natural toxins (patulin) to the transmutation of radioactive iodine (^{129}I). The latest progress on fishing vessel detection is documented and an insight to support for nuclear reactor safety is given. The JRC's role from vehicle emissions and genetically modified organisms to prospective technological studies will also feature in the following pages.

6.1. Structure of the Multi Annual Programme

Structure of the Multi Annual Work Programme - Integrated Scientific Areas

1. Food, Chemical Products and Health

Safety and quality of food and feed

Food chain: from agriculture to consumer protection

GMOs in food, feed, seeds and the environment

Assessment of Chemicals and Exposure

Alternative methods to animal testing

Technologies for Biomedical Applications

Health and Environment: addressing exposure via human envirogenomics

2. Environment and Sustainability

Air quality and environmental radioactivity

Water quality and aquatic ecosystems

Soils and waste management

Land resources

Integration of sustainability into other policy areas

Climate change: the Kyoto protocol and beyond

Monitoring and assessing ecosystem sustainability

The Sustainable Energy Technologies Reference & Information System

Renewable energies and advanced energy conversion technologies

3. Nuclear Safety and Security (EURATOM Programme)

Management of spent fuel and of radioactive waste

Nuclear Security (safeguards and non proliferation)

Reactor and Nuclear fuel Safety

Radiation Monitoring

Basic Actinide Research

4. Horizontal Activities

Technology Foresight in other JRC priorities

Cross-cutting techno-economic foresight

Statistical methods for analysis of economic indicators

Reference materials and methods in other JRC priorities

BCR and industrial certified reference materials

Metrology in Chemistry and Radionuclide Metrology

Metrology in Physics: Neutron Data Measurements

Antifraud and monitoring compliance with EU regulations in selected policies

Support to cybersecurity

Technological and natural risks

Contribution to Commission objectives in humanitarian aid and assistance

Promotion of innovation, technology transfer and management of intellectual property rights

6.2. Institute for Reference Materials and Measurements

In recent years the JRC Institute for Reference Materials and Measurements (IRMM) has actively focused its research to support EU policies with the latest prioritising of activities resulting in the consolidation of five research areas:

– food and feed quality and safety

– reference materials, with special emphasis on matrix reference materials and bio-analysis

– chemical reference measurements

– radionuclide metrology, and

– neutron physics.

In 2003 IRMM was designated the JRC Centre for Food and Feed related research activities. To take charge of this new function the Institute's analytical chemists and food scientists were brought together in a new unit. Synergy was also increased in the field of reference measurements by merging metrology activities of the Institute into one single unit focusing on premium quality reference measurements of stable and radioactive isotopes.

The following examples give a cross section of activities at IRMM in 2003:

Determination of natural toxins

IRMM organised a collaborative trial to provide evidence that patulin, a toxin often found in apple products, can be reliably determined at levels lower than 10.0 μg/kg in clear apple juice and fruit puree. These results now make it possible to set the maximum limit for patulin, in products intended for infant consumption, at a lower value than previously possible (draft amending Regulation (EC) No. 466/2001).

3rd generation of reference materials for genetically modified organisms

For the implementation and control of the current labelling regulation (Regulation (EC) No. 49/2000) for genetically modified organisms (GMOs) in foodstuff, GM maize powder reference materials for the detection of Bt-11 and Bt-176 maize have been certified and released for distribution. These were produced by a new dry-mixing technique developed at IRMM that helps to avoid degradation of DNA in the production process.

From the Bureau Communautaire de Référence (BCR) to the European Reference Materials Initiative (ERM®)

IRMM is one of the world's largest producers of certified reference materials and since 2003 manages the production and distribution of both BCR® and IRMM reference materials. In October 2003, an ERM initiative was launched together with the Bundesanstalt für Materialprüfung (BAM, DE) and LGC Limited (UK) bringing together the largest reference materials producers in Europe. The new ERM® trademark

will be a guarantee of high quality and will only be granted for reference materials which have successfully passed a peer evaluation and have been produced according to the principles described in ISO Guides 34 and 35.

Focussing metrology applications in support of EU policies

IRMM organised a measurement evaluation programme for EU national reference laboratories measuring the lead and mercury content in fish (Directive 2001/22/EC). This inter-laboratory comparison enabled the laboratories to demonstrate their measurement capability especially in view of compliance with ISO/IEC 17025 – the standard for testing and calibration laboratories.

Ultra-low level radioactivity measurements

In its underground laboratory at Belgian Nuclear Centre in Mol, IRMM measured the activity of ^{60}Co in steel plates taken from roofs of buildings directly exposed to neutrons from the atomic bomb explosion in Hiroshima. Current knowledge of the effects of ionising radiation on human beings is, to a large extent, based on the follow-up of Hiroshima and Nagasaki victims. There are, however, discrepancies between the model calculations and ^{60}Co activity measurements and the set of data produced at IRMM is the first set that fully supports the most recent model - the Dosimetry System 2002.

New knowledge and data in neutron physics

Measurements at the Institute's Van de Graaff laboratory have improved the understanding of how ^{60}Co is produced by irradiating nickel in stainless steel with high-energy neutrons. These data are crucial for radiation damage calculations for the structural parts of accelerator driven systems, fusion reactors and spallation neutron sources.

Furthermore, experimental data on decay properties above the shape-isomeric ground state in ^{239}U via the ^{238}U(n, γ)-reaction was measured for the first time ever and the data were entered in the international reference database.

6.3. Institute for Transuranium Elements

In October 2003, ITU celebrated its 40th anniversary with a scientific agenda that involved numerous invited speakers, including Commissioner Busquin. This occasion gave ITU the chance to look back over 40 years of technical development in the nuclear field - the speciality of ITU. This perspective showed how much ITU remained loyal to its original nuclear mandate on the one hand, but also how it diversified over four decades, on the other. Some core programmes from the early days still remain such as the ability to fabricate nuclear fuel and to examine irradiated fuel in our hot cells, a capability in considerable demand by the nuclear industry.

Major thrusts include the characterisation of spent fuel and attempts to understand the complex processes that would result in the release of nuclides from long-term repositories. At the same time, to reduce the long-term radiotoxicity of spent fuel, ITU is working on both separation and possible transmutation scenarios. Particularly good progress was made this year in both the liquid-liquid and molten-salt separation technologies.

Safeguards

In terms of newer activities, there has been considerable progress in "Safeguards R&D", aimed at building technologies and methodologies to prevent the misuse or diversion of nuclear materials. Closely allied to this has been the continued progress in the relatively new field called "nuclear forensics", which aims to track down the origins and possible intended use of nuclear material smuggled out of facilities. The study of radioactivity in the environment continued, especially looking at particles and being able to analyse their content and possible origin. For the first time, plutonium containing particles have been separated in sediment samples and detected via their characteristic X-rays, using the synchrotron source (ANKA) at the Research Centre (FZK) in Karlsruhe.

Actinide research and waste transmutation

In basic research, important progress was made in understanding the superconductivity of Am metal and the new ternary systems, such as $PuCoGa_5$. In June 2003, ITU hosted the second school with some 70 participants, 30 of them coming from the Acceding Countries. The Actinide User Laboratory entered its second year of full operation and, in addition to many visitors, four workshops on topics of interest to the community were hosted.

Laser transmutation studies continued this year with the successful demonstration of the transmutation of the important fission product iodine (^{129}I) by an intense laser pulse. This demonstration took place at both the University of Jena (DE) and Rutherford Appleton Laboratory (UK).

Medical Applications

Another example of ITU diversification is the alpha-immunotherapy programme, using the isotope ^{213}Bi. In this area, important new work was started on trying to understand the exact processes by which radiation, such as the alpha particles, destroys malignant cells. A collaboration between the University Hospital Düsseldorf, the German Cancer

Research Centre, and ITU entered into stage I clinical trials for alpha-particle treatment of blood-borne cancer.

Working towards Enlargement

An important theme in 2003 was Enlargement and providing services to scientific organisations in the Acceding and Candidate Countries. ITU accepted this challenge with enthusiasm and had a large number of workshops to show for it. For example, two workshops were held on the "Nuclides Training", two on "Radioactivity in the Environment", and a TRANSURANUS user meeting convened. The TRANSURANUS code system describes and combines interacting phenomena by accounting for all relevant thermal, mechanical and isotopic properties of nuclear fuel – most of which change during reactor operation or long-term storage. The code is supported by a comprehensive verification database. Finally many missions of ITU staff to the Acceding Countries, and visa-versa, provided further attest to the vitality of this link for the future of the enlarging Union.

6.4. Institute for Energy

In 2003 the Institute for Energy (IE) promoted increased interaction with customer services of the European Commission and continued to establish partnerships with world-leaders in the energy field.. Through its experience in co-ordinating and participating in networks, IE demonstrated that energy research activities are successful if developed in symbiosis between industrial efficiency and sustainable development.

In addition to progress documented in the sections "Safety of Eastern Nuclear Reactors" and "Safety of Hydrogen as a Transport Fuel", some additional highlights are described below.

Ageing of Materials under the effect of Load and Irradiation-Assisted stress-corrosion cracking

Stress corrosion cracking, with possible enhancement by neutron irradiation mechanisms, affecting LWR core internals is still not properly understood, despite large international programmes mainly based on post-irradiation tests.

In 2003, IE acquired a new rig consisting of an autoclave with fracture toughness testing equipment and a water chemistry preparation loop. The autoclave is equipped with a pneumatic loading device for bending tests of mini and standard toughness specimens, whose limited dimensions can make it suitable also for future special applications fitting into a High Flux Reactor irradiation capsule.

If successful, this option would constitute the only rig in the world able to perform such fracture toughness tests on small specimens, complementing results obtained using other rigs designed to carry out tensile, fatigue of fracture toughness on larger specimens.

Safety of new reactor systems

IE, with a clear focus on safety, supports R&D efforts related to new reactor concepts and started the assembly of 2 fuel irradiation facilities and the associated instrumentation in the area of High Temperature Reactors (HTR). An additional irradiation set-up was adapted to the needs of a Generation IV reactor system. Experiments will start in 2004. The facilities for material tests were prepared and made operational, the HTR fuel database was updated, maintained and equipped with a user interface.

First exploratory research results on HTR fuel reprocessing were obtained and will be patented. IE also participated in project definition for new systems. The safety of a Pb-Bi and gas-cooled accelerator driven systems (ADS) and gas-cooled fast reactors were analysed and via networking, IE contributed extensively to the organisation of international conferences.

Fuel Cell systems performance Testing & Standardisation

The main goal of the Fuel Cell Testing & Standardisation (FCTEST) Action is to initiate a Commission Reference System in the sector, through the creation of a JRC-IE testing facility and the operation of the FCTEST Network. This action is geared towards

integrating European research activities. Furthermore, work on mathematical modelling of the physical laws pertinent to fuel cells and providing numerical simulation tools to support future testing activities was carried out.

Sustainable Energy Technologies

IE's Sustainable Energy Technologies Reference and Information System (SETRIS) programme provided a techno-economic study entitled *"Controlling Carbon Emissions: the option of Carbon Sequestration"*, which substantially contributed to the EU common position paper on carbon sequestration. This study served as a scientific-technical platform to support the Commission in defining its position for the Carbon Sequestration Leadership Forum partnership - a US-led initiative.

6.5. Institute for the Protection and Security of the Citizen

In addition to the highlights on crop forecasting and the impact analysis of the Israeli Wall on Palestinian settlements, IPSC successes for 2003 include the rapidly expanding use of the Europe Media Monitor (EMM), contributions to the amendment of the Seveso II directives, the installation of the design information verification system at Rokkasho reprocessing plant in Japan and finally the demonstration of near real-time tracking of fishing vessels in the Baltic sea.

Europe Media Monitor (EMM)

The primary objective of EMM is to provide Commission services with targeted intelligence culled from the Internet and other electronic sources. The Press and Communication DG has based their future media monitoring strategy for EU-25 on EMM. The Health and Consumer Protection DG has commissioned a Medical Information System derived from EMM. The External Relations DG and the Humanitarian Aid Office have both requested news services covering each country of the world. Most services have set up policy specific alerts and correspondingly receive SMS messages. EMM is coupled to JRC research into new semantic processing of web pages and new statistical trend analysis. The alert system exploits a JRC developed parallel state algorithm for identifying keywords across multi-lingual texts. It can process the full text of any article against 8,000 keywords from 350 subjects in just 100 msec. No other system achieves the same real time performance. In tests, EMM outperforms Google, Yahoo and Lexis Nexis, detecting new stories up to 3 hours before the others.

Revision of the Seveso II Directive

On 10 September 2003, an agreement was reached in conciliation on the first revision of the Seveso II Directive 96/82/EC on the control of hazardous substances. The coverage of chemical and thermal processing operations in mining and operational tailings management facilities, the tightened scope with regard to explosive and pyrotechnic substances and ammonium nitrate following the Enschede and Toulouse accidents, and reinforced land-use planning provisions were substantially guided by the results of focused expert workshops held by IPSC's Major Accident Hazards Bureau (MAHB). The amendment's provisions on land-use planning include a mandate for the Commission to develop a European database to be used for assessing the compatibility between Seveso establishments and sensitive areas, an activity that is being led by the IPSC.

Design Information Verification System

For non-proliferation and nuclear safeguards work, a Design Information Verification System was developed for the IAEA and installed at the Rokkasho Reprocessing Plant (RRP). The system consists of a laser range scanner with JRC software for the acquisition, processing and analysis of the 3D data. Demonstration, training and in-field-testing were successfully accomplished and ten RRP hotcells, prior to closure, were scanned and reference models built for further use.

Automatic supply of vessel detection results

On 16 June 2003, the project on Fishing Vessel Detection Systems (VDS) achieved the first fully automatic supply of vessel detection results, based upon an algorithm developed by IPSC, using near real-time SAR (Synthetic Aperture Radar) data. Results were e-mailed to Fishing Monitoring Centres, 39 minutes after the RADARSAT ScanSar acquisition. Such efficient image transfer and processing allows the combination and collaboration between space-based observation and local coast-guard interventions to, for example, intercept illegal fishing vessels.

Other highlights, not reported above, were the approval of the Council regulation on electronic labeling of caprine and ovine species, which was based upon JRC's work. A full-size testing of a vehicular bridge beam-deck made of advanced composite materials at the European Laboratory for Structural Assessment (ELSA) was performed for the Spanish Ministry for industry and infrastructure. Other successes include the successful conclusion of the CTOSE (Cyber Tools for Online search for Evidence) project on collecting and securing electronic evidence that is reliable and admissible in international contexts.Support was given to the International Atomic Energy Agency (IAEA) on the improvement of technical measures to detect and respond to illicit trafficking of nuclear material and other radioactive materials. To conclude workshops were convened with the Economic and Financial Affairs DG, the European Central Bank and the OECD on business cycle analysis and econometric tools for short-term analysis.

6.6. Institute for Environment and Sustainability

The IES offers a blend of expertise and competence from the environmental sciences to the field of Earth observation. The Institute is at the forefront of providing scientific and technological support to the Commission Directorates and Services (e.g. Environment, Energy and Transport DGs) dealing with environmental issues. IES' activities combine short-term technical projects with longer-term strategic research in a work programme which supports more than 30 EU regulations, strategies (including the EU thematic strategies) and communications in the fields of Global Change, Emissions, Air quality and Health, Water, Terrestrial and Natural Resources and Renewable Energies.

The IES provides scientific support by networking with the best partners in Europe including those from Acceding States and Candidate Countries. IES establishes highly acclaimed experimental facilities and laboratories, (e.g. the European Reference Laboratory for Air Pollution and the European Solar Testing Installation) and produces European and global reference data sets (e.g., Global Land Cover and the European Soil database).

Supporting the European Marine Strategy

The oceans play a vital role in the ecological and climatic balance of our planet and policies are needed to manage the conflicting needs of protecting the marine environment and exploiting its natural resources. JRC work supporting the European Marine Strategy includes the application of integrated environmental observation systems, both at sea and from space. IES developed remote sensing techniques provide key information on bio-geo-chemical marine processes, such as those related to coastal eutrophication.

Optical space observations, duly calibrated by ground measurements, are used to assess the distribution and abundance of marine biomass and primary productivity in the European Seas and the World's Oceans. This contributes to a better understanding of ecological relations in the oceans, eutrophication of coastal waters and enclosed seas as well as of the oceans' role in absorbing atmospheric CO_2 and thus in regulating the Earth's climate.

Support to the Kyoto Protocol

The European Commission is at the forefront of international efforts to mitigate climate change and aims to continually improve the monitoring and reporting of greenhouse gas emissions in Europe. In 2003, a pilot study with six Member States on how to harmonise methodologies for carbon sink estimates was completed, and investments were made in new methods to measure the carbon sink.

Given the trend of global warming, it was discovered how a carbon sink might become an unwanted source. EU-wide methodologies were developed to estimate emissions of methane based on atmospheric measurements and EUROSTAT statistics. Furthermore, IES' ability to evaluate alternative post-Kyoto climate change mitigation policies was enhanced by improving the understanding of regional and global pollution by ozone and particulate matter.

Vehicle Emissions – EURO-V and EURO-III

JRC is acknowledged as a scientific reference centre for the development and harmonisation of vehicle and engine emission standards. In 2003, as support to policymaking, several hundred tests with cars and motorbikes were performed in JRC's Vehicle Emission Laboratories (VELA). On initiative of the co-ordinator of the Particle Measurement Programme (UK Ministry of Transport), JRC was invited to act as scientific co-ordinator of laboratory inter-comparison exercise to test new measurement methods for particle emissions from passenger cars and light duty vehicles (EURO V). The 2003 highlight event was the International Conference on Future Worldwide Emission Requirements for Passenger Cars and Light Duty Vehicles and EURO V which was organised by JRC and supported by the Environment and Energy and Transport DGs.

Support to EU Strategy for Soil Protection

Concern over European soil quality and the depletion of soil resources led the Commission, in 2003, to outline the first steps in a strategy to protect our soils. The goal is to place soil protection on a par with cleaning up our water and air. To support the Soil Protection Strategy, the JRC, through collaboration with the European Soil Bureau Network and other partners, has developed an improved and harmonised knowledge base on soil properties. This database was expanded (1:1,000,000) to include data for Acceding and Candidate Countries, the Russian Federation, Ukraine and Belarus with the aim to develop a coherent information system for reporting on the conditions of European soils.

6.7. Institute for Health and Consumer Protection

Implementation the EU policy on GMOs

During 2003, the European Commission strengthened its framework for GMO legislation by issuing two new regulations, one which deals with GM food and feed and the other with traceability and labelling.

The IHCP Biotechnology and GMO Unit, established in November 2002, attained increased responsibility in its support work to the implementation of the EU policy on GMOs. In relation to the GM food and feed legislation, it has been appointed "Community Reference Laboratory (CRL)" with the mandate to evaluate if methods are fit for the purpose of regulatory compliance. The European Network of GMO Laboratories (ENGL) will assist in the execution of this demanding task. The European Network of GMO laboratories, which is managed and chaired by IHCP, consists of 46 official members from EU countries and of observers from Accession Countries. This nomination as CRL – the first ever in the JRC – is assigned to the IHCP, recognising its key-role in GMO testing.

The IHCP is also responsible for collecting all summary notifications of deliberate field crop trials (SNIF) in the EU and of summaries and risk assessment files of dossiers submitted for marketing approval. This information is publicly available and allows the submission of comments. As an extension of this work, the Unit has also been nominated EU focal point for the "Biosafety Clearing House" as part of the Cartagena protocol, which entered into force in September 2003.

Supporting the registration, evaluation, authorisation and restriction of chemicals (REACH)

The European Centre for the Validation of Alternative Methods (ECVAM) has responded to the needs set out by the REACH system by focusing on the replacement of those animal experiments with the highest usage of laboratory animals. ECVAM successfully validated two methods on drugs/biologicals that have been introduced by the European Pharmacopoeia. Another benchmark for ECVAM in 2003 was the completion of a validation study for six pyrogen tests which would eliminate the need to use animals for such tests in the future. ECVAM also participated in a successful proposal for an Integrated Project on reproductive toxicology. This new project involves a consortium of 35 international research groups and a budget of 12 million €.

An accurate evaluation of the overall health risk for European citizens requires relevant human exposure data, which are very scarce at present. Responding to these needs, the IHCP develops and studies concepts to validate and harmonise methods and models to assess the potential relationships between chronic low and high dose exposures to environmental stressors (including chemicals and physical agents) from different routes (ingestion, inhalation, skin contact) and the health effects caused by such stressors. The assessment of human exposure also includes toxicogenomic approaches.

A series of studies to identify and quantify chemical substances emitted from products and articles were performed using the "Indoortron" facility - a large-scale environmental chamber - and a list of priority pollutants occurring indoors was established. On request of the Health and Consumer Protection DG, a Pan-European

R&D platform and Information/Reference System on “Risks from Chemicals in Products” and on the “Development/Harmonisation of Testing Methods” was launched.

Activities supporting REACH are also addressed in the “Safety of Chemicals” section of this report.

Training and ERA Research at the IHCP cyclotron

The IHCP runs a cyclotron to stimulate collaborative research for the enhancement of patient access to nuclear medicine. It hosts the first radioisotope production facility that will sell FDG in Italy, and fulfils the requirement to have a well-distributed radiopharmaceutical production network ensuring equal access of EU citizens to Positron Emission Tomography as a vital medical imaging technology. It also hosts a Marie Curie Training Site 'Research Training in Biomaterials Testing Using Radiotracers' which aims at providing high-level interdisciplinary doctoral training in testing of biomaterials using radiotracers.

6.8. Institute for Prospective Technological Studies

IPTS continued to support the European policy-making process in its competence areas, anticipating needs, providing techno-economic analysis, impact assessment and direct support to policy implementation. The Institute's achievements in 2003 spanned a broad range of policy areas, including industry, agriculture, health, environment, energy, transport and the information and communication sector.

Energy and environment

Prominent among IPTS achievements was support to the Commission's guidelines for Policy Impact Assessment and to the Environmental Technologies Action Plan (ETAP). IPTS work on environmental regulations and their impact on innovation provided background for support to the Commission's impact assessment on the EU chemicals policy.

Work in the area of energy and climate change supported the Commission's policy on emission trading and the United Nations Framework Convention on Climate Change negotiation rounds. A support agreement was signed between IPTS and the European Environment Agency (EEA) to provide long term energy/emission scenarios for the forthcoming EEA "State-of-the-Environment report". IPTS also provided input to the World Energy Technology Outlook (WETO) Report presented by Commissioner Busquin in June.

The European Integrated Pollution, Prevention and Control (IPPC) Bureau at IPTS continued to play a key role in implementing the 1996 EU Directive on pollution control, with the launch of the last of a total of 32 "Best Available Technologies Reference Documents (BREFs)". The two years of work that go into these internationally-recognised reference documents brings together industrial experts, Member States' representatives and environmental Non Governmental Organisations (NGOs). In areas like refineries, slaughterhouses, large combustion plants and waste management, IPTS sees itself catalysing contacts between services of the Commission, each dealing with crucial aspects of regulations and structuring the daily lives of many European businesses.

GM0s and genetic testing

Substantial input was given to the development of the Commission's policy on the co-existence of conventional and GM-plants, and to the Commission's Guidance document for the "Development of National Strategies and Best Practices in this area". In follow-up of a long-term commitment on Genetic testing, IPTS co-organised (with the Research DG and the OECD) a major workshop on policy options and challenges within this rapidly developing field.

Information society

IPTS' FISTE (Foresight in Information Society Technologies in Europe) action aimed at reconciling supply and demand aspects. Among its main achievement were studies on the development of the Information Society in Candidate Countries and support to the Information Society DG's high-level advisory groups.

Enlargement

The IPTS Enlargement activities concentrated on Scenarios for potential future developments of certain structural indicators of the Lisbon process. Reports were delivered to the "Foresight in the Enlarged European Research and Innovation Area" conference in May in Ioannina co-organised with the Research DG and the Hellenic Presidency of the EU, and to a conference co-organised with the European University Institute in Florence in November under the Italian Presidency.

Implementing the European Research Area

A major collaborative agreement between the Research DG and the JRC was signed in October for longer-term support to the construction of the European Research Area. The aim is to provide strategic intelligence services on S&T policies to the implementation of the action plan aimed at increasing investment in European R&D to 3 % of GDP by 2010, and to establishing a European Area for Science and Technology Foresight.

Support to the European Parliament

IPTS continued to provide support on request of the European Parliament. In March, Commissioner Busquin presented the IPTS study on Employment impacts of technology innovation, and in July the Institutes delivered to the EP's LIBE Committee a report on "Security and Privacy for the Citizen in the Post-September 11 Digital Age: A Prospective Overview". This study has augmented the IPTS' prospective work on Cybersecurity, an area of joint endeavour with JRC sister-institute IPSC.

European Science and Technology Observatory (ESTO)

Within the ESTO Network, IPTS managed the close collaboration with more than 40 research institutions all over Europe and a General Assembly was held in June.

IPTS was also particularly successful in competitive activities with 18 proposals funded of the 22 (84% success rate) submitted for the sixth Framework Programme.

7. SUPPORT TO ENLARGEMENT

The 2003 JRC Enlargement action deals with the scientific and technical aspects underpinning EU legislation in the fields of environment, health, food, renewable energy, chemicals, agriculture and nuclear safety. The work has been aimed at accelerating the uptake of the 'acquis communataire', the body of EU legislation which the new Member States must adopt and implement. A network of JRC "National Contact Points", scientific attachés and participants in the JRC Board of Governors from 13 Acceding and Candidate Countries are providing direct input to the definition, monitoring and implementation of the JRC Enlargement Action. Some of the highlights from 2003 are described below:

Some 1000 experts from the Candidate Countries participated in 72 workshops and advanced training courses on S&T aspects of EU policies

JRC organised 15 information events in 10 Enlargement countries. Some 2500 mostly senior level representatives attended from academic, industrial and public administration domains.

JRC invited 22 journalists from Enlargement countries to a dedicated workshop in Ispra and 39 press articles on JRC-related topics were published.

112 researchers from the enlargement countries worked at the JRC Institutes under employment contracts as seconded National experts, visiting scientists or research fellows. A recruitment call for an additional 70 posts yielded 380 eligible applications.

Of 230 FP6 proposals submitted by the JRC, 70% included one or more partners from Enlargement countries.

To nurture the development of future partnerships, a new facility for short-term contracts was introduced to encourage exchange visits between Enlargement country research organisations and JRC Institutes

JRC has taken a pro-active approach to attracting young researchers from enlargement countries to train within its Institutes and sought stronger collaboration within the Marie Curie Actions by inviting the respective Marie-Curie National Contact Points to Ispra.

8. CONTRIBUTION TO THE EUROPEAN RESEARCH AREA

Overall Strategy towards the European Research Area (ERA)

The ERA Action Plan for the JRC, published in 2003, sets out specific targets against which to measure JRC's contribution to the European Research Area. This contribution is built around five major activities: common scientific reference systems, networking, training and mobility, research infrastructures and enlargement. These activities are embedded in the JRC's own workprogramme.

In 2003 the JRC has strengthened its role in the development and operation of several reference systems on metrology, energy and cyber-security. Work was carried out in preparation for Community Reference Laboratories on GMO Food and Feed Legislation, on Food Contact Materials and on Feed Additives.

Collaborations with Partners

The Framework Programme is one of the main instruments to implement the ERA. In the first year of FP6 the JRC has, together with its partners, successfully prepared a number of major research projects and networks. Participation in these activities allows for important and lasting partnerships with major European research players. It also involves work around JRC facilities which results in increased access and use of specialised infrastructures and databases, and maximises the opportunities for training at JRC Institutes.

The new FP6 projects and networks cover a wide range of topics throughout the entire JRC work-programme, such as: food safety, nano-biotechnology, photo-voltaics, hydrogen, information society, vehicle safety, atmospheric change, actinides, nuclear accidents, and research policy.

Global Monitoring for Environment and Security (GMES)

The objective of the EU and ESA's GMES initiative is ensuring European access to independent and reliable information that can enable decision makers to better manage our environment and security by anticipating or mitigating crisis situations and related issues.

The GMES "Initial Period Final Report and Communication" from the Commission to the European Parliament and the Council were both completed with full JRC participation in the drafting process. To this end, JRC's in-house expertise in research and policy support played an important role. This work, detailed in a brochure, was widely distributed at the 4th GMES Forum and at the 1st Earth Observation Summit at which 37 countries and 22 world-wide organisations participated.

This helped consolidate GMES priorities and has appreciably reaffirmed JRC's international profile in this domain.

9. NUCLEAR FACILITIES MANAGEMENT

Decommissioning of JRC nuclear installations

The Commission is responsible for the management of nuclear installations, built for the purposes of the Euratom Treaty, until their decommissioning. In 1999, the JRC initiated the Decommissioning and Waste Management (D&WM) programme aimed at decommissioning the obsolete installations and the treatment of related waste.

This programme is managed in each JRC establishment by a specialised team, with the advice of a group of experts, which is composed of external experts designated by Member States.

The present status

In 2003, the programme has been entirely reassessed by the JRC and reviewed by a consortium of experienced external organisations, to account for major technical and economical changes that have occurred since 1999 when the programme was first presented to the Council and the European Parliament.

A new communication to the Council and the European Parliament has been prepared on the basis of the above, for approval in 2004.

Further, the JRC set up a permanent Steering Committee chaired by its Deputy Director-General to review on an on-going basis and steer the achievements and objectives of the programme.

At the JRC Ispra site in Italy (the main JRC-site currently undergoing effective decommissioning), progress was made in the provision of waste management facilities, a prerequisite for decommissioning:

The liquid effluent treatment plant was completed and commissioned successfully.

The material clearance facility, which allows declassifying non-radioactive material that originated from nuclear decommissioning activities, was equipped with a non-destructive assay system.

The upgrading of the decontamination plant was pursued with the installation of an ultrasonic bath and a water-wash cabin is being installed.

Meetings were held with the Italian safety authorities in order to define waste acceptance criteria compatible with the future Italian final repository. There was also dialogue on the siting and management of the interim store to be built on the Ispra site.

High Flux Reactor (HFR)

The HFR is one of the most powerful research reactors of its kind and a key technological platform for fundamental, innovative, medical, thermonuclear fusion and reactor safety research.

As follow-up to the 2002 safety assessment, a new in-service inspection took place in the summer of 2003 and the structural assessment plan was successfully completed in November. It concluded that the vessel can be operated until at least 2015. Furthermore an IAEA action plan on safety culture improvement was completed by February 2004.

A new licence request was launched in 2001 and submitted to the Dutch authorities in December 2003. The new licence should be granted to the Nuclear Research and Consultancy Group (NRG), the present operator of the HFR, by mid-2004. A new proposal for a Supplementary Programme covering the period 2004-2006 was adopted by the Commission in December 2003 and by the Council in February 2004.

10. THE JRC IN FIGURES

10.1. Core Staff

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

Core Staff (end-of-year situation)	**2002 M**	**2002 F**	**2002 Total**	**2003 M**	**2003 F**	**2003 Total**
Officials	714	235	**949**	794	262	1056
Temporary agents on 5-year renewable contracts	458	154	**612**	344	123	467
Temporary agents on 3-year non-renewable contracts	64	17	**81**	39	10	49
TOTAL	1236	406	**1642**	**1177**	**395**	**1572**

Of the above-mentioned total, 1253 staff members can be considered as scientific staff. While the number of scientists decreased temporarily in 2003, this was due to the change from the Fifth to the Sixth Framework Programme (FP6). It is anticipated that the numbers will increase significantly throughout the Sixth Framework Programme and more particularly as a result of Enlargement. Commission policy for staff financed on the research budget calls for the "integration of research staff into the mainstream of the Commission's personnel policy". A minimum target of 65% was set and the JRC attained 67% in 2003. On the other hand a margin of flexibility of between 10 to 35% of permanent research posts must be maintained for the recruitment of specialised staff to cope with needs that are strictly time-limited.

Core Staff Distribution (end-of-year situation)	**2002**			**2003**		
	M	**F**	**TOTAL**	**M**	**F**	**TOTAL**
Institute for Reference Materials and Measurements	127	41	168	128	46	174
Institute for Transuranium Elements	175	40	215	168	40	208
Institute for Energy	130	24	154	127	20	147
Institute for the Protection and Security of the Citizen	184	51	235	171	45	216
Institute for Environment and Sustainability	193	56	249	192	55	247
Institute for Health and Consumer Protection	100	58	158	87	54	141
Institute for Prospective Technological Studies	39	17	56	33	18	51
Directorate General, Programme and Resource Management and Institutional and Scientific Relations	288	119	407	271	117	388
Total	**1236**	**406**	**1642**	**1177**	**395**	**1572**

10.2. Visiting staff

In addition to its core staff, the JRC has an active policy of hosting grant holders, visiting scientists, seconded national experts, auxiliaries and trainees coming primarily from the Member States, Acceding and Candidate Countries. Visiting scientists bring skills, knowledge and expertise to help resolve current scientific challenges, while benefiting from the cultural diversity, multidisciplinary research domains and extensive research networks at the JRC.

Visiting staff	**2002 M**	**2002 F**	**2002 Total**	**2003 M**	**2003 F**	**2003 Total**
Trainees	31	22	53	19	20	39
Postgraduate grant holders	53	51	104	42	36	78
Post-doctoral grant holders	60	29	89	48	22	70
Visiting scientists	19	5	24	21	10	31
Seconded national experts	18	6	24	29	9	38
Auxiliaries	141	156	297	211	227	438
TOTAL	**322**	**269**	**591**	**370**	**324**	**694**

Equal opportunities

The JRC takes a proactive stance with regard to promoting equal opportunities and, in particular, gender equality in its working environment. The JRC-wide network on "Women and Science", set up in 2000, continued its monitoring role on gender equality in the organisation. In addition to monitoring progress on recruitment, promotions and managerial positions, the network undertook a comparative study on social working environment aspects and noted the successful implementation of the code of good practice concerning maternity leave replacement. Concerning visiting scientists, gender parity continued to improve with women making up 46.7 % by the end of 2003.

DISCLAIMER

"The figures in this section are tentative and reflect the situation on 30 January 2004. The absolutely final figures will only be available on 31 March".

10.3. Institutional budget

The available credits to the JRC are sub-divided into staff expenses, means of execution (maintenance of buildings and equipment, electricity, insurance, consumables, etc.) and specific credits (direct scientific procurements). The credits come from the institutional budget, made available directly from the European budget to the JRC for the sixth framework programme. On the institutional budget, the following sums were committed:

In million Euro (M€)	**2001**	**2002**	**2003**
Staff expenses	160	163	168
Means of execution	49	49	53
Specific credits	40	38	35
Total (rounded)	**249**	**250**	**256**

In addition, a total amount of 13.0 M€ was made available to finance an action programme to shut down and decommission nuclear installations and manage the waste-activities related to the EURATOM treaty.

Additional credits of 14.7 M€ came from contributions of countries associated to the Framework Programme and from competitive activities undertaken by the JRC.

DISCLAIMER

"All figures on this page are tentative and reflect the situation on 30 January 2004. The absolutely final figures will only be available on 31 March".

10.4. Competitive activities

The table below shows the values of contracts signed and inscribed into the 2001, 2002 and 2003 accounts.

Contracts Signed	**2001**	**2002**	**2003**
Indirect Actions	14.1	2,3	4.1
Competitive activities outside the Framework Programme (FP)	9.3	13,8	17.3
Third Party work	11.4	5,2	4.5
TOTAL	**34.8**	**21,3**	**25.9**

A portion of the JRC's income comes from participation in indirect actions of the Sixth Framework Programme, performing additional work for Commission services and contract work for third parties such as regional authorities or industry. These competitive activities must complement the tasks outlined in JRC's own workprogramme and are seen as an essential tool for acquiring and transferring expertise and know-how.

In response to the first calls for proposals of 2003, the JRC enjoyed a success rate of almost 50% with 77 new proposals awarded. These include participation in 15 Networks of Excellence and 22 Integrated Projects, both new instruments of FP6. Examples of projects funded are:

– Sustainable Introduction of GMOs into European Agriculture

– A Network on Actinides Research

– A Network on Nano-Technologies

– Sharing Experience on Risk Management (health, safety and environment) to Prepare Future Industrial Systems

– Storage of Hydrogen

– The Future of Identity in the Information Society

Competitive activities outside the Framework Programme includes additional paid work for Commission services which is not covered by the JRC's own workprogramme. 29 new contracts were signed in 2003 for a total amount of 17.3 (tbc) M€.

10.5. 2003 Publications

Institute	Monographs and EUR reports	Articles[1]	Conference[2] Proceedings	Conferences[3]	Special[4] Publications	Total
General Management	2		1	2	62	67
IRMM	27	71	42	95	7	242
ITU	1	78	48	80	8	215
IE	15	28	65	16	21	145
IPSC	30	33	91	74	48	276
IES	66	167	128	204	38	603
IHCP	26	57	34	122	24	263
IPTS	32	20	5	56	14	127
TOTAL	199	454	414	649	222	1938

11. APPENDICES

11.1. Board of Governors (status December 2003)

Prof. Fernando ALDANA Director Oficina de Innovación y Tecnología Empresarial E. Técnica Superior de Ingenieros Industriales E - 28006 Madrid - Spain	**CHAIRMAN**
MEMBERS	
Dr. Monnik DESMETH General Adviser Public Planning Service "Science Policy" B - 1000 Brussel **Replaced Mr. Jacques WAUTREQUIN in June 2003**	**BELGIQUE/BELGIË**
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Mr. Hartmut F. GRÜBEL Ministerialdirigent Bundesministerium für Bildung und Forschung Heinemannstrasse 2 D - 53175 Bonn	**DEUTSCHLAND**
Prof. Demosthenes ASIMAKOPOULOS Chairman of the Physics Department University of Athens GR - 157 84 Athens - Greece	**ELLAS**
Prof. José Pío BELTRÁN Institute of Molecular and Cell Biology of Plants (CSIC-UPV) Campus de la Universidad Politécnica de Valencia Avenida de los Naranjos s/n E – 46022 Valencia	**ESPAÑA**
Mr. Philippe GARDERET Directeur de l'Innovation et des Technologies Emergentes AREVA F – 75433 Paris Cédex 09	**FRANCE**

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Mr. Pierre DECKER Conseiller de Gouvernement 1ère classe Ministère de la Culture, de l' Enseignement Supérieur et de la Recherche L - 2273 Luxembourg	**LUXEMBOURG**
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Prof. José CARVALHO SOARES Centro de Física Nuclear da Universidade de Lisboa Avenida Prof. Gama Pinto 2 P – 1649-003 Lisboa	**PORTUGAL**
Professor Erkki KM LEPPÄVUORI Director General VTT Technical Research Centre of Finland Vuorimiehentie 5, Espoo - P.O. Box 1000 FIN - 02044 VTT	**SUOMI/FINLAND**
Prof. Kerstin FREDGA S – 131 50 Saltsjö-Duvnäs - Sweden	**SVERIGE**
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Secretary : Ms. D. Ursulet.

11.2. JRC Directors

The JRC Directors (status February 2004)

Director-General	Barry Mc Sweeney
Deputy Director-General	Roland Schenkel

Institute for Reference Materials and Measurements	Alejandro Herrero-Molina
Institute for Health and Consumer Protection	Kees van Leeuwen
Institute for Environment and Sustainability	Manfred Grasserbauer
Institute for the Protection and Security of the Citizen	Jean-Marie Cadiou
Institute for Energy	Kari Törrönen
Institute for Transuranium Elements	Gerard Lander
Institute for Prospective Technological Studies	Peter Kind

Institutional and Scientific Relations Directorate	Michael Fahy (acting)
Programme and Resource Management Directorate	Freddy Dezeure (acting)
Ispra Site Directorate	David R. Wilkinson