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JRC

JOINT RESEARCH CENTRE
European Commission

2008
ANNUAL REPORT

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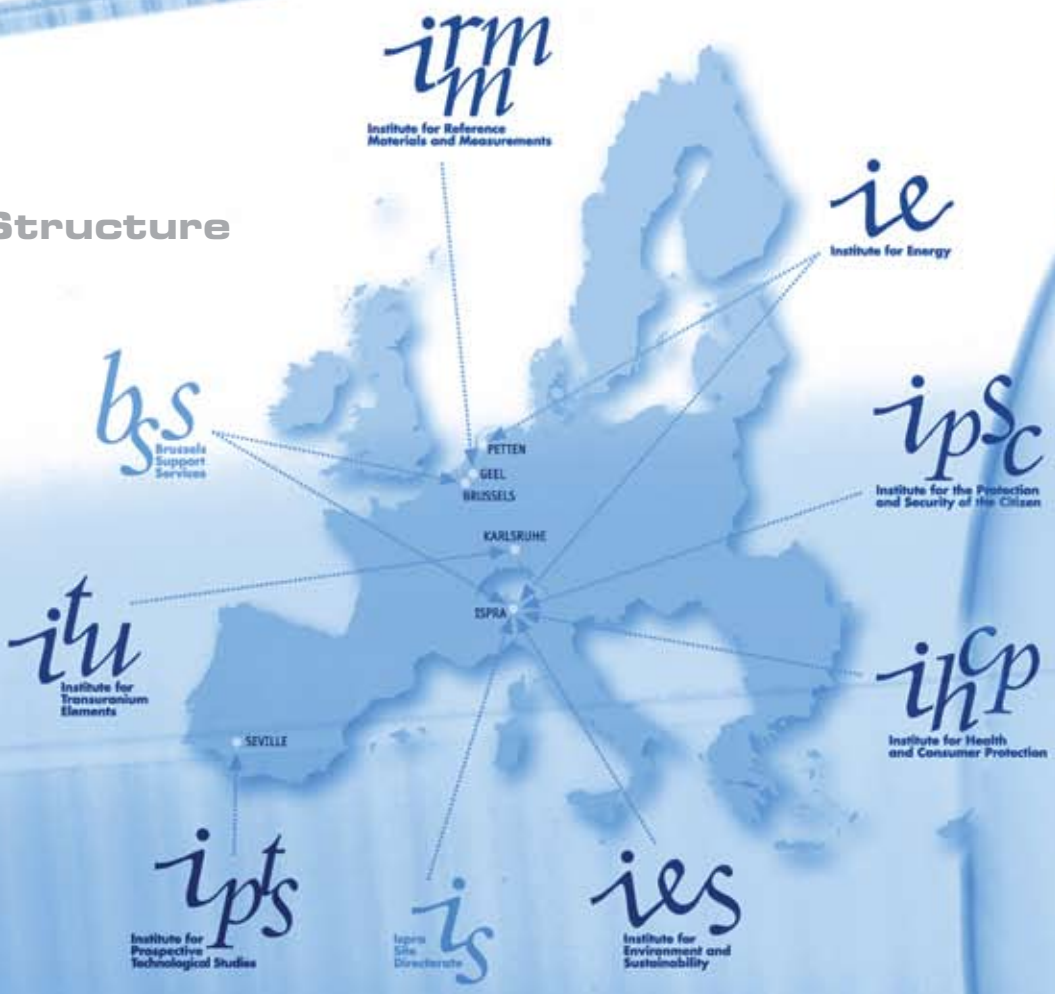
JRC Structure



Joint Research Centre

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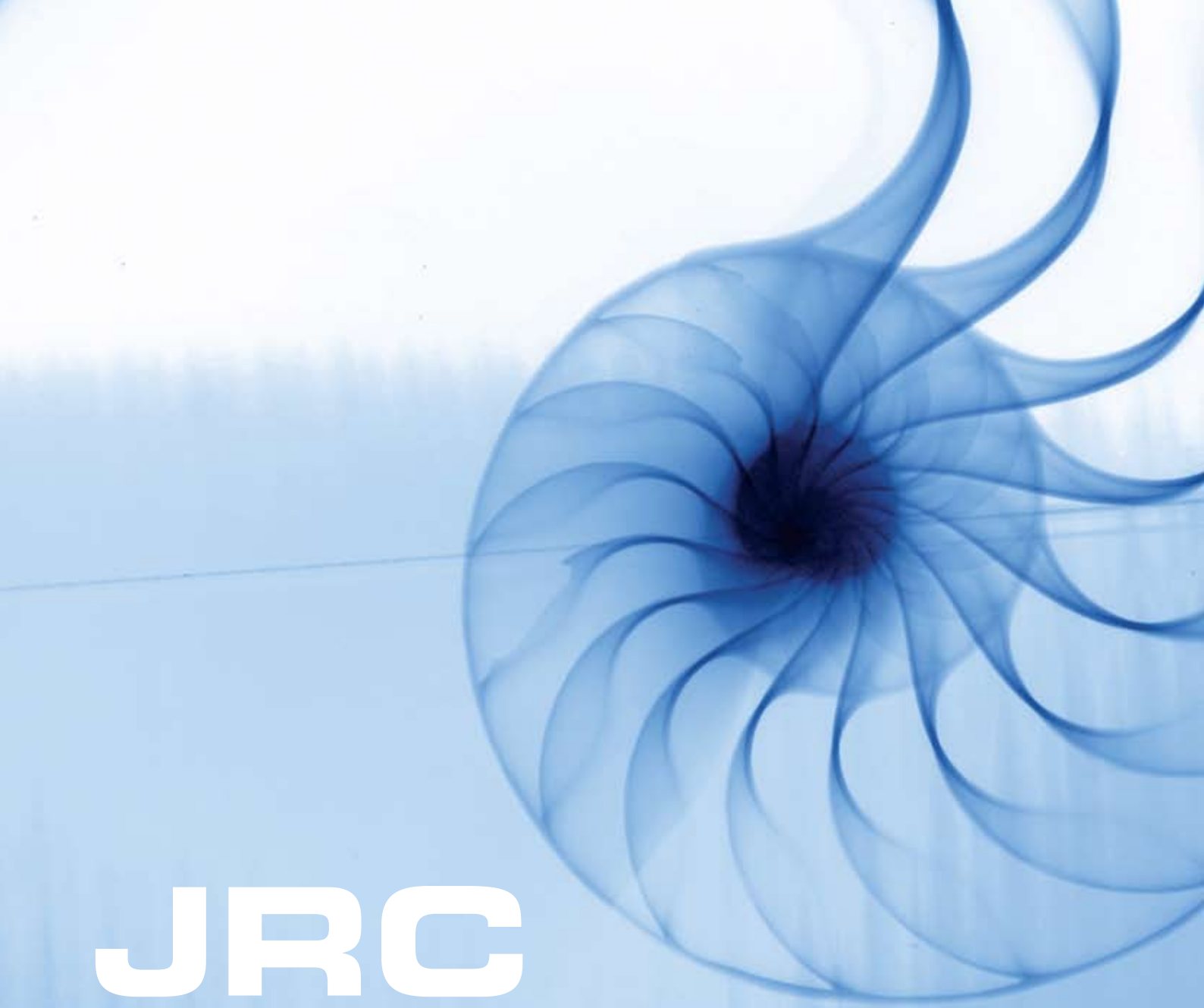
Mission

The mission of the Joint Research Centre is to provide customer-driven scientific and technical support for the conception, development, implementation and monitoring of European Union policies. As a service of the European Commission, the Joint Research Centre 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.



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Joint Research Centre
European Commission

Annual Report 2008

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Joint Research Centre

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Foreword from the Commissioner for Science and Research

Janez Potočnik, Commissioner for Science and Research.

Commissioner Potočnik speaking at the European City of Sciences in Paris.

Inaugural meeting of the Slovenian Presidency with the European Commission.

"There is a strong need for evolution towards our ambitious goals for the EU." My own words in the JRC Annual Report five years ago. Time flies ... and so I am pleased to receive good news recently in the form of a report on the JRC's work under the Sixth Framework Programme for Research and Technological Development (FP6). This report was prepared by a panel led by Sir David King, until recently Chief Scientific Adviser to the UK Government. It confirms that the JRC, while fulfilling its mission to provide customer-driven scientific and technical support for the conception, development, implementation and monitoring of EU policies, continues to function as a reference centre of science and technology for the Community. Just as the European Commission's role is to uphold and represent the interests of the EU as a whole, the JRC's ability to provide credible, fully independent advice upon which to base our decisions is one of its core strengths.

When I was appointed European Commissioner for Science and Research in 2004, I heard some voices that were critical of the JRC but they have progressively lessened over the years. From supporting the full integration of the new Member States into the *acquis communautaire*, to embracing the Seventh Framework Programme (FP7) in order to further promote the integration of EU research, boost excellence and foster competition, the Joint Research Centre has provided invaluable information and analysis. In 2008, the JRC continued to underpin research and work in a wide range of fields, including: competitiveness and innovation, renewable and cleaner energies and transport, the information society, life sciences and biotechnology.

The latest statistics on the EU's performance in research and development, as well as innovation show that the EU is adapting to the challenges of our rapidly changing world by building a sustainable and knowledge-based society. The EU's assets no longer lie in resources or low-tech industries, but in brain power! The figures show that the EU has produced more doctoral graduates than the United States and Japan since 2000, so we have the capacity in human resources. What we need now are the knowledge-intensive services and industries to employ those graduates in equal number. I'm confident that the initiatives we have taken together with the Member States in order to create the European Research Area, of which the main strategic orientations are to improve the EU's research efficiency, to increase the openness and attractiveness of Europe and the free movement of knowledge, to stimulate innovation and to develop high-tech markets, are putting the EU on the right track.

The continued search for knowledge and discovery has defined Europe's identity and values. I know that the JRC's dedication, hard work and devotion to service and progress will continue in 2009 and in years to come. A new corporate strategy for the organisation is currently in development: it is set to identify core work areas on which to focus and to outline, in consultation with stakeholders and customers inside and outside the Commission, how best to implement a new global vision for the JRC.

Please take the time to look through this report and discover a whole world of scientific research that is taking place across all the JRC sites. I would like to thank every member of the JRC staff for all their commitment and to encourage them to continue providing scientific excellence to the EU.

JANEZ POTOČNIK

Message from the Director-General

First and foremost, I would like to thank the staff of the JRC whose daily commitment and enthusiasm have started to pay off. The results of the independent evaluation made of the JRC over recent months by Sir David King, former UK Chief Scientific Adviser, and 14 experts from different disciplines are very encouraging. The focus of the evaluation is our work carried out under Sixth Framework Programme (FP6) from 2002 to 2006.
In Sir David King's introduction, he stresses that the "JRC is an indispensable source of knowledge and expertise in support of the political agenda of the EU".

Roland Schenkel, Director-General, JRC.

For my part, there are three main conclusions:

- Our strong customer-focus and emphasis on delivering results come across loud and clear, and are bearing fruit;
- The increasing demand from a growing range of customers is testimony to a job well done and the importance of scientific advice in the EU context;
- We are on the right track, but in order to make further progress and move to the next level we need to define a corporate strategy spelling out clearly how we want to work in the future.

In this year's Annual Report, selected examples of the JRC's major achievements are presented under the title 'Supporting EU policies'. Highlights from the seven Institutes are also included, as well as the JRC's contribution to the enlargement and integration of new Member States, technology transfer and intellectual property. A section of the report has also been dedicated to the Excellence Awards of the JRC's scientists and their innovative results in 2008.

Our work is becoming more and more appreciated by our customers in the Commission's Directorates-General and the Member States, by European Members of Parliament, the Council and our partners, and we are keen to share our knowledge. We took steps to promote collaboration with Turkey at the Security Research Conference in Ankara where we were impressed with the quality and standard of the research and the methodology. We can also look forward to working with Japan in the future, mainly in the field of nuclear research, as well as in the areas of environment, climate change and energy.

Mr. Schenkel at the JRC Excellence Awards Ceremony 2008.

At this year's Annual Conference of the American Association for the Advancement of Sciences (AAAS), one of the biggest scientific events in the world, our contributions were greatly appreciated. The JRC gained high visibility and a clear recognition of JRC performance. We also made an impact via key interviews with top class media which will raise the JRC profile in scientific media and establish the JRC as a real performer at the centre stage of science and technology.

The Director-General at the AAAS conference.
From left to right: Commissioner Potočnik, Aidan Gilligan, Ulla Engelmann and Roland Schenkel.

I would like to emphasise again the importance of the visits of stakeholders, customers and the local public to our sites – they can learn first-hand about our work, understand better what the JRC is about and spread the good word. I saw myself last year enthusiasm with which our staff prepared various events, and what excitement it generated among the visitors!

It is clear that there has been an increase in the visibility of the JRC and the appreciation by the public of the important role we have in EU policy making. We must strengthen that role, thus reinforcing the messages of Sir David King's evaluation. We need to continue to focus on achieving scientific excellence in our work in order to provide services tailored to the needs of our customers. Consequently, we will continue to monitor our performance and benchmark the JRC with similar organisations in the Member States.

To conclude, I sincerely thank all the JRC staff for their enthusiasm and commitment!

Roland Schenkel

Observations from the Board of Governors

The Board of Governors commends this Annual Report as a fair reflection of the achievements of the JRC during 2008. The Board believes that JRC has made significant progress in consolidating its mission, strengthening relations with its stakeholders and gaining wider international recognition. Ten years after the adoption of its mission, the JRC has demonstrated its ability to match the EU policy agenda by adapting its work programme to the evolving scientific and technical needs.

Killian Halpin,
Chairman of the Board.

Some of the most ambitious legislations issued by the EU in 2008 is the package to fight climate change and promote renewable energies. This package seeks to reduce greenhouse gases by at least 20%, and increases to 20% the share of renewable energies in the energy consumption by 2020. We are pleased to note that the JRC is strongly involved in this package and supports the "Strategic Energy Technology" plan in mapping technologies and capacities (state of the art, barriers and potential of technologies). We also appreciated the JRC's work on biofuels, and in particular its report, "Biofuels in the European context: fact, uncertainties and recommendations" which drew great attention worldwide from policy analysts, decision makers and the international press.

The JRC has also strengthened its expertise in the area of climate change, by pooling the competencies available within different institutes – such as techno-economic modelling, monitoring deforestation and impact assessment – in order also to underpin the EU position at the United Nations Framework Convention on Climate Change (UNFCC) conferences. In this context, we wish to commend the recent report issued by the JRC together with the European Environment Agency and the World Health Organization, entitled "Impacts of Europe's changing climate". The report addresses the effects of global climate change on the environment and on human activities, highlighting the most vulnerable areas in Europe.

"Biofuels in the European context: facts and uncertainties".

The Board wishes to acknowledge the work of the European Chemical Bureau (ECB), which celebrated its 15th anniversary in April 2008. We were particularly proud to note the high consideration for the work of the ECB expressed by its stakeholders during the celebratory event. We are also pleased to observe that many of the tasks undertaken by the ECB have now been taken over by the European Chemicals Agency (ECHA) in Helsinki, and that the JRC is a member of the management board of this agency. We also encourage the JRC not to disperse its expertise on chemicals, but to concentrate on research areas closely related to the REACH legislation including exposure assessment and validation of in-vitro tests in alternative to tests on animals.

Another important JRC achievement is the implementation of the INSPIRE Directive (Infrastructure for Spatial Information in Europe). The EU Member States appreciate the quality of the work and the transparency of the process for the development of the implementing rules, which the JRC has prepared in collaboration with an international expert group. Once the adoption process is completed, the implementing rules will take the form of a Commission regulation and will become national law in the Member States. The JRC has renowned expertise in remote sensing. One example of an application of remote sensing is the new map which the JRC has compiled to describe the distribution of soil pH across the EU, using advanced geospatial interpolation techniques and more than 12,000 data points across Europe. This map allows a more precise assessment of soil quality and to identify areas that may have limitations of their soil functions due to extreme pH values.

We also noted significant progress at the JRC in the field of security research across a wide range of topics, from the identification of the critical infrastructures in Europe related to the energy and transport networks, to the analysis and review of the EU Deposit Guarantee Scheme and the support to crisis management at a European and global level.

Board of Governors meeting in Seville on 20-21 November 2008.

The Board was particular impressed by the high profile leading-edge work the JRC is carrying out in the field of genetically modified organisms (GMOs). Only five years after its establishment, the GMO Community Reference Laboratory is recognised as a reference centre of worldwide renown. In 2008, the JRC delivered a report to the European Parliament gauging current approaches to addressing potential health effects from genetically modified food and animal feed. Also impressive is the growing market of the JRC reference materials: concerning the number of distributed units, the JRC is today second only to the US National Institute of Standards and Technology (NIST) and is world leader in the reference materials for biotechnology applications (food and feed, GMO, microbiological and pathogen, clinical). We look forward to the success of the JRC's strategic collaboration with NIST, which aims at advancing the development and availability of international measurement standards in the fields of chemistry, life sciences and emerging technologies.

We would also like to mention the important work carried out by the JRC in supporting EU research policy, for instance its EU Industrial Research and Development (R&D) Investment Scoreboard presents information on 2,000 companies from around the world reporting major investments in R&D. The 2008 edition revealed that for the first time in five years, European companies outpaced US counterparts in R&D investment growth. We would like to see the JRC being even more involved in supporting the EU research policy.

Significant progress has been observed on several topics related to the safety and security of nuclear energy. For instance, the JRC has been involved in the implementation of the new "Sustainable Nuclear Energy Technology Platform", and has contributed to the publication of its strategic research agenda. Meanwhile, its nuclear forensic team has continued to perform a crucial role in fighting illicit trafficking on nuclear materials in Europe. We also appreciated the recent Commission communication on the decommissioning of nuclear installations and management of radioactive waste at the JRC carried out under the Euratom Treaty.

We wish to stress, that to be able to give sound scientific support, the JRC must also perform exploratory research of its own. We are pleased that the JRC sets aside resources for this

purpose, and encourage the organisation to continue this practice. We appreciate the effort of the JRC management to reward exploratory research, which is also highly motivating for younger researchers.

We noted that the JRC has also stepped up its effort to develop new collaboration and gain visibility outside the EU. We appreciated in particular its efforts in 2008 to promote the integration in its activities of research organisations and experts from the Seventh Framework Programme (FP7) Associated Countries and EU Candidate Countries.

Finally we would like to commend the evaluation of the JRC activities during the Sixth Framework Programme (FP6) that was carried out by a panel of independent high-level experts chaired by the former UK Chief Scientific Adviser Sir David King. The Board discussed the report with Sir David King and the JRC senior management, and noted with satisfaction the overall positive assessment of the performance of the JRC. The Board is looking forward to further improvements of the JRC following the recommendations of the report, and will follow progress on their implementation.

Ten years after the adoption of its mission, the JRC has demonstrated its ability to match the EU policy agenda by adapting its work programme to the evolving scientific and technical needs.

The Board monitors the JRC's efforts to improve its efficiency and effectiveness, and is gratified that so much good science has been achieved while making progress on key performance targets.

Killian Halpin, Chairman of the Board

The Board believes that JRC has made significant progress in consolidating its mission, strengthening relations with its stakeholders and gaining wider international recognition.

Ex-post evaluation of the JRC

A panel of 14 international experts led by Sir David King has completed an in-depth review of work carried out by the Joint Research Centre from 2002 to 2006 under the Sixth Framework Programme for Research and Technology Development (FP6). Success factors were identified as: delivering continued service to the European Commission without compromising scientific vitality or integrity; responding to customer needs; integration of the seven research Institute's competencies and facilities around thematic priorities; increased networking activities; enhanced researcher training; and assisting Candidate Countries in the last steps of the EU accession process.

The evaluation panel observed that "the JRC has accepted and implemented the recommendations of the Five-Year Assessment carried out in 2003" through a clear customer orientation and "reinforced its networking activities both across Europe and internationally".

Sir David King stated that, "it became evident during the panel' s work that the JRC today is not only instrumental in supporting the policy development of the European Commission, but also in responding to crisis situations threatening the security of European citizens. The JRC has undergone a major transformation over the last ten years, consolidating its position as an indispensable source of knowledge and expertise in support of the EU' s political agenda".

The report singles out as special achievements the JRC's role in enhancing the training of European researchers, assisting new Member States in the uptake of EU legislation, and delivering well-respected international services in several areas of competence.

Sir David King wrote that a "detailed assessment of the work carried out during FP6 convinced the panel of the good, very good and sometimes excellent quality". To continue further, he said the JRC will need a fully-fledged corporate strategy with a vision describing where the JRC should be in five years' time. It should also have an eye on where the JRC could be 25 years from now, in terms of its assets, competences and priorities. The panel felt that this vision might distinguish at least three distinct types of activity. The largest element will remain providing policy support to customers largely within the Commission, but increasingly extended to the Parliament and Council. The second element is the JRC's Euratom commitment via a stable Euratom Framework Programme. Thirdly, the JRC's expertise and work on reference materials and measurements will remain constant.

Therefore, while the future looks bright, Director-General Roland Schenkel is determined to keep the momentum going and stated that, "we cannot afford to stand still". Following the evaluation, Mr Schenkel said that "the conclusions and recommendations of the King evaluation are very much in line with the thinking behind the senior management's push in recent years for a more strategic approach to our ongoing development. In that sense, we share the same vision on issues such as promoting a greater anticipatory thinking inside the JRC on what client needs may be upcoming, promoting greater integration of resources within the JRC and between units and Institutes, and finally promoting a JRC-specific approach within Commission rules to recruitment. We simply must ensure that we have the right pool of talent to perform the growing range of specialised work we are increasingly called upon to provide".

Sir David King, Evaluation Panel Chairman and former UK Chief Scientific Adviser.

"Ex-post Evaluation, Joint Research Centre: Direct Actions in the 6th Framework Programmes 2002-2006".

Quotations

EuropeAid and the JRC have worked together for many years now. But bridging the distance between Brussels and Ispra was very worthwhile. I' m impressed by the variety of issues at hand, the expertise with which they are implemented, and the voluntarism in selecting relevant subjects. Let' s not only continue, let' s intensify co-operation!

Koos Richelle, Director-General of EuropeAid (13 March 2008)

Knowledge is the most powerful tool for development. Sharing knowledge is wholly the best form of development partnership. The JRC has knowledge and it shares it. This makes it a great partner for development. Let' s keep working together! Thank you and congratulations.

Stefano Manservisi, Director-General for Development (30 May 2008)

JRC Clearing House annual meeting in Petten (17-18 December 2008)

The Clearing House JRC team activities and initiatives taken during 2008 were found to be well managed, justified, targeted and were achieving the overall objective to intensify and enhance the use of operational experience for safety improvement. On behalf of all Clearing House members, we would like to thank the IE team for its dedication, professionalism and the results achieved in 2008.

Jukka Laaksonen, Director-General of STUK (Radiation and Nuclear Safety Authority of Finland), as a Chair of the Technical Board of the JRC Clearing House on NPP Operational Experience Feedback


SUPPORTING
EU POLICIES

Health and consumer protection

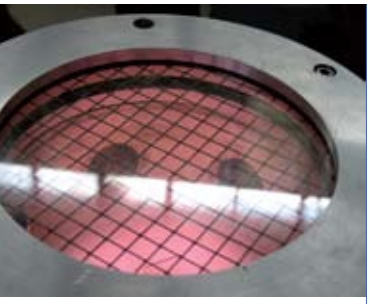
JRC publishes study on health effects of genetically modified food and animal feed

Assessing the potential health impacts of food derived from genetically modified (GM) plants is an important component of any consumer protection policy. Associated societal issues are complex, and this is a subject of intensive research which is surveyed not only by the scientific community, but also closely followed by the regulatory bodies. In September 2008, the JRC published a study entitled "Scientific and technical contribution to the development of an overall health strategy in the area of GMOs (genetically modified organisms)".

Carried out at the request of the European Parliament in co-operation with the European Food Safety Authority (EFSA) and with input from a panel of twenty international experts, the study assesses the current situation in terms of scientific knowledge in this field, and addresses areas for possible improvement. The study found that there is a comprehensive body of knowledge that already adequately addresses current food safety issues including those dealing with GM products, and that this is considered by the experts as sufficient to assess the safety of present GM products. However, it also indicates that more research and development is necessary in an international context in order to maintain an adequate capacity to deal with novel products in general terms (not only GM-derived).

Monitoring food safety in a chemical laboratory.

The study, which attracted considerable attention from the press, was complemented by the development of a new, rapid and ready-to-use analytical system for the simultaneous detection of all EU approved and non-approved GMOs for which a method was submitted to the Community Reference Laboratory for GM Food and Feed. The system allows for the simultaneous detection of different types of known GMOs. The adoption of this tool by control laboratories will be an important step towards achieving harmonised means of detecting GMOs.



Top view of a plasma discharge used for plasma sterilisation and decontamination. (© A. Rana)

Fifteen years of assessing dangerous chemicals in the EU

2008 represented a milestone in the history of the European Chemicals Bureau (ECB), marking its fifteenth year of activity evaluating dangerous chemicals, and at the same time, the accomplishment of its tasks and handover of the activities to the newly created European Chemicals Agency (ECHA).

The ECB was created in 1993 with tasks concerning the legislation on classification and labelling of dangerous substances, the notification of new substances, testing methods, risk assessment of new and existing substances, and export/import control of dangerous substances. Following a debate started in the European Parliament in 2000, a new European chemicals legislation, REACH, entered into force in 2007, replacing some 40 previously separate legal texts.

REACH called for the establishment of the ECHA, which became fully operational in June 2008. The ECB contributed to the successful start-up phase of ECHA by seconding experienced staff members and also providing an essential database for the collection and exchange of chemical data. A significant number of activities of the ECB have already been and will continue to be phased out during 2009, and its expertise on risk assessment methodologies will be used to support new challenging working areas of the JRC, including integrated test strategies to assess the toxicity of chemicals and to reduce and replace animal testing as much as possible.

Controlling risks in one go requires a new mindset and multi-disciplinary expertise.

Frans M. Christensen

Protection and security of the citizen

Reinforcing the stability of the financial system: the JRC contributed to the revision of EU rules on Deposit Guarantee Schemes

Deposit Guarantee Schemes play a key role in maintaining confidence in the banking sector and help to avoid bank runs.

Deposit Guarantee Schemes are a key element of the financial safety net ensuring that, if a bank fails, depositors will be able to recover at least a part of their money. This increases confidence in the banking sector and avoids bank runs leading to severe economic consequences.

The functioning of Deposit Guarantee Schemes is regulated in the EU by the Directive 94/19/EC. A revision of this Directive has being going on for the last few years and the JRC supported this process by providing a number of technical studies (publicly available on the Internal Market and Services Directorate-General (DG) website: http://ec.europa.eu/internal_market/bank/guarantee/index_en.htm).

The ongoing financial crisis prompted EU policy makers to accelerate the revision process. An amendment of the Directive, fed by the JRC's work, was released in October 2008. One of the main changes proposed concerns the increase of the minimum level of coverage for all deposits. Internal Market and Services Commissioner McCreevy said, "Increasing the minimum protection will strengthen Europeans' confidence in the safety of their deposits. The new rules go hand in hand with the commitment made by EU finance ministers ... and are another sensible and proportionate response to the financial turmoil we are experiencing"[1].

The JRC contributed to the revision of EU rules on Deposit Guarantee Schemes to reinforce the stability of the financial system.

Francesca Campolongo

Upon an urgent request of Internal Market and Services DG, the JRC conducted an 'ad hoc' study on the impact of raising the minimum level of coverage in the EU.

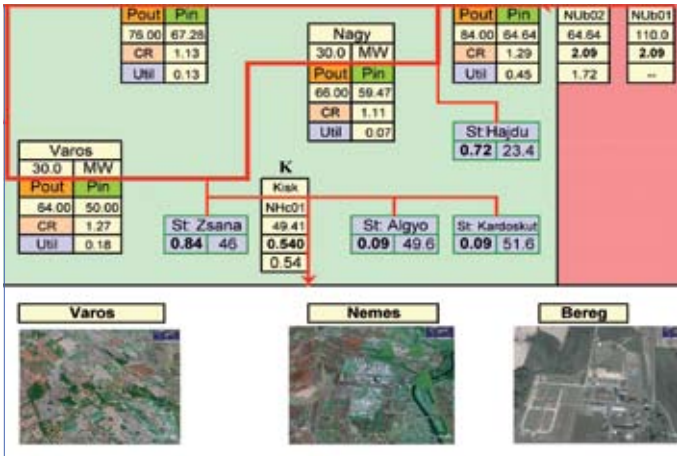


Illustration of a model of transmission of gas over a number of European Countries used to identify critical elements of the gas infrastructures and assess the cross-border consequences of their failures.

Critical Infrastructures Protection

The European Programme for Critical Infrastructure Protection, adopted by the Commission in December 2006, recognises that the security and economy of the European Union, as well as the well-being of its citizens, depend on certain infrastructures and the services they provide. The disruption of such infrastructures could mean the loss of lives, the loss of property and a collapse of public confidence in the EU. In support of this programme, and in close co-operation with Member States and the European Council, the JRC carried out research to identify critical infrastructures, assess their vulnerabilities and the consequences of their failures upon inter-dependent infrastructures and society at large, and define strategies to improve their protection. This research involved modelling and simulation of the infrastructures in the transport, energy, chemical, and information and communication sectors, as well as laboratory experimentation in cyber-security and on the physical vulnerabilities of structures. The JRC developed the criteria which will assist Member States in the selection of their critical infrastructures, as well as the technical guidelines for the application of the directive on the "identification and designation of European critical infrastructures and the assessment of the need to improve their protection"[2] adopted by the Council in December 2008.

The protection of our critical infrastructures is of paramount importance for the security and economy of the European Union as well as the well-being of its citizens.

Jean-Pierre Nordvik

1 Press release IP/08/1508 of 15 October 2008.
2 Directive 2008/114/EC, 08 December 2008.

New serum and nanotechnology reference materials

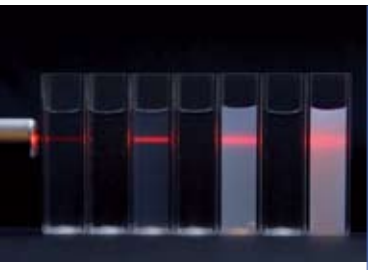
Serum protein reference material

Measurements of serum proteins are used for the diagnosis of many conditions including infection, liver or kidney disorders, iron deficiency, malnutrition and the monitoring of autoimmune diseases. Consequently, they are amongst the most important measurements done in clinical chemistry.

Serum proteins are used for the diagnosis of many health conditions.

In 2008, the JRC released a new reference material certified for the mass concentration of 12 serum proteins. The reference material is intended to be used for assigning values to calibrators that are an integral part of in vitro diagnostic medical devices (IVDs). The EU Directive on In Vitro diagnostic medical devices (IVD-MD) (Directive 98/79/EC) requires traceability of calibrants and control materials to reference measurement procedures and/or reference materials of higher order. The International Federation of Clinical Chemistry (IFCC), which actively supports standardisation in clinical chemistry, collaborated with the JRC on the development of this material.

The reference material, ERM-DA470k/IFCC, is the successor of ERM-DA470, which is presently used worldwide as the serum protein standard. The new material will ensure continuity in the standardisation of serum proteins, which is crucial in clinical chemistry. It makes it possible for laboratories worldwide to use common reference ranges, and to compare results over time and between hospitals and countries.



Nanoparticle solutions of increasing concentration.

Nanotechnology

The European Commission's communication on regulatory aspects of nanomaterials (COM(2008)366) reported that the scientific basis needed to fully understand all properties and risks of nanomaterials is insufficient. It concluded that a rapid improvement of scientific knowledge, such as data on toxic effects and specific characteristics of nanomaterials, was required.

To better understand the correlations between structural and functional properties of nanoparticles, one needs to accurately measure their physicochemical characteristics. The key measurement is expected to be the analysis of the particle size. The JRC has prepared a new reference material (IRMM-304) for quality control of particle-sizing. The reference material consists of silica nanoparticles with a nominal diameter of 40 nm suspended in an aqueous solution, and can be used for checking the performance of instruments and methods that characterise the particle size distribution of nanoparticles suspended in a liquid medium. It can be used for method development, interlaboratory comparisons and establishing quality control charts.

The JRC is also investigating the potential toxicological effects of nanoparticles, focusing on their physico-chemical characteristics and biological activity. This activity has been developed in collaboration with scientific partners and international organisations. The JRC co-chairs two steering groups within the Organisation for Economic Co-operation and Development (OECD) Working Group on Manufactured Nanomaterials. Different toxicity in vitro tests have been compared and selected for nanotoxicology applications, including the Colony Forming Efficiency test to screen basal cytotoxicity, the Cell Transformation Assay for carcinogenic potential, and the Micronucleus test for the genotoxicity. These tests are now being optimised to develop standardised protocols.

Stefanie Trapmann

The reliable measurement of complex substances such as proteins in human serum requires a thorough understanding of their properties relevant for decisions, in health diagnosis. Therefore, JRC-IRMM scientists are leading interdisciplinary projects to develop related measurement standards required worldwide.

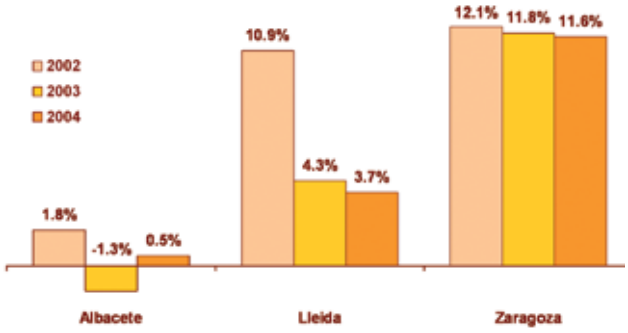
Genetically modified maize in the EU

Agronomic and economic aspects of GM maize cultivated in the EU

Despite the extensive adoption worldwide of genetically modified (GM) crops – 114 million hectares in 2007 in 23 countries – cultivation in the EU remains very limited (less than 0.1 million hectars) and is restricted to a single crop (a type of pest-resistant maize known as *Bt* maize).

Scientific and policy debates on GM crops in the EU have so far focused mainly on safety and less on the possible agronomic performance and economic impact for farmers. However, this research is fundamental to obtain a wider picture of GM technology and is understandably attracting the attention of policy makers. In the EU, the Council[1] asked the Commission to submit to the European Parliament and the Council a report on the socio-economic benefits and risks, and the agronomic sustainability of placing GMOs on the market based on information provided by the Member States by June 2010 for due consideration and further discussions.

Anticipating this scenario, the JRC published a report in 2008, entitled, "Adoption and performance of the first GM crop introduced in EU agriculture: *Bt* maize in Spain", presenting the results of a field survey of commercial maize farmers in Spain – the largest EU producer of GM maize. This study looks for the first time into the agronomic and economic performance of a GM crop in Europe (*Bt* maize) during three growing seasons (2002-4). Researchers also looked into the profile of farmers who adopted *Bt* maize versus those who did not.



Yield difference of Bt *maize over conventional maize (by region).*

The study concludes that:

- farmers adopting *Bt* maize experienced higher average yields than conventional maize growers;
- there are no differences in the market price paid to farmers for *Bt* or conventional maize;
- while *Bt* maize seeds are more expensive than the conventional ones, *Bt* maize growers use less insecticide to control maize borers, and thus have associated savings;
- all things considered, the impact of *Bt* maize adoption on gross margin obtained by farmers in different provinces ranged from neutral to €122 per hectare, per year;
- *Bt* maize adopters quoted 'lowering the risk of maize borer damage' and 'obtaining higher yields' as the two main reasons to adopt the technology; 'better quality of the harvest' is also quoted by farmers because of reductions in maize ear damage by pests.

Finally, the report compared the socio-economic profiles of both types of farmers. No statistical differences were found for variables such as land ownership, farm size, main crop cultivated, age, education, agricultural training or years of experience as a maize grower. Therefore, the report concludes that the higher yields and gross margins enjoyed by *Bt* maize growers are mostly attributable to the adoption of *Bt* maize varieties and not to the differences in the technical competence of the two types of farmers surveyed.

The JRC has produced many documents on the socio-economic aspects of GM crops and on co-existence, available from: http://ipts.jrc.ec.europa.eu. The main findings of this report were also published in the April 2008 issue of *Nature Biotechnology* ("*Bt* corn in Spain – the performance of the EU's first GM crop", Vol. 26, No.4, pp.384-6).

I am proud to be part of a team that is making a significant contribution to the development of better policies around the knowledge triangle, and thus provide a valuable contribution to Europe' s sustainable growth.

Xabier Goenaga

1 http://www.consilium.europa.eu/ueDocs/cms_Data/docs/pressData/en/envir/104553.pdf

The environment and climate change

EFDAC viewer for European Datasets (forest condition, JRC data)

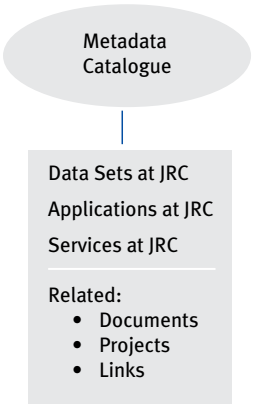
European Forest Fire Information System (EFFIS)

European Forest Resources Information System

Shared Environmental Information System

The Shared Environmental Information System (SEIS) (COM(2008)46 final) will modernise and simplify the collection, exchange, and use of environmental information. It builds on three pillars:

- INSPIRE (Infrastructure for Spatial Information in Europe) is a Directive (2007/2/EC) establishing an Infrastructure for Spatial Information in Europe. As its technical co-ordinator, the JRC develops the specifications for metadata, services and interoperability to which SEIS will also comply;
- GEOSS (Global Earth-Observation System) is an international initiative to link earth observing systems. The JRC co-chairs the Architecture and Data, and User Interface Committees to ensure that European requirements are centrally placed;
- GMES (Global Monitoring for Environment and Security) (COM(2008)748 Final) aims to develop a European independent capacity for monitoring the Earth's environment and security threats, and contribute new services to SEIS (Shared Environmental Information System).



Structure of the European Forest Data Centre (EFDAC).

The JRC ensures the technical coherence of SEIS, INSPIRE, GMES and GEOSS and provides content through two data centres:

- **The European Forest Data Centre (EFDAC)** is the focal point for data and information on forests in Europe. It facilitates the access to all the European datasets for forest resources, forest condition and forest fires, and provides the link to other international information systems.
- **The European Soil Data Centre (ESDAC)** is the thematic centre for soil-related data in Europe and has been established according to a decision taken by the European Commission's Environment DG, the JRC, the European Statistical Office (Eurostat) and the European Environment Agency. It currently contains soil data and information on a European scale and provides links to similar data centres at global and national level.

Climate change impacts: the challenge for Europe

Europe is affected by the consequences of climate change and these are becoming ever more visible in the economy, environment and human health. The European climate change programme acknowledges that in addition to enhancing greenhouse gas emission reductions, there is also an urgent need to adequately adapt to climate change and moderate its negative effects.

A key contribution to the European and international discussion on the consequences of climate change has been provided by the JRC reference report, "Impacts of Europe's changing climate".

The JRC delivered scientific evidence that policy measures addressing climate change on the one hand and those regarding air pollution on the other can in fact synergise.

Rita van Dingenen

The report, jointly prepared with the European Environment Agency and the World Health Organization, analyses a wide range of fields and highlights that vulnerability to climate change varies widely across regions and sectors in Europe. Evidence is provided, based on 40 key indicators, of the consequences of both observed and projected changes. These include an increased risk of floods and droughts, loss of biodiversity, threats to human health, and damage to economic sectors such as energy, transport, forestry, agriculture and tourism. It shows that the main vulnerable areas in Europe are mountainous regions, coastal zones, the Mediterranean and the Arctic. The research performed by the JRC in collaboration with top-class world partners provides key elements for the definition of the European strategy of adaptation to climate change.

Sustainable energy

Strategic Energy Technology Plan and Strategic European Energy Review

The JRC is the co-ordinator and operator of the Information System of the European Strategic Energy Technology Plan (SETIS) – an open access information and knowledge management system designed to provide regular and reliable information and data for effective strategic planning. The JRC contributed to the second Strategic European Energy Review which focused on energy security and solidarity. It compiled and validated reference values for the performance and the current and future production costs of energy for 33 technologies used in power generation, domestic heating and road transport. These reference values were requested by the European Council and were used for the assessment of the potential role of low carbon energy technologies in the transition to a more sustainable energy system. This assessment was based on a consistent methodology (developed by the JRC) for collecting, validating, harmonising and processing up-to-date information on energy technologies. Furthermore, the JRC performed an analysis of the coal, oil and natural gas reserves in the European Union and produced a European fossil fuel resources map which accompanied the Strategic Energy Review. This information was used to underpin the arguments on energy security, as presented in the Commission communication COM (2008) 781.

Commissioner Potočnik and Giovanni De Santi discussing SETIS and SET Plan reports at the French Presidency SET Plan event.

The JRC also assisted the European Commission's Energy and Transport DG, Research DG, and Economic and Financial Affairs DG in the impact assessment of the forthcoming communication on "Financing Low Carbon Energy Technologies" by developing the Technology and RTD Capacity Maps which underpin the impact assessment.

Biofuels

Over the last few years, biofuels have been the subject of a worldwide societal debate related to issues of cost, security of energy supply, greenhouse gas emissions, the sustainability of production systems, the impact on food production, land use, and biodiversity. In this context, the JRC Well-To-Wheels (WTW) study of automotive fuels was one of the first studies to include detailed analysis of energy use and greenhouse gas emissions assessment of biofuels.

The JRC Biofuels Task Force is using a truly integrated approach to address all issues related to biofuels.

Following the WTW study, the report "Biofuels in the European context: facts and uncertainties" was published in March 2008 as a contribution to the Commission's "Proposal for a Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources (COM (2008)19)". The document integrated the work of several JRC Institutes and added some of the latest information available on indirect effects of biofuels production in developing countries. It provided significant input to the development of policy.

To work on biofuels is a real challenge. It offers the JRC a unique opportunity to play a central role in a scientific debate – one which has a huge impact on society.

Luisa Marelli

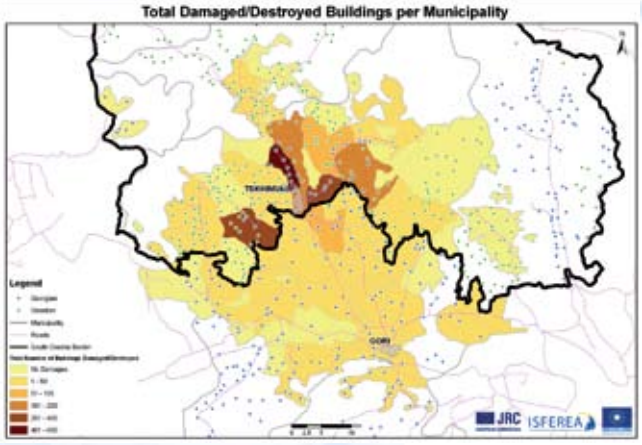
In 2008, the JRC Biofuels Task Force became a working platform to address the most relevant policy questions related to the production and use of biofuels, and is a truly integrated approach. Work has focused particularly on questions of sustainability, with issues of direct and indirect land use, changes related to greenhouse gas emissions, impacts on soil, water and biodiversity, pressure on tropical forests, compatibility with vehicle and energy efficiency, development of second generation biofuels, and the economic effects of an increase in the demand for biofuels.

The development and large-scale deployment of advanced low carbon energy technologies in Europe is a necessary condition for the Union to meet its challenging but necessary energy and environmental goals.

Evangelos Tzimas

Response to crises in 2008

In 2008, the JRC continued its efforts to enhance the capacity of the European Commission to anticipate, prepare and respond to crises.



Georgia damages per municipality.

Rapid civilian damage assessment for the Georgia conflict of August 2008

The JRC, in co-operation with the European Union Satellite Centre (EUSC), carried out a civilian damage assessment of transport infrastructure as well as residential and non-residential structures in the core conflict area of the Georgian Territory. The comprehensive damage assessment undertaken on the basis of analysing pre- and post- crisis very high resolution satellite data (1 m and finer) constituted a first independent assessment of the largely inaccessible conflict area. The summary of the findings were presented by the European Commission's President Barroso to the EU Heads of State or Government at the emergency EU summit held in September 2008.

The JRC's response to the Wenchuan earthquake on 12 May 2008

On 12 May 2008, the Sichuan province in China was affected by the Wenchuan earthquake with a magnitude of Mw 7.9, a shallow depth of 19 km and a rupture length of 270 km. The earthquake affected a vast area, causing massive landslides and extensive damage to building structures. 70,000 people died in the event, over 370,000 people were injured and five million were reported to be homeless. The total economic loss is estimated at €90 billion.

Overview of building damage at Beichuan County town.

The JRC's Global Disaster Alert and Coordination System (GDACS: www.gdacs.org) timely provided the first alerts of the Wenchuan earthquake to its users network including the Chinese National Earthquake Response Support Service (NERSS) who promptly reacted, saving lives.

Yingxiu town of Wenchuan County: soft storey collapse of a Xuankou middle school five-storey building.

At the request of the European Commission delegation in China and in agreement with the Chinese Ministry of Science and Technology, the JRC also provided scientific support to the Centre for Earth Observation and Digital Earth (CEODE) of the Chinese Academy of Science. The support included tasking and delivery of pre- and post disaster very high resolution optical and radar satellite data, as well as the provision of technical expertise in the form of a team of JRC specialists who worked alongside their counterparts in CEODE for a short period immediately following the earthquake. The successful co-operation with both NERSS and CEODE led to the signature at the end of 2008 of Memoranda of Understanding with the two organisations.

In the field of civil engineering and seismic vulnerability, the JRC together with the Earthquake Engineering Field Investigation Team (EEFIT, part of the UK Institution of Structural Engineers) participated in a field mission with the purpose of collecting data and making observations leading to improvements in design methods and techniques for strengthening and retrofit, and to assist the phase of reconstruction. A preliminary report was issued within the first two weeks of completing the mission.

It brings huge satisfaction to my team and I to be able to apply early warning/alerting systems and information extraction and analysis techniques developed at the JRC in order to assist the Community and its partners in responding effectively to major crises.

Delilah Al Khudhairy

JRC supports EU response to floods in Romania, Moldova and Ukraine

Extensive flooding in Romania, Moldova and Ukraine triggered a rapid response from the Commission and EU Member States who offered valuable assistance, hardware and experts through the EU Civil Protection Mechanism. The JRC supported this effort by delivering forecasts and real-time monitoring of the flood based on its early warning system, the European Flood Alert System (EFAS)[1]. More generally, the JRC also provided policy support on this issue, focusing on cross-border river basins. For example, the JRC carried out flood mitigation and forecasting case studies in the Elbe and Danube, along with flood risk mapping, and information on flash floods and climate change effects on the river flood issue in Europe.

New international system for early flood warning in Danube River basin

The first international system for forecasting Danube floods and providing early flood warning was launched on 10 March 2008 by the International Commission for the Protection of the Danube River (ICPDR)[2] together with the JRC. Following the disastrous floods in the Danube and Elbe basins in 2002, the new system now provides the national authorities of the Danube River basin – the most international river basin in the world – with up to ten-day forecasts to prepare for large floods. 'Danube-EFAS' is now part of EFAS, run by the JRC and used by 25 national authorities across Europe, and covers over 85% of our continent's major international river basins.

Disastrous flooding in the Elbe basin in August 2002.

Europe prepares for forest fires – major simulation exercise held in Sardinia

With extraordinarily hot summers becoming more frequent, the risk of forest fires has been increasing. In 2008, the European Commission and Member States worked closely together to prepare for the then coming forest fire season, building on the lessons learnt from the tragic experiences of 2007. Five Member States and the European Commission's disaster Monitoring and Information Centre (MIC) were involved in a large-scale simulation exercise in Sardinia that ran from 16 to 19 April 2008. Exercises like this one, but also actual fire-fighting campaigns, are supported by the JRC's European Forest Fire Information System (EFFIS)[3]. EFFIS provides fire danger forecasts (currently up to six-day forecasts) during the fire season, helping to improve preparation for forest fire fighting. In addition, EFFIS monitors the forest fire situation in Europe through the provision of information of active fires (hot spots) and the rapid assessment of forest fire damage.

Large-scale simulation exercise in Sardinia that ran from 16 to 19 April 2008.

The JRC plays an important role in early warning and crisis management for floods and forest fires in Europe. We also participate in EU and Member States' initiatives towards the prevention of disasters.

Ad de Roo

1 http://efas.jrc.ec.europa.eu/
2 http://www.icpdr.org/
3 http://effis.jrc.ec.europa.eu/

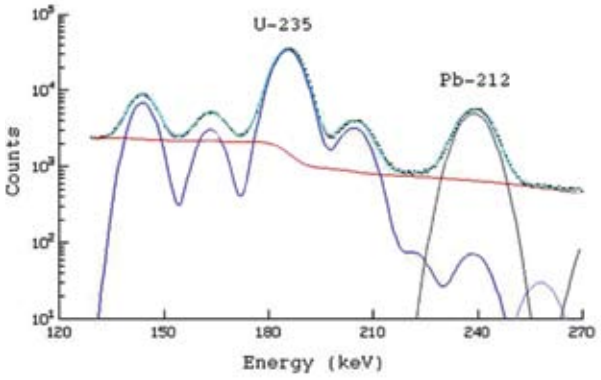
Nuclear safety and security

Experts from the German Federal Office for Radiation Protection (BfS) measure an unknown nuclear sample during their training at the JRC.

Response and detection support to nuclear security events

In November 2007, 430g of uranium oxide powder was seized in Slovakia. A sample of this material was analysed at the JRC where important information on the production date of the material was revealed, and hints on the production process provided. Such nuclear forensic support is offered by the JRC to EU Member States and other countries upon request. To answer the expanding training demand in this field, the nuclear security activities are encompassed by a comprehensive training programme, ranging from the development of national response plans, and the management of contaminated crime scenes, to nuclear forensic analysis in the laboratory, which form today a major pillar of the JRC's nuclear training programme. These activities are embedded in a broad range of international collaborations, including the International Atomic Energy Agency (IAEA), the International Technical Working Group on Nuclear Smuggling (ITWG), Europol, Interpol, Germany, France, the United Kingdom, Australia, Canada, Russia, Ukraine, the United States and others. In December 2008, the JRC hosted an international workshop on "Nuclear forensics and law enforcement awareness" focusing on the Caucasus region. The workshop was jointly organised by the JRC, the US Department of State and the International Science and Technology Center (ISTC) and was aimed at describing the current status of nuclear security in the participating countries. It resulted in concrete project proposals for addressing the problems identified.

In-field support to Euratom and IAEA safeguards for physical inventory verification of uranium fuel



Gamma spectrum (dotted line) of low-enriched uranium, obtained with the COMPUCEA $LaBr_3(Ce)$ detector, fitted (solid lines) with a modified NaIGEM code. The presence of ^{212}Pb from the decay of ^{232}U indicates that the material has been reprocessed.

The JRC provides support to the Commission's Energy and Transport DG (Euratom) and IAEA safeguards inspectors during their physical inventory verification campaigns in European low-enriched uranium fuel fabrication plants. JRC analysts are present on-site to perform high-accuracy analyses of uranium elemental content and ^{235}U enrichment in uranium pellet and powder product samples with the transportable COMPUCEA equipment. The analytical results are directly reported to the inspectors on site, ensuring timeliness and eliminating the necessity to ship samples. In 2008, a total of 58 samples were measured at four different installations. An upgraded version of gamma spectrometry software for the ^{235}U determination was launched which enables the identification of uranium produced from reprocessed material by detecting the decay products of ^{235}U. The COMPUCEA technique has been validated, and a comparison with analyses of parallel samples at IAEA analytical laboratories showed excellent consistency.

Study on radiological vulnerability in the European Union

Klaus Mayer

The JRC's nuclear research makes a strong contribution to Europe's high profile in nuclear safeguards and security.

The threat of illicit trafficking of nuclear and radioactive material and their possible use for terrorist purposes is of great concern to the international community. This concern has led to significant activities and counter-measures by national and international organisations. The key question that nevertheless remains is how well prepared are the European Union and its Member States to face radiological threats. In order to strengthen preparation against nuclear terrorism, the Commission's Justice, Freedom and Security DG has entrusted the JRC to carry out a survey of radiological vulnerability in the European Union. The issues raised are, for example, the European and international (non-)binding instruments related to the radiological and nuclear preparedness, and the identification of different radioactive material dispersion scenarios and the consequent management of such events. The results were presented and discussed during an expert seminar (gathering 47 participants from several Member States) which took place in July 2008. A number of areas for security improvements at EU level in the field of combating radiological and nuclear terrorism have been identified.

Other examples of supporting EU policies

New Impact Assessment tools website

The JRC opened an Impact Assessment tools website (IA TOOLS) to the public (http://iatools.jrc.ec.europa.eu). This online platform provides policy actors and impact assessment practitioners throughout Europe with a repository of guidance, information and best practices for impact assessment of new policies and legislative measures.

Regulatory framework for carbon capture and storage

The JRC provided the Environment DG with a quantitative analysis on the number and capacity of coal/lignite and gas plants that operate as electricity-only or in a cogeneration of heat and power mode, affected by the 300 MW rule for compulsory carbon capture.

Publication of a peer-reviewed scientific article on the control of origin of Atlantic salmon

The work "Determination of origin of Atlantic salmon (Salmo salar): the use of multiprobe and multielement isotopic analyses in combination with fatty acid composition to assess wild or farmed origin" was published in the *Journal of Agricultural and Food Chemistry*. This scientific work is an outcome of the research carried out within the FP7 project COFAWS to support the common organisation of the markets in fishery and aquaculture products (Council Regulation (EC) No. 104/2000), especially with regard to traceability and information to consumers (Commission Regulation (EC) No.2065/2001).

JRC provides support to ECDC for the 2008 Olympic Games

The European Centre for Disease Control (ECDC) requested the support of the JRC's Medical Health Intelligence System (MEDISYS) in tracking health threats in the Olympic Games in China. A MEDISYS system to allow for live tracking, alerting and searching in Chinese was operational in time for the Olympic Games.

The JRC becomes a member of the new western Balkan countries' International Co-operation Network for eastern European and central Asian Countries (INCO-NET)

The Western Balkan Countries (WBCs) INCO-NET was officially launched in Ljubljana, Slovenia. WBC-INCO-NET members include 25 research ministries and agencies from WBCs and EU countries. WBC-INCO-NET aims to support WBCs to identify research priorities and capacities in a sound and transparent way and to foster participation of researchers from these countries in the Framework Programme. The main role of the JRC in the four-year project is to help define a methodology for priority setting to be applied in all WBCs as well as to support dialogue with various Commission Directorates-General and to monitor co-operation and participation in the EU Research Framework Programme.

Final noise protocols delivered to the Environment DG

In the context of the implementation of the Environmental Noise Directive (END), the JRC delivered an updated technical report that includes the final protocols on road traffic, railway traffic, industrial and aircraft noise to the Environment DG. These protocols will be used by the EU Member States for the equivalence exercise between the national noise mapping methods against the interim ones.

Quotations

Visit of the Committee on Industry, Research and Energy from the European Parliament (ITRE) to JRC Ispra (28-29 October 2008)

Un plaisir de voir les réalisations et les projets du JRC à Ispra et c' est aussi une joie de revoir des personnes compétentes et sympathiques. Bonne continuation.

A great pleasure to see the achievements and projects in Ispra and it's also a joy to see such competent and kind people. Keep up the good work.

Philippe Busquin (PSE)

A great pleasure to visit the JRC at Ispra once again. Informative as ever but encouraging signs of new concepts and keeping up with the changing times and circumstances.

Giles Chichester (EPP/ED)

È sempre con grande piacere che torno ad Ispra. In questi anni, ho potuto osservare il difficile e importante lavoro che donne e uomini dei Paesi dell' Unione svolgono per dare ai cittadini ed alle Istituzioni dati scientifici e sperimentali utili, indispensabili a garantire un futuro più sicuro. Grazie per il vostro lavoro.

It's always a great pleasure to return to Ispra. During recent years, I have had the occasion to observe the difficult and important work which women and men from the Member States carry out to provide the citizens and Institutions with useful scientific and empirical data, which is necessary to guarantee a safer future. Thank you for your work.

Cristiana Muscardini (UEN)

L' ingegno e la laboriosità italiana. L' eccellenza di un centro invidiato da tutto il mondo, al servizio dell' Europa. Grazie Ispra. Grazie JRC.

Italian ingenuity and the will to work. The excellence of a centre envied by all the world, at the service of Europe. Thank you Ispra and the JRC.

Romano Maria La Russa (UEN)

HIGHLIGHTS FROM THE JRC INSTITUTES 2008

JRC Institute for Reference Materials and Measurements (JRC-IRMM)

The mission of the JRC-IRMM is to promote a common and reliable European measurement system in support of EU policies.

Reference materials

The JRC-IRMM is a leading provider of nuclear and non-nuclear reference materials which are used in laboratories around the world to calibrate instruments, establish traceability of measurement results, develop and validate new methods, and perform proficiency tests. Reference materials underpin the global measurement system and enable quality control of measurements and laboratories.

In 2008, the JRC-IRMM produced a new batch of Large-Sized Dried (LSD) spikes. Dried spikes are isotopic reference materials of certified uranium and plutonium composition intended to meet requirements for reliable and traceable fissile material control in dissolved nuclear fuel. They are provided to plant operators worldwide and to safeguard authorities including the European Commission's Energy and Transport DG, to be used at on site laboratories in Sellafield and The Hague.

The JRC-IRMM also released 33 non-nuclear reference materials in 2008, such as for the mass concentration of serum proteins and for nanoparticle sizing. As part of the continuous drive to improve its service, in 2008 the JRC-IRMM introduced an online ordering capability for reference materials (http://irmm.jrc.ec.europa.eu/rmcatalogue/searchrmcatalogue.do).

Nuclear research – maintaining and developing expertise

Signing of Euratom-CEA collaboration agreement.

In 2008, a collaboration agreement between the European Atomic Energy Community (represented by the JRC-IRMM) and the Commissariat à l'Énergie Atomique (CEA) was signed. The agreement significantly advances co-operative research in domains of common interest: high level nuclear waste minimisation and management, safety of advanced reactor concepts and fuel cycles, and issues in basic nuclear science.

As part of the broader effort to maintain a high level of expertise and human resources in all areas of nuclear fission and radiation protection, the JRC-IRMM hosted the first Neutron Resonance Analysis Summer School (NRA2008) from 2-6 June 2008. The school was co-organised with the International Atomic Energy Agency (IAEA), the Nuclear Energy Agency within the Organisation for Economic Co-operation and Development (OECD-NEA), the Ancient Charm Collaboration and the CEA, and around 30 students from over 14 different countries participated. It provided a practical introduction to the analysis of measured neutron-induced resonance reaction data using lectures and hands-on computer exercises. Topics included neutron-induced reactions, R-matrix theory, neutron time-of-flight measurements and uncertainty assessment.

The Van de Graaff accelerator at the JRC-IRMM.

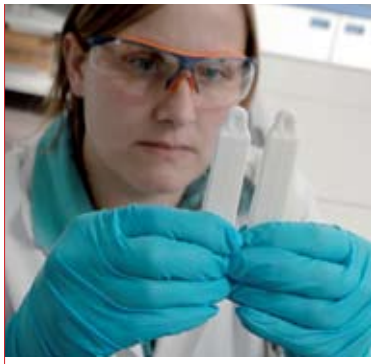
Accurate neutron data are required for the assessment of safety aspects of nuclear power installations and for the study of innovative concepts like nuclear waste transmutation and Generation IV nuclear energy systems. In the frame of the FP6 project CANDIDE, the JRC-IRMM organised the fifth workshop on "Neutron measurements, evaluations and applications" (NEMEA-5) in Ljubljana, Slovenia, on 27-29 October 2008. This important event for the nuclear data community – initiated by the JRC-IRMM – was attended by 36 scientists from 15 countries.

The JRC-IRMM also launched a new European project, EUFRAT, which is part of a wider European initiative to enable transnational access to large scientific infrastructures. Through the EUFRAT project, researchers can apply for a total of 4500 hours experimental time for neutron data measurements at the accelerators at the JRC-IRMM. In a recent review of the JRC – chaired by Sir David King (see page 9) – the GELINA accelerator of the JRC-IRMM was cited as one of the "efficient facilities absolutely necessary for the European nuclear

research programme". The call for proposals is open, and proposals can be submitted at any time until 31 August 2011 (http://irmm.jrc.ec.europa.eu/eufrat).

Food safety and quality – remaining vigilant

The health scare in China over powdered milk raised concerns about possible melamine contamination in products on the European market. The European Commission decided that composite products, including feed, that contain milk products originating in or consigned from China should be checked, including laboratory analysis (Commission Decision 2008/798/EC). In consultation with the Health and Consumers DG, the JRC-IRMM reviewed existing analytical methods for the detection of melamine in food and feed, and launched a proficiency test to benchmark laboratories' ability to detect melamine in food and feed. More than 100 participants from the EU, Australia, China, New Zealand, Taiwan and the United States registered: (http://irmm.jrc.ec.europa.eu/melamine).



Laboratory analysis for food safety is carried out.

Following a submission to the Rapid Alert System for Food and Feed (RASFF) regarding the presence of mineral oil in Ukrainian sunflower oil, the Health and Consumers DG requested the JRC-IRMM to organise together with a Swiss expert laboratory a workshop to discuss available testing methods and to carry out a proficiency test amongst official and private control laboratories in the EU and Ukraine: (http://irmm.jrc.ec.europa.eu/html/interlaboratory_comparisons/index.htm).

Metrology and European legislation

Although European legislation is heavily dependant on measurements in order to set targets and monitor progress, there is currently no harmonised approach among the various Commission services to address in a systematic way the technical aspects of measurement quality. In view of its metrology expertise, the JRC-IRMM took the initiative to set up a new inter-service group on "Measurement standards for European legislation". The group is currently composed of representatives from the following Directorates-General: EuropeAid, Enlargement, Enterprise and Industry, Environment, Research, Health and Consumers, Taxation and Customs Union, Trade, and Energy and Transport. The group aims to provide clarity on measurement quality issues for a proper understanding, implementation and assessment of EU policies and a guidance document is being developed for this purpose. The group also aims to anticipate possible bottlenecks arising from the measurement requirements of new legislation.

The JRC-IRMM has provided conceptual advice for the Water Framework Directive.

The Water Framework Directive is one example where the JRC-IRMM has provided conceptual advice to policy regarding the quality of measurements. The JRC-IRMM was charged with the scientific co-ordination of the FP6 project EAQC-WISE which in 2008 delivered a blueprint of an efficient and potentially sustainable quality control system for implementing the Water Framework Directive. Moreover, the JRC-IRMM also drew on its expertise in measurement evaluation to deploy an interlaboratory comparison in support of the directive. Around 60 laboratories involved in monitoring water quality compared their ability to measure eight polycyclic aromatic hydrocarbons (PAHs) considered priority substances in the Water Framework Directive.

In 2008, the JRC-IRMM organised a meeting between various Commission services (Environment, Health and Consumers, Research, Enterprise and Industry, and the European Anti-Fraud Office) and representatives from the developing European Metrology Research Programme (EMRP), to discuss the evolution of European funding for metrology. Towards the end of the year, the Commission adopted a proposal to set up a joint European research programme in the field of metrology under Article 169 of the EC Treaty. Funding of around €400 million is earmarked for the programme: half of this will come from the countries involved and the other half will be allocated by the European Commission. Its work will be co-ordinated by the European Association of National Metrology Institutes (EURAMET), of which the JRC-IRMM is an associated member.

We are proactively applying our expertise in reference materials and measurements in new and difficult applications to anticipate the measurement needs of the future. One example is the area of bio-analysis, where thousands of personalised health measurements will require precise measurements of very complex biological molecules. Innovation in new technologies and methods is essential.

Alejandro Herrero

JRC Institute for Transuranium Elements (JRC-ITU)

The mission of the JRC-ITU is to provide the scientific foundation for the protection of the European citizen against risks associated with the handling and storage of highly radioactive elements.

ITU's Integrated Management Systems "recognised for excellence"

In 2008, the JRC-ITU completed the implementation of an Integrated Management System (IMS) combining the ISO 14001:2004 standard for environmental management, and OHSAS 18001:1999 (Occupational Health and Safety Standard) and ISO 9001:2000 quality management norms. The European Foundation for Quality Management (EFQM) Excellence Model was taken as a basis for the implementation of integrated business processes.

The management system was evaluated through an external audit, conducted by an experienced team of practising managers, which resulted in the certifications of the JRC-ITU and the award of the IIQNet Business Excellence Class (IBEC) Bronze level, five stars 'Recognised for Excellence'.

Thomas Fanghänel (Director, JRC-ITU) showing the IBEC Bronze level certificate awarded to the JRC-ITU. From left to right: Thomas Fanghänel, Stefan Heinloth (Head Manager of DQS GmbH, Deutsche Gesellschaft zur Zertifizierung von Managementsystemen), Omer Cromboom (JRC-ITU Quality Manager), Roland Schenkel (Director-General, JRC), Jean-François Babelot (JRC-ITU, Head of the Management Support Unit).

Marie Curie Award 2008 for study on ^{213}Bi-therapy of bladder carcinoma

A collaborative project between the Nuclear Medicine Department of KRDI (Klinikum rechts der Isar) in Munich and the Alpha-immunotherapy group at the JRC-ITU on the study of radioimmunotherapy for the treatment of bladder carcinoma using antibody constructs labelled with the alpha emitter ^{213}Bi received the 2008 Marie Curie Award of the European Association of Nuclear Medicine.

In vivo bioluminescence imaging before and after ^{213}Bi-therapy. Tumour cells in the bladder appear in blue. Complete eradication of bladder carcinoma following therapy with 925 kBq ^{213}Bi-anti-EGFR-MAb seven days post-cell instillation can be observed. (Courtesy of B. Pfost, Klinikum rechts der Isar, Munich)

Novel internal gelation route for fuel production

Closing the nuclear fuel cycle as planned for Generation IV fast reactor systems requires the dissolution of irradiated fuel, separation of the actinides, and their conversion to suitable powder to be compacted into fuel pellets before loading into fuel pins for irradiation in the reactor. For this purpose, a new compact method based on internal gelation has been developed for deployment in the Minor Actinide Laboratory which will enable free selection of actinide stoichiometry and will minimise waste.

IQNet Business Excellence Class (IBEC) Bronze level certificate awarded to the JRC-ITU for applying the principles of business excellence in its day-to-day operations.

LWR DEPUTY-8 fuel pins completed

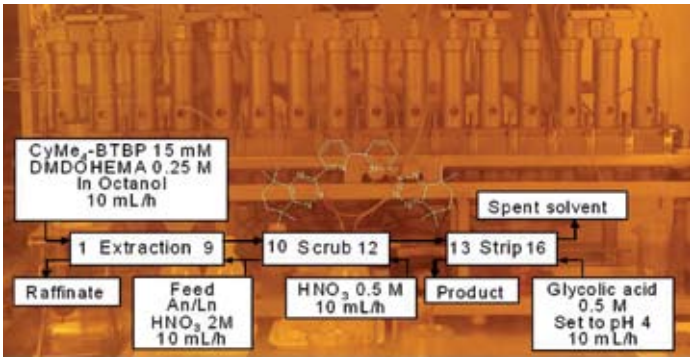
For the LWR DEPUTY irradiation experiment, two fuels, steel-based and molybdenum-based pellets, were fabricated in the laboratories of the JRC-ITU's Nuclear Fuels Unit. The objective of this FP6 project was to assess the performance of ceramic-in-metal (CERMET) fuels in reducing waste through deep burn-up in conventional nuclear reactors. The eight fuel pins were transported to Mol, Belgium for irradiation in the BR2 reactor.

Karlsruhe, Germany

First demonstration of a SANEX process using the $CyMe_4$-BTBP extractant

Current reprocessing technology allows plutonium to be recovered from the spent fuel and transferred back into the nuclear reactors as MOX (mixed oxide) fuel. By additional recovery of the minor actinides (MA) and their transmutation into short lived nuclides, the long-term radiotoxicity could be significantly decreased.

For the latter, the current European reprocessing concept is based on a two-step strategy. A first demonstration study performed at the JRC-ITU, in the so-called SANEX (Selective ActiNide EXtraction) process, has shown that the nitrogen based "$CyMe_4$-BTBP" molecule displays excellent feed decontamination factors for Am and Cm. The recovery of these elements into the product fraction and Ln 'decontamination' is higher than 99.9% which is what is aimed for in an efficient partitioning and transmutation fuel cycle.



16 stage centrifugal contactor set-up installed in the chemical hot cells used for the hot SANEX process demonstration and the flow-sheet process. The chemical formula of CyMe4-BTBP, given in the middle, shows a soft nitrogen donor cavity which is specific for the complexation of trivalent actinides.

A HKED instrument for the Mayak Reprocessing Plant RT-1

The project "Modernisation and Enhancement of Nuclear Material Accounting and Control (NMAC) of the Mayak RT-1 Plant" in Russia is an undertaking funded by the TACIS (Technical Aid to the Commonwealth of Independent States) programme of the European Union which aims at upgrading near-real-time accountancy of nuclear materials. In order to improve irradiated fuel analysis in process solutions, the implementation of a Hybrid K-Edge Densitometer (HKED) is part of the project. The design, manufacturing and tests of the instrument were technically managed in close co-operation with the partners of the Russian Federation. Further support for the installation and commissioning will be given after the arrival of the HKED instrument at the Mayak plant.

50th anniversary of the Karlsruhe Nuclide Chart

The first edition of the Karlsruhe Nuclide Chart, a form of extended periodic table of the elements that displays all known nuclides of any element and their radioactive data, was published in 1958. To celebrate its 50th anniversary in 2008, a special event was organised by the JRC-ITU on 9 December 2008 in Karlsruhe. The event gathered selected guests from high-level scientific experts in the field to Members of the European Parliament and politicians. A special commemorative book to mark the 50th anniversary of the Karlsruhe Nuclide Chart was edited.

Commemorative publication for the 50th anniversay of the Karlsruhe Nuclide Chart, G. Pfennig, C. Normand, J. Magill, T. Fanghänel (editors), European Communities, ISBN 978-92-79-09115-5, 2008.

Performance tests of high burn-up fuel

The first ever crash tests on segments of spent UO_2 fuel were carried out in the JRC-ITU hot cells facility. Several tests were performed at different burn-up on fuel rods from a light water reactor. Differences in fracturing behaviour can be tentatively associated with hydrogen pick-up by the cladding during irradiation. Crash tests on highly radioactive materials are scarce and only possible in a very limited number of facilities. The tests performed at the JRC-ITU aroused a large amount of interest amongst the applied nuclear research community and might lead to new study requests.

This year, we successfully celebrated the JRC-ITU' s 45th anniversary. This glance back into history gives us the prospect to confidently build the future of the Institute and to address the 21st century challenges in nuclear science.

Thomas Fanghänel

Extending burn-up model in the TRANSURANUS code

Fuel designers and safety authorities rely heavily on computer codes describing the general fuel behaviour. In the present version of the TRANSURANUS code, major improvements have been implemented and tested for simulating UO_2 irradiated up to high burn-up in a commercial pressurised-water reactor (PWR), in WWER reactors (Water-Moderated Energy Reactor), for Gd-doped UO_2 in the OECD Halden heavy boiling water reactor (HBWR), and for MOX fuel in PWRs.

JRC Institute for Energy (JRC-IE)

The mission of the JRC-IE is to provide support to Community policies related to both nuclear and non-nuclear energy in order to ensure sustainable, safe, secure and efficient energy production, distribution and use.

2008 was a dynamic year for the JRC-IE. A major re-organisation and expansion took place in order to align the Institute even more with the needs of customer Directorates-General and the ever-growing demand to provide policy makers with robust data to support the development of a European energy policy. The Institute's competences have been expanded to better support energy policy in the domains of renewable energy, energy efficiency and security of energy supply. While adapting to changes and future needs, the JRC-IE has continued to support the European energy policy in many different areas, including biofuels, energy efficiency, and a continued major role as the co-ordinator and operator of the Information System of the European Strategic Energy Technology Plan (SETIS) (details of which are available on page 17).

Learning from operational experience feedback.

Other specific highlights from 2008 are described below:

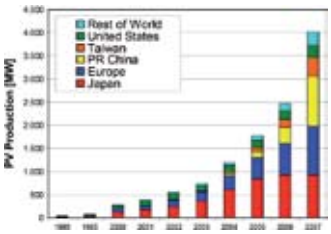
Expert network on NPP operational experience feedback

Nuclear Power Plant (NPP) operational experience has been used for many years to improve the safety of nuclear facilities throughout the world. To support the Community activities on evaluation of NPP operational events, a "Clearing House" on NPP operational experience feedback was established at the JRC-IE. This was upon the request of a number of Nuclear Safety Authorities, namely from: Spain, Lithuania, Hungary, the Netherlands, Romania, Slovenia, Finland and Switzerland (the Czech Republic being an observer). In 2008, a significant effort was dedicated by the JRC-IE to review and enhance national NPP operational event reports to support the Clearing House members' national activities for the international (IAEA/NEA) Incident Reporting System. Furthermore, scientific research was conducted and technical reports were published on selected operational events covering NPP loss of off-site power, criticality and maintenance-related operational events. The activities of the Clearing House were strongly supported by the Energy and Transport DG as one of the means towards further harmonisation of EU nuclear safety practices. This was of particular importance in 2008, the year in which the Energy and Transport DG launched a proposal for a Council directive (Euratom) setting up a Community framework for nuclear safety.

The JRC Photovoltaics Status Report has been downloaded more than 120,000 times.

Photovoltaics Status Report

Photovoltaic solar energy is one of the renewable energy technologies that the JRC is currently assessing within the context of the Strategic Energy Technology Plan. Its European Solar Test Installation (ESTI) is the leading European laboratory for photovoltaic testing, providing measurements traceable to primary standards based on the International System of Units (SI) under the highest-level ISO 17025 accreditation. ESTI's research made significant contributions to international standards and to European programmes in areas such as photovoltaic module testing, third-generation devices (FullSpectrum) and solar resource assessment.



The latest Photovoltaics Status Report showed that photovoltaic production has increased substantially.

The use of solar modules in Europe continues to grow.

Petten, the Netherlands
Ispra, Italy

In December, the latest Photovoltaics Status Report was released. This scientific study combines analysis of up-to-date international manufacturing and market implementation data throughout 2007 with subsequent strategic and political developments up to September 2008. Key findings from the report included an increase in the yearly growth rate of solar photovoltaic production, averaging 40% over five years and then peaking at 60% in 2007. Within the first few months, the report was downloaded more than 120,000 times (see http://re.jrc.ec.europa.eu/refsys).

JRC launches EU Code of Conduct: energy savings for data centres

The JRC-IE actively supports EU energy efficiency policies through research on energy consumption in the different end-use sectors by investigating the technical and economic savings potential. Based on in-house analysis, it proposes possible energy efficiency policies or measures such as voluntary programmes (Codes of Conduct). The JRC has already launched several voluntary programmes for external power supplies, digital TV receivers, broadband equipment (modems, routers, etc.), and uninterruptible power supplies, and in 2008 a Code of Conduct for data centres was launched. Data centres or buildings hosting servers and associated network equipment consume an estimated 50 TWh of electricity in the 27 Member States. This is predicted to double by 2020 if no action is taken. Therefore, there is a large and untapped energy saving potential in data centres. Recent studies have shown that about 50% of the energy is used to cool and maintain a low temperature in the buildings which is not needed, and that many servers are 'idling', thus consuming electricity when not needed. Following more than a year of discussion with stakeholders, a set of agreed Guidelines or Best Practices was published by the JRC-IE recommending actions to operators on how to improve efficiency in data centres. The guidelines were welcomed by both industry and Member State Governments.

The latest EU Code of Conduct launched by the JRC focused on energy savings for data centres.

A fuel cell stack undergoing testing in the JRC-IE facility.

Reference laboratory for fuel cells testing

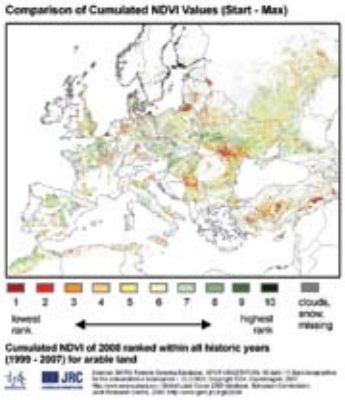
In May 2008, the Competitiveness Council adopted the regulation setting up the Fuel Cells and Hydrogen Joint Undertaking (FCH-JU). Within this Joint Technology Initiative, the JRC-IE provides a reference laboratory service in the area of pre-normative research, supporting individual FCH-JU projects. The work conducted at the JRC-IE has contributed to the development and harmonisation of test procedures for fuel cells. By way of example, the JRC-IE, in the frame of the Fuel Cell Testing Quality Assurance Network (FCTESQA), was involved in harmonising and validating testing procedures for fuel cells in stationary and transport applications. The members of the network include leading laboratories from Europe, North America, Korea and Japan, and the JRC-IE acted as the scientific co-ordinator. These protocols are used as input to international standards drafting by the International Electrotechnical Commission (IEC) and the International Organization for Standardization (ISO). Such standards constitute harmonised technical specifications to prove compliance with the essential legal requirements set by the EU Directives. As part of the FCTESQA exercise, the JRC-IE conducted test campaigns by assessing the performance of fuel cell stacks under fast transients at different stack powers, quick start-ups of the stacks to maximum power, and stacks operated on simulated reformed hydrogen fuel gas. As a spin-off of the FCTESQA activities and based on the JRC-IE's long-term involvement in pre-normative research, the JRC-IE contributed to the drafting of a New Work Item Proposal (NWIP) on "Small Stationary PEFC Power Systems – Performance Test Methods" which was submitted to the IEC.

The recent year has highlighted not only how critical a secure energy supply for Europe is but also the importance of science and technology in guiding the way forward.

Giovanni De Santi

JRC Institute for the Protection and Security of the Citizen (JRC-IPSC)

The mission of the JRC-IPSC is to provide research results and to support EU policy-makers in their effort towards global security and towards protection of European citizens from accidents, deliberate attacks, fraud and illegal actions against EU policies.



The picture shows a drop monitoring product from the MARS Remote Sensing infrastructure with the ranked cumulated NDVI (Normalized Difference Vegetation Index) for arable land for the cropping season 2008.

1 Dry pit (active mine)
2 Highly sedimented water (active mine)
3 Sedimented water (suspect)
4 Clear water (non active mine)

A view from a 1m resolution satellite imagery of active, non-active and potentially active diamond mines. (Courtesy of GeoEye; data provided by European Space Imaging).

In 2008, the JRC-IPSC made considerable efforts to further focus its activities around the fields of 'protection' and 'security' while enhancing its scientific work. The Institute's new mission statement clearly reflects the JRC-IPSC's role in providing scientific support to selected EU policies, thus ultimately contributing to strengthening security at a global level as well as in everyday life.

eMARS and major accidents in Europe: the JRC-IPSC develops a new online reporting system

In the context of the Seveso II Directive which aims to promote the exchange of information among EU Member States on accidents and 'near-misses', the European Commission has adopted a Decision[1] establishing a new major accident report form. The form, intended for use by national authorities from December 2008, is part of the eMars (Major Accident Reporting under Seveso II) online system for reporting accidents and disseminating lessons developed by the JRC-IPSC's Major Accident Hazards Bureau. The eMARS system, available to the Member States for testing and use at http://emars.jrc.ec.europa.eu, marks an important step forward in improving the quality of accident reporting and in facilitating the dissemination of lessons learned, in turn helping to prevent the occurrence of similar accidents in the future.

'Major accidents', such as those involving hazardous substances, can have widespread consequences and can potentially affect more than one country. Accident reporting and analysis represent fundamental scientific input to risk management and prevention. As such, they represent key requirements of the Seveso II Directive.

Kimberley Process Certifying Scheme: satellite imagery helps monitor the extraction of conflict diamonds

The Kimberley Process Certifying Scheme (KPCS) is a joint government, industry and civil society initiative to eliminate the trade in conflict diamonds, i.e. rough diamonds used by rebel movements to finance wars against legitimate governments. The JRC-IPSC provides scientific and technical support to the External Relations DG by monitoring the illegal mining activities using satellite remote sensing. In this respect, the JRC-IPSC has developed application-specific methodologies based on change detection and volumetric analysis to verify and assess illegal and legal mine production dynamics, and to estimate the volume of excavated material. Satellite-based monitoring of production has gained increasing recognition by the Kimberley Process (KP) stakeholders as an invaluable instrument to support the KP crisis response capacity.

Since 2008, the JRC has also been contributing to the Working Group on Statistics of the Kimberley Process. The JRC-IPSC's primary contribution is the redevelopment of the methodology to be followed in the analysis of the data submitted by the KP participants in order to assure compliance with the KP rules. The JRC-IPSC's proposal was presented to the Working Group on Statistics (WGS) at the KP plenary meeting in New Delhi in November 2008 and has received considerable interest.

1 C(2008) 7530 of 2 December 2008.

Ispra, Italy

The JRC-IPSC provides certified testing services of Radio Frequency Identification (RFID) devices

The JRC-IPSC's Thermal, Electro-Magnetic, Physical Equipment Stress Testing (TEMPEST) laboratory provides a testing service for the assessment of Radio Frequency Identification (RFID) devices and for standardising test procedures. The TEMPEST laboratory was accredited in 2008 in conformance with the ISO/IEC 17025:2005 standard by the United Kingdom Accreditation Service (UKAS). Thermal tests involve the use of climate chambers capable of reproducing a large range of environmental conditions while electromagnetic immunity tests consist of the reproduction of disturbances and discharges due to magnetic and electrostatic fields. Mechanical stress tests include low, medium and high frequency vibrations, and shock and drop tests. The TEMPEST laboratory performs qualification tests on electronic equipment used for animal identification and traceability of animals/products. The same tests may be applied to similar devices, used in the context of nuclear safeguards or agriculture.

Exploring the use of open source trade data to support IAEA verification activities

As part of a European Commission support programme task to the International Atomic Energy Agency (IAEA), a survey of open source world trade data was conducted. A catalogue was produced to cover services offering data on trade, both of statistical and transactional nature, on all categories of goods. The survey was motivated by the hypothesis that trade databases may be useful to support IAEA verification activities. Trade data may also provide insights to assist the verification of additional protocol and nuclear material transfer declarations, as well as to give indications of possible undeclared activities. This hypothesis is being confirmed by positive results obtained by testing these new sources of information on sample cases provided by the IAEA.

Countries covered by services offering transactional data about trade.

The JRC-IPSC forecasts above average cereal production

The JRC-IPSC monitors on an operational basis the crop growth conditions of the major European crops and prepares short term yield forecasts. In August 2008 the Institute announced an exceptionally good year with yield increases for cereals of more than 11 % compared to the previous year and a cereal production close to 301 million tonnes. The agricultural campaign was beneficial for most of Europe. Final figures from Eurostat for 2008 confirmed an increase of yield of 13.85 % compared to the previous year. This proved once more the reliability of the crop monitoring system in place at the JRC-IPSC.

ECCAIRS expanding into other public transport domains

ECCAIRS – a tool developed by the JRC-IPSC in the framework of the Directive 2003/42/EC – has proved to be an effective and reliable tool to collect and exchange information about aviation incidents. After some years of successful use by EU Member States and the International Aviation Safety Organization (ICAO), ECCAIRS has now raised interest in the maritime and railways domains.

Following a joint study with the European Maritime Safety Agency (EMSA) and the development and testing of a functional prototype of a maritime version of ECCAIRS, EMSA decided to implement during the coming year their European Marine Casualty Information Platform (EMCIP) on top of ECCAIRS. The European Railways Agency (ERA) is now considering ECCAIRS as a platform for implementing their future European accident and incident database. A first prototype, based on ERA's current taxonomy, was delivered at the end of 2008. After the redesign of the system's IT architecture, ECCAIRS is now constructed as an 'ECCAIRS Common Framework', independent of the transport mode, on top of which specific extensions can be deployed.

In 2008, the JRC-IPSC was very successful in providing policy support in crucial areas. From automated damage assessment after the China earthquake to statistical modelling on the financial crisis, the large set of scientific and technological capabilities at the Institute again proved very useful for the protection and security of citizens.

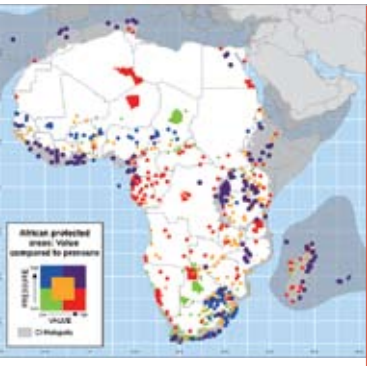
Stephan Lechner

JRC Institute for Environment and Sustainability (JRC-IES)

The mission of the JRC-IES is to provide scientific-technical support to the European Union' s policies for the protection and sustainable development of the European and global environment.

The JRC-IES underpinning African Union-European Union collaboration

As a scientific reference centre, the JRC-IES develops thematic information portals and decision-making tools for European Commission services and African stakeholders such as the EU Water Initiative Content Information System and the Assessment of African Protected Areas. The JRC-IES has also installed an observatory on humid rainforests in Central Africa, combining satellite information and field observations on deforestation, logging and biodiversity of Congo basin forests. In 2008, the Institute also began preparations for the publication of a Soil Atlas of Africa and a Global Atlas of Desertification, organising the information and expert groups.

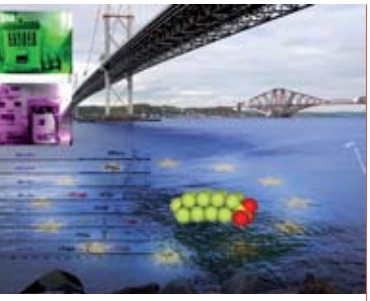


Assessment of environmental threats to 741 Protected Areas – combining biodiversity and Earth Observation data.

Under the AU-EU Strategic Partnership, the JRC is co-ordinating the action plan for Global Monitoring for Environment and Security (GMES) Africa, part of the chapter on Science, Information Society and Space. Capacities-building activities were also conducted in Africa through short-term training sessions, on-project actions or secondment of JRC staff to the African Union Commission. The importance which policy support clients are paying to this work became visible through the visits of the European Commission Director-Generals Koos Richelle (EuropeAid) on 13 March 2008 and Stefano Manservisi (Development) on 30 May, 2008.

INSPIRE makes a difference

One of the key barriers to evidence-based policy in Europe is the lack of good quality and timely information. Although there is plenty of data available at national and local level, often it is not harmonised. Decision-makers ask where it is, who has it and how it can be accessed and turned into usable information. The INSPIRE Directive (2007/2/EC) aims at overcoming this. The JRC-IES as technical coordinator of INSPIRE is responsible for preparing its implementing rules. This includes, for example, data schemes, network services, viewing and transforming, and interoperable services once information is found and accessed. With the first INSPIRE implementing rule adopted in 2008[1], conventions and formats (so called 'metadata elements') were defined – useful to document coherently the information resources available in Member States. The implementing rules on 'Discovery and View Services' were also approved by the regulatory committee and were passed to the European Parliament for scrutiny. The JRC-IES organised and led the process of preparing these implementing rules, and drafted both legal text and technical annexes. This is a major achievement for the JRC as it is for environmental policy making in Europe: for the first time it will be possible to find the geographic and environmental information necessary to support policy at EU level and monitor outcomes.



The JRC-IES supports the Water Framework Directive.

Cleaner water to a higher standard everywhere in Europe

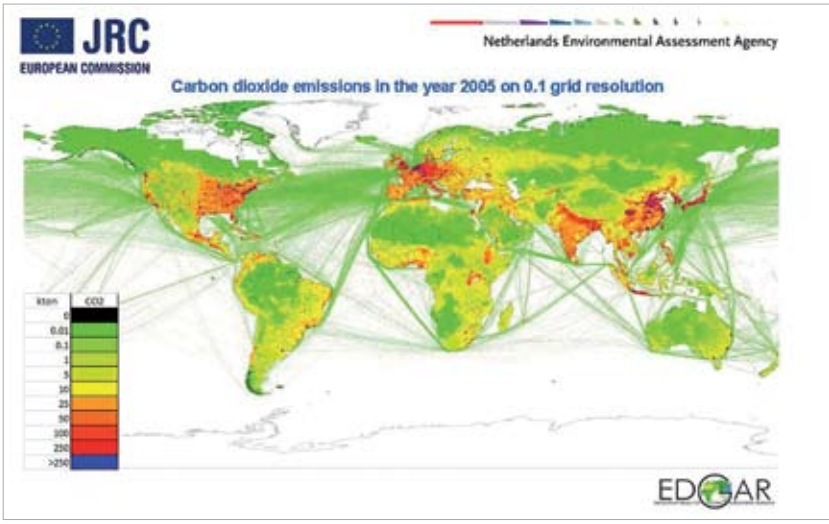
The JRC-IES has been working closely with Commission services and Member States in the Common Implementation Strategy of the Water Framework Directive (WFD). Good examples were the major achievements in intercalibration. This is the process at the heart of the Directive setting the criteria for the Good Ecological Status to be achieved by Member States for all their surface waters by 2015. Under the JRC-IES' lead, a network of more than 500 experts from Member States was structured in 14 regional intercalibration groups. They compared ecological water quality assessment systems among countries sharing similar types of surface water bodies. A Commission decision listing actions compulsory for Member States was published in December 2008. It gives explicit reference to the JRC's role in the WFD intercalibration and implementation.

1 Regulation EC 1205/2008.

Ispra, Italy

Climate change

In 2008, the JRC-IES played an important role in the impact assessments for two important policy documents. Firstly, the assessment of the effects of European air pollution policies on European and World climate, supporting the National Emission Ceilings (NEC) Directives. Secondly, the assessment of the benefits and trade-offs of the scenarios outlined in the recent Commission communication "Towards a comprehensive climate change agreement in Copenhagen". Specifically, the JRC-IES analysed the co-benefits of a global 'two degree' climate policy. The Institute worked on emissions of air pollutants and evaluated the impact of air pollution policies on climate change and health, notably the reduction of 'climate cooling' air pollutants. The JRC-IES also informed the European climate policy on reducing emissions from deforestation and degradation (REDD) in developing countries under the UNFCCC framework. This included also expertise on the future treatment of the Land-Use, Land-Use Change and Forestry (LULUCF) sector.



Carbon dioxide emissions.

Policy support of that kind is also fully science-based: the Climate Change Unit of JRC-IES co-authored a paper in *Science*[2] and two in *Nature*[3] during 2008, as well as Action Leader Frank Dentener being invited to deliver talks at Princeton and Cornell Universities (United States) regarding the work on integrated assessment of environmental consequences of global greenhouse gas reduction scenarios.

The JRC-IES' Transport and Air Quality Unit led the group of experts who produced the document "Requirements and recommendations for Heavy Duty Vehicles (HDV) retrofit with cost-effective, best available technology Diesel Particle Filter (DPF) Systems".

The JRC-IES looking ahead: proposing a harmonised procedure for Diesel Particle Filters

The JRC-IES' Transport and Air Quality Unit led the group of experts who produced the Technical Document "Requirements and Recommendations for Heavy Duty Vehicles (HDV) retrofit with cost-effective, best available technology Diesel Particle Filter (DPF) Systems". It is noteworthy that this working group was set up by the JRC-IES on its own initiative, based on its own analysis of the problem and of the need for a harmonisation of PM retrofit procedures among EU Member States. When the JRC was asked by the Enterprise and Industry DG to provide a technical document serving as a starting point for an EU regulatory process, the JRC-IES was thus able to respond immediately – being acknowledged by the policy makers as a remarkable example of a proactive approach.

New action of the JRC-IES sets up European Drought Observatory

The JRC helps the European Union to fulfil its role as key player in international efforts towards security and sustainable development of the Earth.

Leen Hordijk

The impact of recent regional droughts in Europe on the European environment and economy has been significant. Climate change predictions for Europe further indicate an increased likelihood for summer droughts in the Mediterranean, central and south-eastern Europe. Other regions in Europe are also likely to experience changes in their energy and water balances, resulting in an increased likelihood for periods with reduced water availability as well as increased probabilities of extreme climatic events in general. This situation calls for consistent and timely information on droughts at European, national and regional scales. To fulfil this need, the JRC-IES has developed a prototype of a European Drought Observatory for drought forecasting, assessment and monitoring. A first Map Server providing European scale information on a test basis was launched in 2008[4]. Further information on the project can be found at http://desert.jrc.ec.europa.eu/.

2 ***Science*** 320, pp.893-7, 2008.
"Impacts of Atmospheric Anthropogenic Nitrogen on the Open Ocean", R.A. Duce, J. LaRoche, K. Altieri, K. Arrigo, A. Baker, D. Capon, S. Cornell, F. Dentener, J. Galloway, R.S. Ganeshram, R.Geider, T. Jickells, M.M. Kuypers, R. Langlois, P. S. Liss, S.M. Liu, J.J. Middelburg, C.M. Moore, S. Nickovic, A. Oschlies, T. Pedersen, J. Prospero, R. Schlitzer, S. Seitzinger, L.L. Sorensen, M. Uematsu, O. Ulloa, M. Voss, B. Ward, L.Zamora.

3 ***Nature Geoscience*** 1, pp.430-7, 2008.
"Global nitrogen deposition and carbon sinks", D.S. Reay, F. Dentener, P. Smit, J. Grace and R.A. Feely.

Nature Geoscience 1, pp.425-9, 2008.
"Carbon accumulation in European forests", P. Ciais, M. J. Schelhaas, S. Zaehle, S. L. Piao, A. Cescatti, J. Liski, S. Luyssaert, G. Le-Maire, E.-D. Schulze, O. Bouriaud, A. Freibauer, R. Valentini & G. J. Nabuurs.

4 http://edo.jrc.ec.europa.eu/

JRC Institute for Health and Consumer Protection (JRC-IHCP)

The mission of the JRC-IHCP is to protect the interests and health of the consumer in the framework of EU legislation on chemicals, food, and consumer products by providing scientific and technical support including risk-benefit assessment and analysis of traceability.

2008 marked an important year in the history of the JRC-IHCP: the Institute celebrated its first ten years of scientific work in support of Community policies on health and consumer protection. During the year, it also started an internal debate on a new organisational structure designed to better integrate its activities, to cluster more closely around its areas of competence, and to respond more efficiently to future challenges and needs of EU policy makers.

One trigger for the reorganisation was another important milestone: the entering into force of the new legislation on chemicals (REACH) and the associated start-up of the European Chemicals Agency (ECHA) which brought about the accomplishment of the European Chemicals Bureau (ECB) tasks, and the handover of the files and activities to ECHA. A critical aspect of the reorganisation is the closer linkage to the main policies of work which are now served through five core themes: Health and environment, Nanotechnology, Genetically modified organisms, Alternative testing and the European Centre for the Validation of Alternative Methods (ECVAM), and Consumer products and nutrition.

One of the five core themes of the JRC-IHCP' s work is health and environment.

Health and environment

The Institute supports EU policies concerning the risks to public health and the environment from exposure to chemicals and physical stressors. Activities comprise projects assessing the hazards, exposure and risks of contaminants from the environment on human health. They also cover Community legislation on, for instance, chemicals, noise, indoor air pollution, drinking water, and tobacco. For example, in the context of the Environmental Noise Directive, the JRC-IHCP issued a technical report on protocols on road and railway traffic, and on industrial and aircraft noise.

During 2008 a substantial achievement was the finalisation of ECB handover activities to ECHA, and the work on the harmonisation of risk assessment methodologies in international frameworks such as the OECD and the WHO International Programme on Chemical Safety (IPCS). As part of the handover programme, an awareness campaign on REACH was jointly organised with ECHA, and capacity building activities extended to the ASEAN region with a workshop held in China.

Cortical rat neuron on a micro-electrode array chip.

Nanotechnology

In 2008, public health, safety, environmental and consumer protection issues were addressed by the Commission in its communication "Towards a European strategy for nanotechnology". The communication states that technological progress in nanotechnology needs to be accompanied by scientific investigation and assessment of possible health or environmental risks, and all applications and use of nanosciences and nanotechnologies must comply with the high level of public health, safety, consumer and worker protection, and environmental protection that the Community has established.

The interactions of nanoparticles with living organisms and the unknown health risks associated with manufactured nanoparticles are a main focus of the JRC-IHCP's activity on nanotechnology. Associated to this is the work done in the JRC-IHCP's cyclotron where the JRC-IHCP produces radio-labelled nanoparticles in support of its work in understanding the risks of nanoparticles. The cyclotron is also used for new applications for cancer treatment.

In this respect, during 2008 a new target system for the production of fluorine-18 radioisotopes was installed. This was a major step forward to increase the production capacity and meet the increasing demand faced by our industrial partners.

Genetically modified organisms (GMOs)

In order to implement the legislation and ensure that unauthorised genetically modified organisms (GMOs) do not enter the European market, it is vital to have the means of detecting GMOs, even in small quantities, in shipments of imported food and seeds. The Community Reference Laboratory on Genetically Modified Food and Feed (CRL-GMFF) validates GMO detection and quantification methods in close collaboration with a formal network of national reference laboratories and the European Food Safety Authority. In 2008, the CRL-GMFF validated 15 methods including those for genetically modified cotton, maize, soy bean and stacked events. Among the most notable results in 2008, the CRL-GMFF verified the key performance parameters of a detection method for the identification of unauthorised *Bt* 63 rice and provided a technical solution for sampling and analysis of bulk agricultural commodities and pre-packaged products. Furthermore, two important events marked the work in the GMO area in 2008: the First Global Conference on GMO Analysis held in June, and the publication of a study on the health effects of GM food and feed. More than 500 people from 70 countries attended the conference, which covered topics such as the current state-of-the art in sampling, traceability ('from farm to fork'), sample preparation, and production and availability of reference material.

The First Global Conference on GMO Analysis took place in June.

The JRC's European Centre for the Validation of Alternative Methods (ECVAM) directly supports the EU Directive regarding the protection of animals used for experimental and other scientific purposes.

Alternative testing and ECVAM

The development of reliable alternative methods is in general a long and expensive process and the limited availability of acceptable alternative methods places increasing pressure on the efforts to provide alternatives to animal testing methods by 2009/13, when the marketing ban on cosmetics tested on animals will come into effect (the 2009 ban refers to tests for all effects on human health with the exception of repeated-dose toxicity, reproductive toxicity and toxicokinetics. For these specific health effects, the deadline is 2013). The JRC's European Centre for the Validation of Alternative Methods (ECVAM) directly supports the EU Directive regarding the protection of animals used for experimental and other scientific purposes by developing alternative testing strategies and validating alternative methods. REACH itself also calls for the use of methods reducing, refining and replacing animal testing whenever feasible. New testing technologies based on toxicogenomics, metabonomics and proteomics are promising tools that need to be evaluated for their suitability and validity. An integrated testing strategy allowing for a more holistic and effective method to carry out risk assessment was broached in 2008. Moreover, in order to ensure that the scientifically validated methods undergo a rapid procedure to gain regulatory acceptance, the JRC-IHCP has launched TSAR (Tracking System for Alternative test methods), a website designed to track the progress of alternative methods in the regulatory pipeline.

Consumer products and nutrition

European consumers' concerns and demands are the primary focus for the JRC-IHCP. As a European scientific research Institute, we provide support for policies related to health and consumer protection.

Elke Anklam

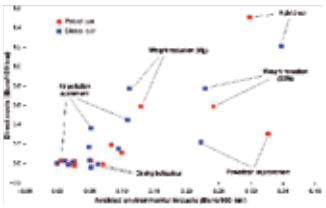
The Community Reference Laboratory for Food Contact Materials (CRL-FCM), the second Community Reference Laboratory hosted at the JRC-IHCP, works on the safety and quality of food and consumer products as well as new textile fibre labelling, measuring emissions from consumer products and the European Wine Office (BEVABS). During 2008 a number of activities on capacity building were performed in these areas, notably training courses on the BEVABS' EU Wine Databank, as well as training courses on EU best practices on food contact materials for official Chinese controls and the Thai Department of Science Services.

JRC Institute for Prospective Technological Studies (JRC-IPTS)

TThe mission of the JRC-IPTS is to provide customer-driven support to the EU policy-making process by developing science-based responses to policy challenges that have both a socio-economic as well as a scientific/technological dimension.

The environmental improvement of products (IMPRO) reports

The JRC-IPTS has supported the Commission's Integrated Product Policy (IPP) since the initial stages of its development with contributions to the 2001 Green Paper and the 2003 communication. The IPP seeks to minimise environmental degradation of products by looking at all phases of a product's life-cycle and taking action where it is most effective.



Improvement options: direct costs and avoided externalities per 100 km.

The research conducted at the JRC-IPTS started with the EIPRO (Environmental Impact of PROducts) report. EIPRO assessed which products have the greatest environmental impact from a life-cycle perspective. In a second stage, based on its results, the JRC-IPTS conducted three new studies, the IMPRO (Environmental IMprovement of PROducts) projects: IMPRO-car, IMPRO-buildings and IMPRO-meat and dairy. EIPRO identified these three product groups as those that have the greatest environmental impacts from a life-cycle perspective.

The IMPRO reports first present a systematic overview of the life cycle of the respective products and their environmental impacts, covering the full chain. Secondly, they provide a comprehensive analysis of the improvement options that allow reducing the environmental impacts throughout their life cycle. Finally, the reports assess the different options regarding their feasibility as well as their potential environmental and socioeconomic benefits and costs.

The Commission's Action Plan on Sustainable Consumption and Production and Sustainable Industrial Policy adopted by the Commission in July 2008 draws extensively on this JRC-IPTS research. The IMPRO and EIPRO reports are available at: http://ipts.jrc.ec.europa.eu/.

Mapping R&D investment by the European ICT business sector: the European ICT sector is the biggest contributor to business R&D but still lags behind the United States

The ICT sector is responsible for 26% of business R&D investment in Europe.

In 2008, the JRC-IPTS finalised the first comprehensive overview of available data on European ICT (Information and Communication Technology) industry R&D (Research and Development) spending: "Mapping R&D Investment by the European ICT Business Sector". This JRC reference report shows that the ICT industry based in Europe is the largest R&D-investing sector, contributing 26% of total business expenditures in R&D (BERD - Business Expenditure on Research and Development), ahead of the automotive and pharmaceutical industries.

Nevertheless, the EU's ICT industry spends some 50% less on R&D than its counterparts based in the United States, not only in absolute amounts but also as a share of the respective Gross Domestic Product. Indeed, this differential in the ICT business sector R&D accounts for half of the overall R&D gap between the EU and the United States.

This research was undertaken at the request of the European Commission's Information Society and Media DG. The report was first presented at ICT 2008, Europe's largest research event on information and communication technologies held in Lyon from 25 to 27 November 2008. The report (accessible from http://ipts.jrc.ec.europa.eu) is the first in a series of studies to provide further analysis of ICT R&D data from the 27 Member States, including public financing for ICT R&D. Future reports will aim to measure EU ICT R&D performance vis-à-vis other leading world economies.

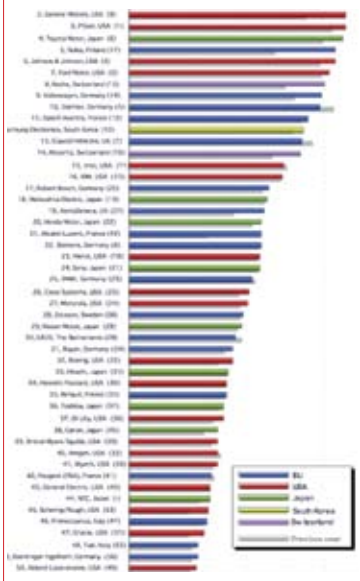
Seville, Spain

Promoting a better understanding of EU corporate investment in research – five years of the Industrial R&D Investment Scoreboard

For the fifth year since 2004 the Commission published the Industrial R&D Investment Scoreboard, generating considerable media attention. The origin of the Scoreboard is a joint initiative by the JRC-IPTS and Research DG to increase the understanding of why individual firms invest in R&D – a point high on the Lisbon agenda[1]. Thanks to the Scoreboard, it is now widely understood that the top R&D investing companies are not to blame for the low EU spending on R&D relative to nominal GDP. There is no under-investment by EU companies. The Scoreboard has also made clear that most of these companies are active in European and world markets.

In addition to generating a keen interest from business, the Scoreboard has established itself as a source of micro data for researchers. In response, the European Statistical Office Eurostat has taken the Scoreboard data on board, with company names attached – the first instance in which it endorsed data not collected under the umbrella of the national statistical offices.

The 2008 Scoreboard shows a considerable fall in the growth in R&D investment in US companies. For the first time in five years, the growth in the EU companies outpaces the growth in the United States. Each year the nominal growth in R&D of the top R&D investing companies with headquarters based in the EU has been larger than the year before. The Scoreboard series can be downloaded from: http://iri.jrc.ec.europa.eu/.



The Industrial R&D Investment Scoreboard.

Sustainable agriculture and soil conservation

Agriculture plays an important role in maintaining natural resources and cultural landscapes. However, unsustainable farming practices and land use, including inappropriate intensification as well as land abandonment, have an adverse impact. Against this background and upon request of the European Parliament and the Commission's Agriculture and Rural Development DG, the JRC-IPTS in collaboration with the Institute for Environment and Sustainability conducted the SoCo project (Sustainable Agriculture and Soil Conservation through simplified cultivation techniques).

Firstly, SoCo performed a stock-taking to produce a classification of soil degradation processes, soil conservation practices and policy measures, including a survey on the national and regional implementation of EU policies and national policies. In May 2008, a SoCo Stakeholder Workshop was opened by the Commissioner for Agriculture and Rural Development, Mariann Fischer-Boel. Case studies were carried out in ten EU countries. They identified some of the complex causal chains that shape the adoption of different farming systems and practices, and the ultimate impact on agricultural soils.

SoCo analyses soil degradation processes, soil conservation practices and policy measures.

SoCo has shown that, in general, the existing suite of policy measures is adequate to address soil degradation processes in the EU. However, the effectiveness of the policy measures could be significantly increased if: reference levels were clearly defined; incentive payments were better targeted and monitored; greater levels of advice and support were provided and all relevant policy measures were co-ordinated and specifically targeted to soil protection. All finalised SoCo reports can be downloaded from: http://soco.jrc.ec.europa.eu/.

In 2008 not only did we manage to substantially increase our income earned from customers, but we also made good progress in boosting our scientific standing. We are now on track to achieve the right balance between energy devoted to delivering a first-class service to our customers, and energy devoted to playing a full role in the scientific community.

Peter Kind

1 The Lisbon Agenda aims to achieve a total (public and private) investment of 3% of Europe's GDP in research and development by 2010. For more info, please see: http://ec.europa.eu/growthandjobs/faqs/background/index_en.htm

Quotations

Visit from the Delegation of the Intergroup on the Welfare and Conservation of Animals (23 May 2008)

Thank you for preparing and organising an excellent and very interesting visit and tour around all your facilities. On behalf of the Members of the European Parliament and our advisors, we appreciate the visit and are now much better informed!

Neil Parish (MEP, UK)

Thank you for an excellent and very interesting day. You do very important work!

Dan Jørgensen (MEP, Denmark)

I hope ECVAM continue to work on the development of alternative methods that will avoid the suffering of millions of animals. Today' s visit was very important.

Silvia Nogal Dias (Diario de Noticias)

Thank you for showing us your work. It was a very nice day. We had the opportunity to learn how the Centre works in order to explain it to others.

Maria Joao Cunha (Animalia.pt)

It was a very interesting visit in an amazing place. Please continue your job. You' re preparing here a part of the future.

Pascal Martin (Le Soir)

Many thanks for the excellent visit you have organised for the MEPs which was really well appreciated and very fruitful.

Delphine Bourgeois, animal welfare lobbyist

HORIZONTAL ACTIVITIES

The JRC at the service of its customers and stakeholders

European Parliament.

Meeting of the JRC National Contact Points in Geel on 6 June 2008.

Inaugurating the French Presidency at JRC Ispra.

In order to implement its mission and keep abreast of scientific progress, the JRC relies on collaboration with several partner organisations in the EU Member States and beyond. Scientific collaboration occurs in different modalities including joint research projects, for example, in response to published Seventh Framework Programme (FP7) calls for proposals, exchange of research staff, joint workshops, co-authorships in peer-reviewed journals, and the use of common research facilities. In 2008 the JRC started an initiative to promote closer collaboration with selected larger public research organisations in Europe. Initial visits were organised with the Technical Research Centre of Finland (VTT), the Italian National Agency for New Technologies, Energy and the Environment (ENEA), the Commissariat à l'Énergie Atomique (CEA) in France, and TÜBITAK (Turkey) with a view to identify topics of mutual interest where added value can be found. With this is mind, a technical visit to the JRC Ispra site was organised in October for the members of IGLO (Informal Group of RTD Liaison Officers).

The JRC has also actively promoted scientific collaboration via its networks of National Contact Points (NCP) in the EU Member States, and FP7 Associated Countries and Candidate Countries. An action plan to create awareness of the opportunities for collaborating with the JRC was agreed at the annual NCP meeting in Geel (6 June 2008). The JRC has also actively worked in support of the EU Council by collaborating with the 2008 Slovenian and French Presidencies of the EU. JRC information events and bilateral visits were organised in 2008 to promote collaboration with the FP7 Associated Countries, notably Iceland, Israel, Norway and Switzerland. Furthermore, the JRC has started an action to strengthen its international profile. Exploratory meetings have been organised with the scientific attachés of the EU missions of major countries such as Australia, Brazil, Canada, China, India, Japan, Korea, Russia, South Africa and the United States.

The European Parliament (EP) is one of the main stakeholders of the JRC. In order to ensure the best co-ordination, the EP-JRC relations are governed by an Interface Working Group. During 2008, four thematic discussions were organised between the interested European Members of Parliament and senior representatives of the JRC Institutes, and visits from the Animal Group and the European Parliament's Committee on Industry, Research and Energy (ITRE) to the JRC took place. The JRC has also strengthened its collaboration with the Office of Scientific Technology Options (STOA). In 2008, the JRC carried out three studies for the European Parliament; indoor air pollution; the impact of GMOs on health; and sustainable agriculture and soil conservation.

Intellectual Property & Technology Transfer

While managing the intellectual property portfolio of the European Communities, deliverables were provided to 32 Commission services and agencies. Assistance focused on trademark issues, protection of the European emblem against misuse, and many copyright issues, from audiovisual content to negotiation of software licences with third parties. Twenty trademarks were filed, twelve licences were signed and eight new patent applications were put in place.

Efforts to commercialise results from the JRC's work programme bore fruit. Examples include a spin-off created in the field of Internet software, an agreement concluded with a South African company to improve safety of nuclear fuel, and a licence to an Italian company to manufacture a tele-surgical robotic arm. Technologies available for licensing can be viewed online in the JRC's Technology Portfolio.

JRC and SOFAR – a fruitful collaboration

In November 2008, the JRC concluded a licence agreement with SOFAR, an Italian company, to commercialise an innovative tele-surgical robotic system which provides tactile sensing and a range of unprecedented capabilities. This was the culmination of a collaboration initiated in 2004 during which the JRC's software expertise was combined with the medical know-how of the company. Three patents were filed in the period and, after much work, the results were successfully demonstrated at two international medical congresses in June 2008 in Bari, Italy, and in October 2008 in Amsterdam, the Netherlands.
The technology, known as ALF-X, is now undergoing testing in hospitals to obtain the necessary authorisations and should be on the market by the end of 2010.

Supporting EU enlargement and integration

In 2008, the JRC continued its dedicated action supporting enlargement and integration. This consists of different instruments promoting networking, mobility and integration of organisations, researchers and experts from the new Member States, EU Candidate Countries, the Potential Candidate Countries in the western Balkan region, and, on a selective basis, the European Neighbourhood Policy Partner Countries.

In compliance with the JRC mission, the Enlargement and Integration Action focuses on scientific and technical aspects of EU legislation which are within the competence of the JRC in fields such as environment, food safety, chemical safety and nuclear safety. Emphasis is given to the JRC projects implementing EU directives such as monitoring agriculture with remote sensing, the Integrated Pollution and Prevention Bureau, and identification and labelling of GMOs.

The JRC 'Enlargement and Integration Action' consisted of various activities in 2008 including:

- About 50 workshops and training courses were organised on scientific and technological aspects of EU legislation involving experts of the partner countries who were identified with the help of the permanent representations or missions of the target countries to the EU and the JRC National Contact Points. Some of these workshops were supported by the Enlargement DG's TAIEX programme.
- Information/dissemination events were held in the target countries: in 2008, Information Days were organised jointly with the Research DG in Croatia (10 April) and Albania (6 May). The JRC also organised more focused events in the Czech Republic, such as the Open Day in Prague on 27 June, and in Bulgaria, with the Round Table in Sofia on 18 November. In support of the Slovenian Presidency, the JRC also organised a conference on Research in support of policies in Ljubljana on 26 May. The JRC participated at the Western Balkans Steering Platform and contributed to its meetings in Slovenia on 13 June.
- With respect to the FP7 Associated Countries that are not EU candidates, the JRC organised Information Days in Iceland (27 August) and Norway (29 August), and technical visits and an Information Event in Israel (18-19 June). The JRC also organised the visit of the Swiss State Secretary for Education and Research to JRC Ispra on 12 September and the visit of the Swiss National Contact Points to the JRC-IPTS on 24 April. JRC experts also visited the Swiss National Supercomputing Centre in Manno on 29 May, and the University in Lugano and SUPSI (Scuola Universitaria Professionale della Svizzera Italiana) on 25 November.
- As a follow-up to the Memorandum of Understanding with Turkey signed in 2007, the JRC-TÜBITAK call for grant-holders was successfully published at the beginning of 2008. A number of profiles for doctoral and post-doctoral students coming from Turkey were identified by the JRC Institutes with agreement to be financed by the Turkish side and hosted by the JRC Institutes working on projects and research of mutual interest. The first group of 12 grant holders was approved in the second half of 2008 and many of these young people have already started work at the JRC. On top of this, the Security Research Conference on 18 April and three reciprocal high-level visits of JRC experts on 18-22 September in Turkey were organised.
- Concerning JRC support to the European Neighbourhood Policy, the opportunities for JRC collaboration were presented at the S&T Subcommittees (External Relations DG) and Committees (Research DG) for Lebanon (6 February), Jordan (16 April) and Egypt (14 November).

Visit of Professor Mauro dell' Ambrogio, the Swiss State Secretary for Education and Research to Ispra on 12 September.

The JRC Round Table in Sofia, Bulgaria on 18 November.

The JRC-TÜBITAK Conference on Security Research in Ankara on 17-18 April.

The Enlargement and Integration Action is a practical instrument for the EU Candidate Countries and neighbouring countries to access the scientific and technological bases of complex EU legislation and participate in future developments.

Giancarlo Caratti di Lanzacco

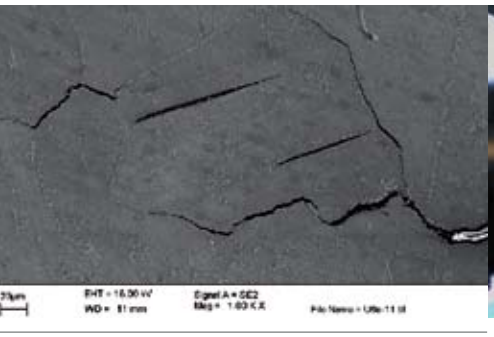
Research for safety of future nuclear reactors

The year 2008 marked the official start of several multinational collaboration projects in the frame of the Generation IV International Forum (GIF), in particular on (Very) High Temperature Reactors (VHTR) and Sodium Fast Reactors (SFR). Projects related to the Gas Fast Reactor (GFR) are now close to conclusion.

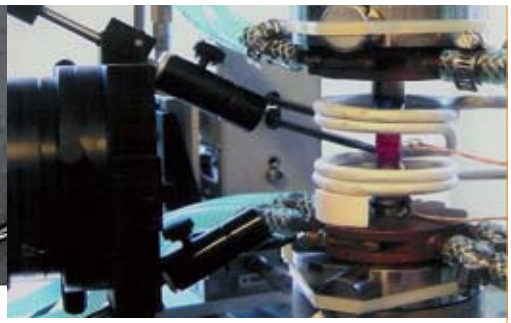
While the VHTR particularly targets the industrial process heat market, the SFR and GFR specifically focus on closing the uranium-plutonium fuel cycle. For example, reactor cores and fuel compositions were optimised to achieve closed fuel cycles based on uranium or thorium with minimum waste generation and maximum sustainability.

A number of typical research activities were carried out:

- Experimental and analytical work was performed to assess and enhance the safety and feasibility of several reactor design options in terms of neutron physics and thermal hydraulics;
- Dedicated fuel irradiation tests in the Petten HFR (High Flux Reactor) have been carried out to determine the properties and irradiation performance of fuels and cladding materials for several reactor systems. The use of thorium fuel is of particular interest for the Molten Salt Reactor (MSR), for which the "System Research Plan" was finalised. This document is a prerequisite for developing projects within GIF;
- Post-irradiation examination of metallic, carbide and nitride fuel pins continued. In particular, the latter fuels performed well under irradiation in the Phénix Reactor;
- The suitability of various classes of structural and functional materials for future nuclear reactors and process heat applications (high temperature strength, corrosion issues) was experimentally investigated in JRC laboratories.



Scanning electron micrograph revealing fatigue cracks in a candidate turbine disk material for VHTR or GFR.



Set-up for low-cycle fatigue and thermo-mechanical fatigue tests.

JRC participation in several established expert networks, for example, the High Temperature Reactor Technology Network (HTR-TN), the Experimental Feasibility of Targets for Transmutation (EFTTRA), the International Project on Innovative Nuclear Reactors and Fuel Cycles (IAEA/INPRO), and the Sustainable Nuclear Energy Technology Platform (SNE-TP)), and on GIF project management boards and steering committees triggered new initiatives and project proposals. All aim to develop secure and sustainable energy, thereby enabling ambitious CO_2 emission targets through the replacement of fossil fuels by nuclear energy within the time frame of the Strategic Energy Technology Plan (SET-Plan).

The Generation IV project for me illustrates the mission of the JRC (future research and development, networking with Member States, and international collaboration).

Pierre Frigola

Decommissioning of JRC nuclear installations

In 2008, the JRC continued implementing its Decommissioning and Waste Management (D&WM) programme to dispose of obsolete nuclear materials and installations.

At the JRC-ITU, the decommissioning of historical liabilities represented by obsolete experimental installations and glove boxes was continued. An additional gamma spectrometer was procured to improve the efficiency of the radioactive waste characterisation.

At the JRC-IE, 56 High Flux Reactor (HFR) spent fuel elements and eight control rods were shipped from Petten to the mid-term storage facility of COVRA in Vlissingen in the Netherlands. Moreover, eight test fuel elements, owned by the United States Department of Energy and irradiated in past experiments at the HFR, have finally been successfully transferred back to the United States. Finally, the settlement of the transfer of the historical waste from the HFR operation to the Dutch licence holder NRG was executed.

After the reorganisation of the D&WM Programme at the JRC Ispra site, the implementation of the programme was actively pursued, with the following main achievements in 2008:

- Waste Management Facilities: Following the completion in 2007 of the waste characterisation facilities and of a large part of the decontamination plants, the work in 2008 concentrated on grouping in a single licence the facilities of the waste management station and on completing the realisation of additional waste storage capacities. In parallel, the waste collection, sorting and initial characterisation started with the objective to fill the new buffer storage with at least 50% of the design capacity by the end of 2009;
- Management of historical waste: At the end of 2008 remarkable progress had been noted with the start of the transfer process of fresh and irradiated alkali metals to UK and France, the licensing and start of the operation of the non-destructive examination equipment for bituminised drums, the procurement for the extraction of the waste from the "Roman pits" (historical waste), and the continuation of the organisation of shipments of un-irradiated nuclear materials, started in 2007, to be completed in 2009;
- Decommissioning of old facilities: The most encouraging progress can be seen with the decommissioning of the Radiochemistry Laboratory. In parallel, the preparation of the Ispra 1 decommissioning plan was launched, and the radiological characterisation of the nuclear facilities undergoing decommissioning continued.

In 2008, the call for tender for the extraction of the remaining 14 pits was completed.

The preparation of the Ispra-1 decommissioning plan was launched in 2008.

Finally, it should be stressed that the third communication on the D&WM Programme was prepared and finally adopted by the Commission as COM(2008)903. Meanwhile, an external audit was carried out on the Programme at the JRC Ispra site as the main contributor to the D&WM Programme. An important conclusion of this audit was to recommend an improvement in programme management, procurement and staffing areas.

During the course of 2008, the Nuclear Decommissioning Unit of the Ispra Site Directorate continued its effort in the decommissioning of the six shut down nuclear facilities.

Celso Osimani

The JRC promotes science in schools

The latest Eurobarometer study (November 2008) has shown that young Europeans (aged 15-25) have mixed attitudes towards science and technology (S&T). While young Europeans are enthusiastic about science, they are still reluctant to pursue scientific careers. Commissioner Janez Potočnik said that "the low interest in engineering and scientific studies is a major concern" and that "we must reverse this trend because talented and educated 'brains' are EU major assets in the current global competition".

In latter years, the JRC has been increasingly promoting science in schools and is successfully using its networks and contacts with local communities to foster growth and expansion through various important initiatives.

The Fifth European Science Symposium was held in Varese (Italy) from 5 to 9 April 2008. The three-day event involved pupils from ten European Schools accompanied by their science teachers who presented their own projects based on scientific research and experimental work they themselves had carried out. The winners (from the European School of Karlsruhe, Germany) represented the European School at the European Union Contest for Young Scientists (EUCYS), in September in Copenhagen. The JRC helped to organise this event, and on 8 April, the 200 participants were invited to visit laboratories at the Ispra site.

The School Day took place at JRC Ispra on 23 May 2008.

On 23 May 2008, the JRC together with the Ufficio Scolastico Provinciale di Varese organised an Open School Day at its Ispra site. Over 1100 children from 25 Italian schools visited the site and the young guests were aged between 9 and 18 years. Each school was given the opportunity to choose the laboratories, installations and presentations it wanted to visit. This tailored (and more focused) approach was much appreciated by pupils and teachers alike. The working atmosphere at some of Ispra's research facilities was briefly exchanged for one of joviality and youthful curiosity as children were guided from biometrics to solar energy, from genetically modified organisms to nanobiotechnology and from forest conservation to biodiversity, to name but a few examples. A brief evaluation after the visit revealed very high levels of satisfaction and over 90% of the pupils said they wanted to return.

Additional activities to promote science in schools included a conference in Brussels entitled "Move out of the shadow – seize the opportunity" on 6 March for the JRC scientists, organisers and pupils who took part in the Commission-wide shadowing day. The JRC also organised a visit by the European School in Varese on 24 June, and the World School Forum on 22 October with pupils from 22 countries. Furthermore, JRC Institutes in Geel, Petten and Karlsruhe organised Open Days in 2008 with special programmes aimed at school pupils, and summer schools such as the Neutron Resonance Analysis Summer School hosted by the JRC-IRMM in June.

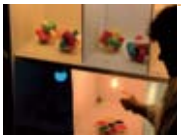
Visiting the Cogeneration (cold/warm) lab.

Visiting the Cyclotron lab.

Shadowing Day in Brussels with Commissioner Reding.

Students starting their visit to JRC laboratories.

Visiting the Soil installation.



Saving energy using the right illumination device.

Visiting ELSA (European Laboratory for Structural Assessment).

Press and media relations

In 2008, the JRC's work continued to be well covered in the media with more than 2200 articles and multimedia broadcasts reported worldwide during the year.

Types of press and media events organised in 2008 include: thematic press briefings and conferences, media visits, seminars for journalists, information days and round tables in Member States and Candidate Countries, stands at exhibitions and conferences, Open Days at Institutes, and interviews and meetings with senior management and scientists. For many journalists, the JRC is now a well recognised source for news, as well as a reliable source for background information, which can be seen by a rise in the number of requests received.

Snapshot of 2008 results

- 2256 coverage pieces were retrieved: over 1140 articles in print and online general press and press agencies, 1048 articles in specialist publications and 68 audiovisual broadcasts were recorded
- Press coverage was generated in 67 countries worldwide – the highest number of countries ever reached
- All 27 EU Member States featured press articles or multimedia broadcasts about the JRC.

Geographical spread

The total number of countries where coverage was reported in 2008 increased to 67, of which 40 are non-EU countries, compared to 35 in 2007 and 33 in 2006.

With regard to the number of articles per country, Italy remained on top (437), with Germany in second place (241), followed by Spain (138). A notable increase can be seen in the Czech Republic (23 articles, compared to 9 in 2007), in Slovenia (24, compared to 11), and in Denmark (26, compared to 8). This shows that efforts undertaken to address coverage in countries where it was weak were very successful, for example the Info Day in Slovenia and the Open Day in Prague.

Topics most reported in the media

Biotechnology and energy are the JRC's top themes – not only for the quantity of coverage but also for the quality. The rating system introduced to assess the quality of articles according to content and source shows that, in 2008, GMO-related issues (First Global Conference, *Bt* maize report and GMO health study) and renewable energy issues received the most prominent press coverage with the highest number of feature articles in top publications. This was followed by nuclear safeguards and forensics and climate change. In terms of number of articles per work field, the biofuels study is on top with over 200 articles.

Highlights from ESOF and AAAS 2008

The Euroscience Open Forum (ESOF) 2008 in Barcelona on July 18 to 22 featured a strong presence by the JRC, with five scientific sessions as well as a number of high profile science-related communication activities which included a joint presentation by JRC Director-General Roland Schenkel with the CEO of the American Association for the Advancement of Science (AAAS), Dr Alan Leshner, on a subject entitled "Mars and Venus: How Europeans and Americans view and use science".

At the 2008 Annual AAAS Meeting the JRC presented ten symposia on topics ranging from animal cloning and soil protection, to nuclear forensics and biometrics in border management. The meeting in Boston was specifically devoted to the theme 'Science and technology from a global perspective'. This international focus provided an excellent opportunity for the JRC to showcase its activities in scientific research.

Both events led to excellent press coverage for the JRC. ESOF 2008 generated substantial coverage worldwide, with 104 articles reported following the publishing of a series of important articles in the UK's *The Guardian*. Some of the major daily newspapers that covered the event include *Bild* in Germany, *El Mundo* in Spain, Publico in Portugal, the *Telegraph* in the UK, and *European Voice*. Coverage collected relating to the JRC's participation in the AAAS Conference came to more than 30 articles, for example, in *Le Monde*, the *Associated Press*, and a report on German radio *Deutschlandfunk*.

EXAMPLES OF ARTICLES

DELO.si
Delo (SLO): "Strokovnjaki welijo, da bi jm ljudie bolj zaupali" *(GMO conference)*

WELT ONLINE
Die Welt (D): "Sonnenenergie rund ums Mittelmeer" *(solar energy)*

EL PAIS.com
El País (E): "Los futurólogos de la Unión Europea (IPTS)"

EuropeanVoice.com
European Voice (pan-EU): "Balancing research and services at the JRC"

FINANCIAL TIMES
Financial Times (UK): "Soil under strain" *(soil)*

Il Sole 24 ORE
Il Sole24Ore (I): "Ricerca europea – Il centro JRC sul Lago Maggiore" *(two-pages special on JRC)*

Le Monde.fr
Le Monde (F): "Les dégazages volontaires en mer sont en diminution" *(maritime affairs)*

Lidove noviny (CZ): "GMO kukurice se ve spanelsku vyplaci" *(Bt maize study)*

nature
Nature (UK): "Report urges Europe to combine wealth of biobank data"

NZZ Online
Neue Zürcher Zeitung (CH): "Streit um Gentech-Analysen" *(GMO conference)*

NewScientist
New Scientist (UK): "Europe should spend now to avoid climate catastrophes"

guardian.co.uk
The Guardian (UK): "Saharan sun to power European supergrid" *(solar energy)*

Quotations

Un sincero ringraziamento e le più sentite congratulazioni per le competenze dimostrate e la cortesia nel presentarle.

A sincere thank you and congratulations for the competence shown and the excellent presentation.

Mauro Dell'Ambrogio, Swiss State Secretary for Education and Research (12 September 2008)

Thank you very much for the interesting and instructive visit that I was allowed to make to JRC Ispra. I learnt a lot and will certainly be an 'ambassador' of the JRC at the UN organisation.

Ambassador Luis Ritto, Head of the Delegation of the European Commission to the Holy See, to the Sovereign Order of Malta and to the United Nations in Rome (23-24 October 2008)

Visit of Prof. Luigi Paganetto, ENEA President, and a delegation from ENEA (Ente per le Nuove tecnologie, l'Energia e l'Ambiente) (11 September 2008)

I appreciated very much your warm welcome, the perfect organisation and logistics of the meeting and, most of all, the sound and valuable content of the presentation from your side.

Sandro Taglienti, Sandro Bologna, Antonio Palucci, Marcello Peronaci

JRC EXCELLENCE AWARDS

Visit of President of the Federal Criminal Police (Bundeskriminalamt, BKA) to JRC-ITU (18 January 2008)

Ich bedanke mich sehr herzlich für hervorragende Präsentationen und einen interessanten Einblick in die praktische Arbeit. Ich sehe sehr gute Ansätze für die zukünftige Kooperation zwischen dem JRC-ITU und dem BKA.

I want to thank you very much for the excellent presentations and the interesting insights into the practical work. I see very good signs (or initial stages) for the future collaboration between the JRC and the BKA.

Jörg Ziercke, President of the Federal Criminal Police

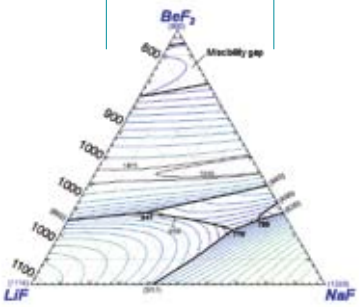
Visit from Director-General Shaul Chorev of the Israel Atomic Energy Commission delegation to JRC-ITU (5 November2008)

"Thanks for the very interesting visit. Looking forward to further co-operation".

Director-General Shaul Chorev of the Israel Atomic Energy Commission

Best young scientists 2008

Ondřej Beneš



One of the highlights of the experimental study was the development of two novel encapsulation methods for the fluoride samples for the calorimetric techniques which avoid corrosion of the detectors.

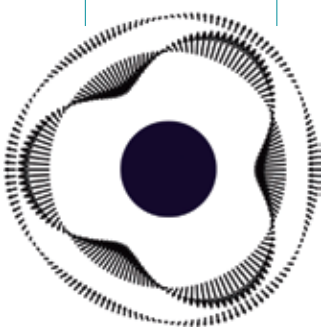
Ondřej Beneš (JRC-ITU)

Molten salt fuel chemistry

The Molten Salt Reactor (MSR) is one of the concepts considered for the Generation IV initiative. In order to evaluate the behaviour of the MSR fuel at various conditions a reliable thermodynamic description of the relevant systems (mainly fluoride salts) is required, allowing the prediction of physicochemical properties such as melting temperature, vapour pressure or solubility of actinides in the fuel matrix.

The thermodynamic study performed at the JRC-ITU can be divided into three main parts. Calorimetric techniques were used to determine the equilibrium data (phase transitions, solid and liquid points) of the RbF-CsF and CaF_2-ThF_4 phase diagrams and the heat capacity of the (Li,Na)F liquid solution. One of the highlights of the experimental study was the development of two novel encapsulation methods for the fluoride samples for the calorimetric techniques which avoid corrosion of the detectors. In addition to the experimental work, several binary systems were modelled according to the CALPHAD method, culminating in the development of the thermodynamic database for MSR fuels containing LiF, NaF, KF, RbF, CsF, BeF_2, LaF_3 and PuF_3. The third part of the research consisted of the exploration of a novel technique to derive thermodynamic data for binary mixtures, namely 'ab initio' electronic structure calculations. Using the CASTEP code, the excess energies of the (Rb,Cs)F solid solution were computed in collaboration with the CEA Saclay, and the results were evaluated using statistical thermodynamic models. The data thus obtained have significantly contributed to the phase diagram assessments and correlated well with the calorimetric measurement, thus confirming the usefulness of this approach, which is now applied to the ThF_4-UF_4 system.

Nicola Magnani



Magnetic field produced by the rank-5 magnetic multipole around the Np ions in the ordered phase of NpO_2.

Nicola Magnani (JRC-ITU)

'Hidden order' in neptunium dioxide

A material is paramagnetic when its constituent atoms or molecules display sizeable dipolar moments which can be partially aligned by a magnetic field. Coupling between these magnetic moments can lead to spontaneously ordered magnetic systems; the most familiar amongst such materials is iron, but today many practical devices are made from a combination of several different magnetic elements to improve their specific properties. Understanding these in detail is therefore crucial for the future development of better, higher performing and more economical materials.

Simple models associate a net dipole moment to each relevant ion in insulating compounds, therefore treating the solid as an arrangement of atomic compass needles. There are only a few real cases where this analogy drastically fails, the most striking being that of neptunium dioxide; a clear ordering transition is observed, but no dipolar moment is measured. Half a century after its discovery, this 'hidden-ordered' phase is still of major interest because it involves the ordering of high-rank magnetic multipoles as opposed to dipoles. Detailed theoretical analysis performed at the JRC-ITU and neutron experiments made with the Institut Laue-Langevin (ILL) in Grenoble have unveiled for the first time a clear signature of the hidden-order parameter in the low-energy spectrum of neptunium dioxide.

These results mark a significant step forward in our current understanding of phase transitions in condensed matter, and the obtained knowledge could be crucial in the future for the design of magnetically polarised devices with no net magnetic moment, for example for use within the spintronic technology.

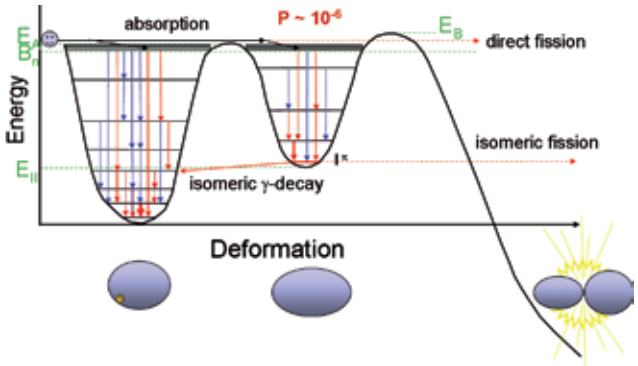
Three best peer-reviewed scientific papers

Stephan Oberstedt and Nikolai Kornilov (JRC-IRMM)

"Identification of a shape isomer in ^{235}U"

Physical Review Letters, 98, 042502 (2007)

Nuclear fission research contributes not only to the development of sustainable, almost CO_2-free energy production but also to understanding the fundamental forces which keeps our world together. The fission process may be regarded as a passage through a landscape of different valleys and hills, the fission barrier. Determining the heights of the hills and the depth of the intermediate valley, the so-called shape-isomeric ground state, provides key data for nuclear reaction models used for the development of nuclear applications and risk analysis. Shape isomers may exist for a time period ranging from 100ms down to picoseconds before decaying by spontaneous fission or γ-ray emission. From the observed half-life and the branching ratio of its decay modes, fission barrier parameters may be precisely determined. With the dedicated isomer spectrometer NEPTUNE recently installed at the JRC-IRMM neutron source MONNET (MONo-energetic NEutron Tower) the shape isomer in ^{235}U was identified at a production level less than 10^{-5} and the half-life determined.



The nuclear energy landscape after absorption of a neutron, the fission barrier, connecting the ground-state deformed actinide (left-hand side) to the nuclear fission point (two separated ellipsoids at the right-hand side).

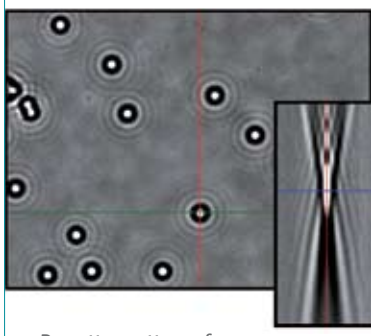
Maurice Whelan

Maurice Whelan (JRC-IHCP, co-authored with E.A. Patterson from Michigan State University)

"Optical signatures of small nanoparticles in a conventional microscope"

SMALL, 4 (10) 1703-1706

Nanotechnology is the purposeful engineering of matter at scales less than 100nm to achieve size-dependent properties and functions. The study of the behaviour of nanoparticles, and in particular their interaction with biological systems, is hindered by the lack of suitable instrumentation that is accessible by a broad research community. Therefore, this work is aimed at developing a straightforward method for tracking the location and movement of nanoparticles in a conventional optical microscope. The approach exploits the phenomenon of optical light scattering where a simple and reversible adjustment to the microscope generates 3D scatter patterns several orders of magnitude larger than the particles themselves. The system thus offers a simple and inexpensive method for visualising the behaviour of nanoparticles without any need for labelling or complex measurement instrumentation. Optical signatures have been detected from single gold particles as small as 3nm, almost 300 times smaller that the wavelength of the light used to observe them.



3D scatter patterns from 1 micron spheres.

Marijn van der Velde and Fayçal Bouraoui (JRC-IES)

"Pan-European regional-scale modelling of water and N efficiencies of rapeseed cultivation for biodiesel production".

Global Change Biology Journal, January 2009, Vol 15

The paper presents a regionalised simulation of current rapeseed cultivation that allows for an evaluation of water and nutrient use efficiency. It also identifies those regions most suitable for rapeseed and oilseed cultivation, and assesses consequent environmental pressures. The approach combines a pan-European simulation with sufficiently detailed modelling to allow informed decision making.

The paper was featured on the front cover of the 'Global Change Biology Journal'.

Three awards for support to EU policies

Cover of the REDD Sourcebook, in which F. Achard and G. Grassi are part of the core editors' team, is designed to be a guide for estimating carbon emissions from deforestation and forest degradation in the UNFCCC framework.

1. Frédéric Achard, 2. Giacomo Grassi, 3. Hugh Eva, 4. Philippe Mayaux, 5. Suvi Monni, 6. Hans-Jürgen Stibig (JRC-IES)

Supporting the development of the European climate change policy, in particular reducing emissions from deforestation and degradation (REDD) in developing countries under the UNFCCC and of the future treatment of the LULUCF sector

Deforestation in tropical regions contributes to about one fifth of global greenhouse gas emissions, whereas in the EU-15 the Land Use, Land Use Change and Forestry (LULUCF) sector is estimated to contribute to 20% of the emission reduction target of the Kyoto Protocol. The official discussions on Reducing Emissions from Deforestation and Forest Degradation (REDD) in developing countries were launched at the 13th Conference of the Parties (COP) to the UN Framework Convention on Climate Change (UNFCCC) in December 2007, and the negotiations continued in 2008. The work of these six JRC scientists, carried out in close contact with policy makers in the Environment DG, contributed to ongoing negotiations on a post-2012 climate agreement by summarising the technical capabilities for estimating emissions from deforestation in the tropics – backed up by several peer-reviewed publications – and by simulating various accounting options for future treatment of the LULUCF sector.

Participants at one of the five workshops of European Critical Infrastructure Protection Experts which were jointly organised by the JRC and the Slovenian Ministry of Defence in 2008.

1. Sara Bouchon, 2. Carmelo di Mauro, 3. Russell Pride, 4. Michael Thornton, 5. Bastiaan Schupp, 6. Christiaan Logtmeijer and 7. Jean-Pierre Nordvik (JRC-IPSC)

Identification and designation of European Critical Infrastructures

In 2008, the EU Council adopted a new directive (2008/114/EC, 08 December 2008) to identify and protect the European Critical Infrastructures (ECI), which, in case of failure, would significantly impact Member States. The development of the criteria and guidelines to be used by Member States to identify these ECIs consisted of analysis of measures for criticality and consequence assessment of failure of infrastructure on inter-dependent infrastructures, and on society in terms of casualties, economic and public effects. It entailed intense collaboration with Member States to build unanimous technical and political consensus. This work contributed to the establishment of a common procedure for the identification and designation of ECIs and of a common approach to the assessment of the needs to improve their protection.

1. Robert Edwards (JRC-IE), 2. Vincent Mahieu (JRC-IES), 3. Szabolcs Szekeres and 4. Frederik Neuwahl (JRC-IPTS)

Support for the EU biofuels policy and involvement in the formulation of the Commission proposal for a directive on promotion of the use of renewable resources

The Well-to-Wheel (WTW) Study was prepared in collaboration with the CONCAWE and EUCAR associations (http://ies.jrc.ec.europa.eu/wtw.html).This website has become the official source of data for key aspects of the impact assessment of the Renewable Energy Directive. The broad experience in biofuel relevant topics at the JRC, together with the major results from the study, was brought together in the report, "Biofuels in the European context: facts and uncertainties" in March 2008. It is the result of a joint JRC Institute effort, and has become the essential reference report for policy makers and stakeholders. The report was probably the first to transparently estimate the possible magnitude of carbon emissions in developing countries caused indirectly by EU biofuels policy. The report brought moderation to the food-fuel debate: biofuels were not the main cause of recent food price increases, but their future effect on future prices would be significant. Both the report and WTW study challenged the prevailing tendency to view second-generation biofuels as a universal panacea: pointing out the high costs and technological uncertainties. Furthermore, it showed that burning biomass for heat or electricity saves more greenhouse gases (GHGs) at much lower cost.

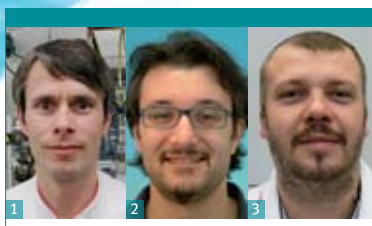
Technical support/assistance

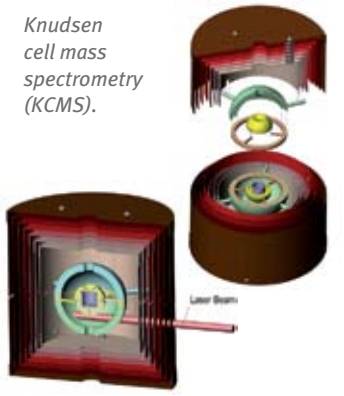
1. Jean-Yves Colle, 2. Roberto Tedeschi and 3. Bernd-Matthias Müller (JRC-ITU)

Very high temperature laser heated furnace for Knudsen cell mass spectrometry

Knudsen cell mass spectrometry (KCMS) is a widely used technique in the field of high temperature chemistry. Since the 1960s, it has been extensively applied in the nuclear material research. At JRC-ITU, this technique is used to measure vapour pressure at equilibrium as well as kinetic measurements like release behaviour of helium or fission products from nuclear fuel. Those are key data in the domain of safety of the complete nuclear fuel cycle, from preparation and irradiation in reactors up to waste management or repository.

During 2008, a new technique for a very high temperature furnace (up to 3000°C) for the Knudsen Cell Mass Spectrometry based on a laser heating technique was developed and constructed. This system overcomes some of the typical technological problems encountered by the standard heating methods like resistance coil, electron bombardment, and induction, in the way that there is no electromechanical energy feed in the furnace. It can be more easily handled in special environments such as glove boxes or hot cells. The furnace, made of tungsten, consists of a small spherical Knudsen cell positioned in the centre of a spherical susceptor acting almost like a blackbody cavity in which laser light is injected through two apertures symmetrically placed. The susceptor itself is held in a thermal shielding system composed of six tungsten shields.





Knudsen cell mass spectrometry (KCMS).

Technological transfer

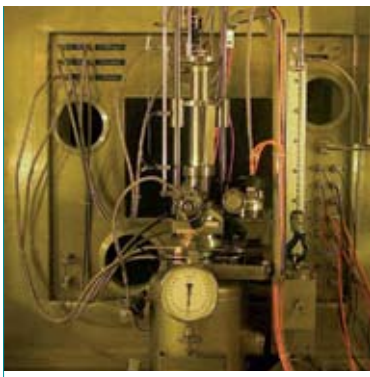
1. David Bottomley, 2. John Ejton and 3. Daniel Freis (JRC-ITU)

Technology transfer of the Kühl Finger Apparat (KüFA) technology from the JRC-ITU to Pebble Bed Modular Reactor (PBMR) Co, South Africa

The Pebble Bed Modular Reactor Co. is building a gas-cooled high temperature reactor in South Africa. It has acquired the licence for this reactor that was developed in Germany in the 1970s. The JRC-ITU had been given a KüFA facility by the Jülich Research Centre (FZ) and, after making considerable improvements, has installed it in a hot cell. It monitors the stability (fission gas release) of fuel elements (pebbles) under extreme temperatures of an accident. First tests with irradiated fuel were successful and demonstrated this reactor's high safety level.

In May 2008 PBMR contacted the JRC with a request for collaboration including; technology transfer of the KüFA facility to PBMR. The JRC-ITU personnel then visited PBMR together with legal service colleagues from Brussels for contractual and technical matters. The JRC-ITU defined a series of adaptations for KüFA's installation in the South African Hot Cells. In June 2008, a PBMR team visited the JRC-ITU to examine the device in detail. By September 2008, a Framework Agreement and Annex specific to the KüFA were finalised.

The JRC-ITU was able to react quickly and assess, together with PBMR, the main adaptations for ease of installation and effective operation, and to formulate the Specific (Technical) Annex, and together with Brussels, the Framework Agreement in approximately four months.



Photograph of the KüFA (Kühlfinger Anlage) after installation in a Hot Cell. This furnace has a special cooled probe to collect volatile fission products released from a fuel pebble at high temperatures.This tests the ability of the Pebble Bed reactor fuel to withstand accident conditions.

Administration and support activities

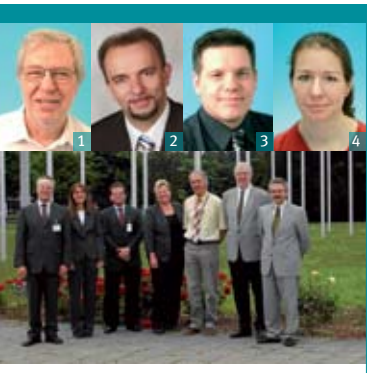
Representatives from the JRC-IRMM Quality Group and the Sector for Safety, Health, Environment and Security. Back l-r: A. Fessler, R. Koeber, M. Bickel, P. Siegler, C. Korn. Front l-r: C. Nazareth, P. Kockerols, G. de Bruyne, R. McLaughlin. Absent from photo: J. McCourt, G. Sibbens, S. Kopecky, T. Linsigner, L. Peeters, M. Van Bocxstaele.

MANAGEMENT OF THE QUALITY, SAFETY, HEALTH AND PROTECTION OF THE ENVIRONMENT

Michael Bickel and Pierre Kockerol (JRC-IRMM), representatives of the team of laureates

"Quality Group"

The JRC-IRMM achieved certification for the international management standards, ISO 9001, ISO 14001 and OHSAS 18001, tools to improve quality, environmental protection, and health and safety performance. This effort was achieved thanks to an unprecedented Institute-wide synergy in developing, for example, the methodology for risk assessment, the integration of objectives, communication aspects, integrated auditing, reporting of non-conformities, incidents and accidents, enhanced Health, Safety and Environment (HS&E) awareness by the hierarchical line and the involvement of all staff. This triple management certification will further increase the JRC-IRMM's reputation for excellence amongst its collaborators and customers.



The JRC-ITU and the DQS (Data Quality Self-assessment) assessors. From l-r: B. Lindner (DQS), A. Steinbauer (DQS), F. Wastin (JRC-ITU), E. Winterhagen-Baus (DQS), J.-F. Babelot (JRC-ITU), O. Cromboom (JRC-ITU), G. Sulzer (DQS).

1. Omer Cromboom, 2. Andreas Bitterhof, 3. Jürgen Lauer and 4. Jaroslava Pravdova (JRC-ITU)

JRC-ITU's Integrated Management System 'recognised for excellence'

The JRC-ITU's Quality Management team has developed and implemented an "Integrated Management System (IMS)" that proposes a unique management approach applying a range of management system standards to satisfy the JRC-ITU's internal and external stakeholders' needs and expectations. The implementation of the management system was evaluated through an external audit conducted by an experienced team of practising managers. The achieved scoring of 530 points, according to the European Foundation for Quality Management (EFQM) Excellence Model, entitled the JRC-ITU to be awarded the IBEC Bronze level, five-stars: 'Recognized for Excellence'.

ITU's Integrated Management System (IMS) has been "Recognised for Excellence".

COMMUNICATION

1. Danae Ortega (JRC-IPTS)

Communication Correspondent

As Communication Correspondent for the JRC-IPTS, Danae is responsible for external and internal communication. In 2008, she concluded the revamp of the Institute's website and intranet. Alongside her main job at the JRC-IPTS, her dedication has been invaluable for the Institute's contribution to corporate priorities in many fields, ranging from quality management, all reporting activities and the Periodic Action review, to the implementation of project software and countless other support tasks.

2. Rossella Speroni and 3. Enrico Ben (JRC-IHCP)

"First Global Conference on GMO Analysis"

Around 600 participants from 70 different countries attended the First Global Conference on GMO Analysis in Como, Italy from 24 to 27 June, 2008. The four-day event welcomed 70 high-level speakers and included an exhibition and poster area on GMO subjects. It was concluded by a JRC seminar on enlargement in which several Commission services took part. JRC inter-Institute collaboration was evident from the scientific programme, while an innovative system allowing on-line registration and payment was developed in-house together with the Internal and External Communication Unit.

Exploratory research

Exploratory research at the JRC seeks to develop new knowledge. Resources invested in the JRC (typically 6% of the institutional budget annually) can be considered as 'seed money' which might yield practical results at a later stage.

The importance of maintaining an appropriate level of exploratory research in the JRC has been constantly recognised by JRC evaluations, and 2008 was no exception. The ex-post evaluation carried out Sir David King, released in January 2009, recommended that a small proportion of the budget be directed into exploratory activities.

On 17 December 2008, the JRC held its annual Exploratory Research Symposium. Seven projects were presented. Below follows a short summary of each project:

Project 1: Detection of allergenic peptides derived from milk hydrolysates by proteomic and immunochemical approaches (JRC-IRMM). The challenge was to develop a new approach for the detection of milk-derived allergenic peptides using both analytical and immunological methodologies.

Project 2: 3D urban structure information extraction from Very High Resolution (VHR) InSAR imagery (JRC-IPSC). The information content of new data is explored with respect to **3D reconstruction of buildings and damage assessment after natural disasters and conflict events.**

Project 3: Properties of 4d metal alloy particles in spent nuclear fuel 'metalloys' (JRC-ITU). These particles were found to have unique characteristics which may be very beneficial to ensure the **long term stability of spent nuclear fuel in a geologic repository.**

Project 4: Modelling of diesel-engine exhaust nanoparticle dynamics (JRC-IES). A set of computational tools developed to model **the dynamics of combustion-generated nanoparticles in vehicle emissions** demonstrated some significant repercussions for the currently legislated vehicle-emission system.

Project 5: Novel integrated processes for on-site conversion, separation, purification and compression of gasification syngas to fuel-cell-quality hydrogen and storage-ready carbon dioxide (JRC-IE). The idea of utilising **low-cost materials for combining capture and compression of pure hydrogen or CO_2** from energy conversion processes was presented to demonstrate the potential application in clean energy systems.

Project 6: Deposition of amino-acid micro-arrays and their modification and removal in a non-equilibrium plasma discharge (JRC-IHCP). Inspired by **modern demands of sterility in medicine,** a plasma process, which is efficient, cost-effective and environmentally friendly to remove amino acids, the building blocks of all proteins, from surfaces was presented.

Project 7: Breaking the walls of Mobile 2.0 (JRC-IPTS). European competitive and innovative edges in the **emerging mobile data applications'** domain require the openness of platforms, the empowerment of users as a major transformation force, research into the interactions between the real and virtual world in everyday routines and a review of the institutional framework.

Project 1: *Virginie Tregoat, Linda Monaci, Arjon van Hengel (JRC-IRMM): Detection of allergenic peptides derived from milk hydrolysates by proteomic and immunochemical approaches*

Project 2: *Dominik Brunner, Guido Lemoine, Joaquim Fortuny (JRC-IPSC): 3D urban structure information extraction from Very High Resolution (VHR) InSAR imagery*

Project 3: *Vincenzo Rondinella (JRC-ITU): Properties of 4d metal alloy particles in spent nuclear fuel ' metalloys'*

Project 4: *Lorenzo Isella, Yannis Drossinos, Barouch Giechaskiel (JRC-IES): Modelling of diesel-engine exhaust nano-particle dynamics*

Project 5: *Jan Rogut (JRC-IE): Novel integrated processes for on-site conversion, separation, purification and compression of gasification syngas to fuel-cell-quality hydrogen and storage-ready carbon dioxide*

Project 6: *Hubert Rauscher, Ondřej Kylián, Francois Rossi (JRC-IHCP): Deposition of amino-acid micro-arrays and their modification and removal in a non-equilibrium plasma discharge*

Project 7: *Claudio Feijoo, Ioannis Maghiros, Fabienne Abadie, Margherita Bacigalupo, Ramón Compañó, Wainer Lusoli, Corina Pascu (JRC-IPTS): Breaking the walls of Mobile 2.0*

JRC Figures on staff, budget and publications

Core staff

The core staff of the JRC (i.e. staff with permanent positions) is composed of officials and temporary agents:

Core staff (M: male, F: female) (total at end of 2008)	2008		
	M	F	Total
Officials	1155	479	1634
Temporary agents on renewable / non-renewable contracts	84	40	124
Total	1239	519	1758

Of the 1758 core staff present in the JRC at the end of 2008, 1176 staff members were working on scientific projects and 582 staff members did administrative or support work (infrastructure, logistics and technical support). Of the total, 1.76% worked in nuclear decommissioning and waste management.

The Commission policy for the "integration of research staff into the mainstream of the Commission's personnel policy" is reflected in an overall decrease in the number of temporary agents from 516 staff (2003) to 124 staff (2008) by converting temporary agents to permanent officials. Nevertheless, a margin of flexibility will be maintained for the recruitment of temporary specialised staff on permanent research posts to cope with short-term needs to ensure a healthy flux of ideas and competencies in particular to meet part of the demands of competitive activities.

Visiting staff

In addition to its core staff, the JRC has an active policy of hosting grant holders, visiting scientists, seconded national experts, contract agents, and trainees, primarily from the Member States and Candidate Countries. Visiting scientists bring advanced skills, knowledge and expertise to help resolve current and future scientific challenges, while benefiting from the cultural diversity, multidisciplinary research domains and extensive research networks at the JRC. The number of visiting staff is steady (compared to 2007) at around 35% of the total number of all JRC staff.

Visiting staff (total at end of 2008)	2008		
	M	F	Total
Trainees	18	22	40
Postgraduate grant holders	13	2	15
Post-doctoral grant holders	86	57	143
Unpaid visiting scientists	9	0	9
Seconded national experts	39	12	51
Contract agents	328	339	667
Total	493	432	925

Total staff

The total number of staff (core and visiting) in the JRC at the end of 2008 reached 2683, which is comparable to that of 2007 (2770). The distribution throughout the JRC Institutes and Directorates is as follows:

Staff distribution (core and visiting) (end-of-year situation)	2008		
	M	F	Total
Institute for Reference Materials and Measurements	178	120	298
Institute for Transuranium Elements	200	70	270
Institute for Energy	182	61	243
Institute for the Protection and Security of the Citizen	311	124	435
Institute for Environment and Sustainability	269	126	395
Institute for Health and Consumer Protection	143	138	281
Institute for Prospective Technological Studies	107	73	180
DG, PSR, RM and ISD	342	239	581
Directorate-General	*10*	*9*	*19*
(Directorate of) Programmes and Stakeholders Relations	*32*	*38*	*70*
(Directorate of) Resource Management	*38*	*60*	*98*
Ispra Site Directorate	*262*	*132*	*394*
Total	1732	951	2683

Equal opportunities

The "JRC Equal Opportunities and Women and Science" Working Group (EO and W&S Group) was established in December 2005 with the mandate to implement the JRC Action Plan 2006-8 for Equal Opportunities, according to the Commis-

sion's Fourth Action Programme for Equal Opportunities 2004-08 (SEC(2004) 447/5).

In 2008, the group continued its gender-watch action on recruitment and career development. It proposed diverse training actions aimed to prepare women for managerial posts, raised awareness, and increased the awareness of newcomers and JRC hierarchy to equal opportunities. The EO and W&S Group participated in a number of forums and conferences supporting gender equality.

The Women and Science Network (W&SN) advises senior hierarchy on the need for better representation of women in JRC science. Its mission is carried out through statistical analyses aimed at monitoring progress in gender equality and through recommendations for the encouragement of women in JRC science.

The W&SN met four times in 2008. During this year, the network provided recommendations to the Director-General on meeting the middle management gender equality targets, and on maternity leave replacements. The network also advised senior hierarchy on childcare facilities affecting work/life balance through bilateral meetings with JRC directors on gender equality progress in scientific units. A 2008 analysis of gender balance in scientific units and JRC scientific management indicates that there is slow but steady progress in the representation of women in science in the JRC. In 2001, 9% of JRC scientific Action Leaders were female. In 2008, this number rose to 15%.

Budget (budget and expenses – institutional activities)

The available credits to the JRC are subdivided into staff expenses, means of execution (maintenance of buildings and equipment, electricity, insurance, consumables etc.) and specific credits (direct scientific procurements).
On the Institutional budget, the following sums were committed (meaning available in commitment appropriations, EFTA credits are not included):

	2008 (in million Euro)
Staff expenses	224.5
Means of execution	69.8
Operational appropriations (Framework Programme)	38.4
Total (rounded up)	332.7

In addition, €29 million was made available to finance the programme to decommission the JRC nuclear installations, and to manage the waste activities related to the Euratom Treaty.

Additional credits of €17.3 million came from contributions of countries associated to the Framework Programme.

JRC competitive activities

A portion of the JRC's income must be generated from competitive activities, which comes from its participation in FP7 indirect actions, performing additional work for Commission services, and contract work for third parties such as regional authorities or industry. These competitive activities complement the tasks outlined in the JRC's work programme and are seen as an essential tool for acquiring and transferring expertise and know-how.

The table below shows the value of competitive agreements signed and inscribed in the accounts during 2008. The total quantity cashed by the JRC for ongoing competitive contracts in 2008 amounted to €48.3 million.

About half of all competitive agreements signed in 2008 were a result of requests from Commission services for additional S&T support.

Contracts signed	2008 (in million Euro)
Indirect actions	14.4
Competitive activities outside the Framework Programme	26.9
Third-party work	4.4
Total (rounded up)	45.7

Publications registered in 2008

	1	2		3	4	Total
		2.1	2.2			
JRC-IRMM	65	0	47	61	6	179
JRC-ITU	97	0	18	30	5	150
JRC-IE	72	0	43	57	1	173
JRC-IPSC	129	0	136	86	3	354
JRC-IES	215	1	71	52	9	348
JRC-IHCP	108	1	40	20	3	172
JRC-IPTS	62	1	71	15	0	149
	748	3	426	321	27	1525

Category 1.
Monographs and articles
(Books, Monographs with JRC editorship, Article contribution to a monograph, Article contribution to a periodical listed in the ISI Science/Social Science Citation Index, Article contribution to other periodicals).

Category 2.
JRC reports and notes
2.1 JRC reference reports,
2.2 JRC scientific and technical reports

Category 3.
Contributions published in conference proceedings
(Article contribution to conference proceedings published in a periodical listed in the ISI Science/Social Science Citation Index, Article contribution to conference proceedings published in other periodicals, Scientific paper presented at a conference and published in a book of conference proceedings (with editorship)).

Category 4.
Special publications
(PhD theses, Publications in a special format, including maps).

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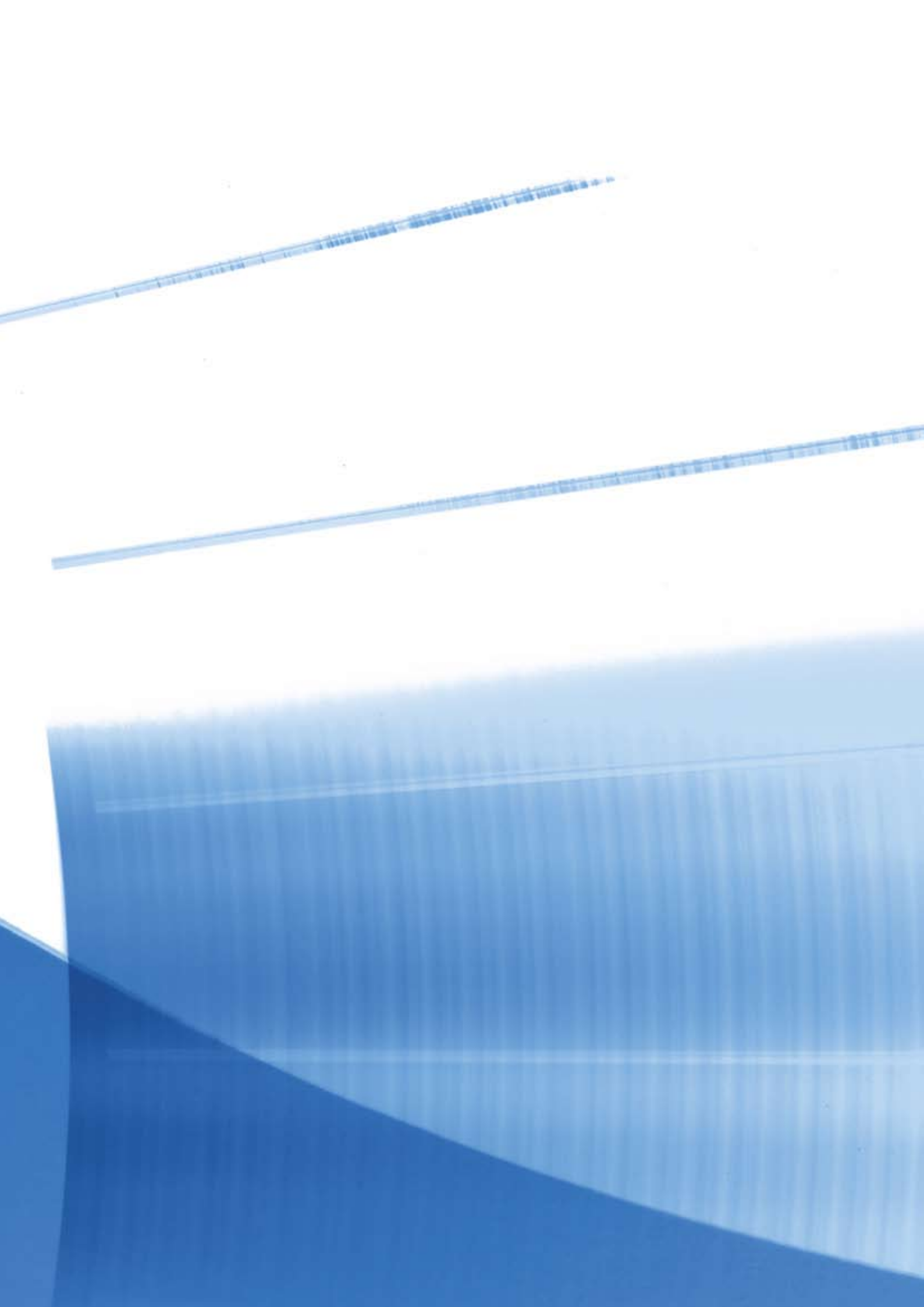
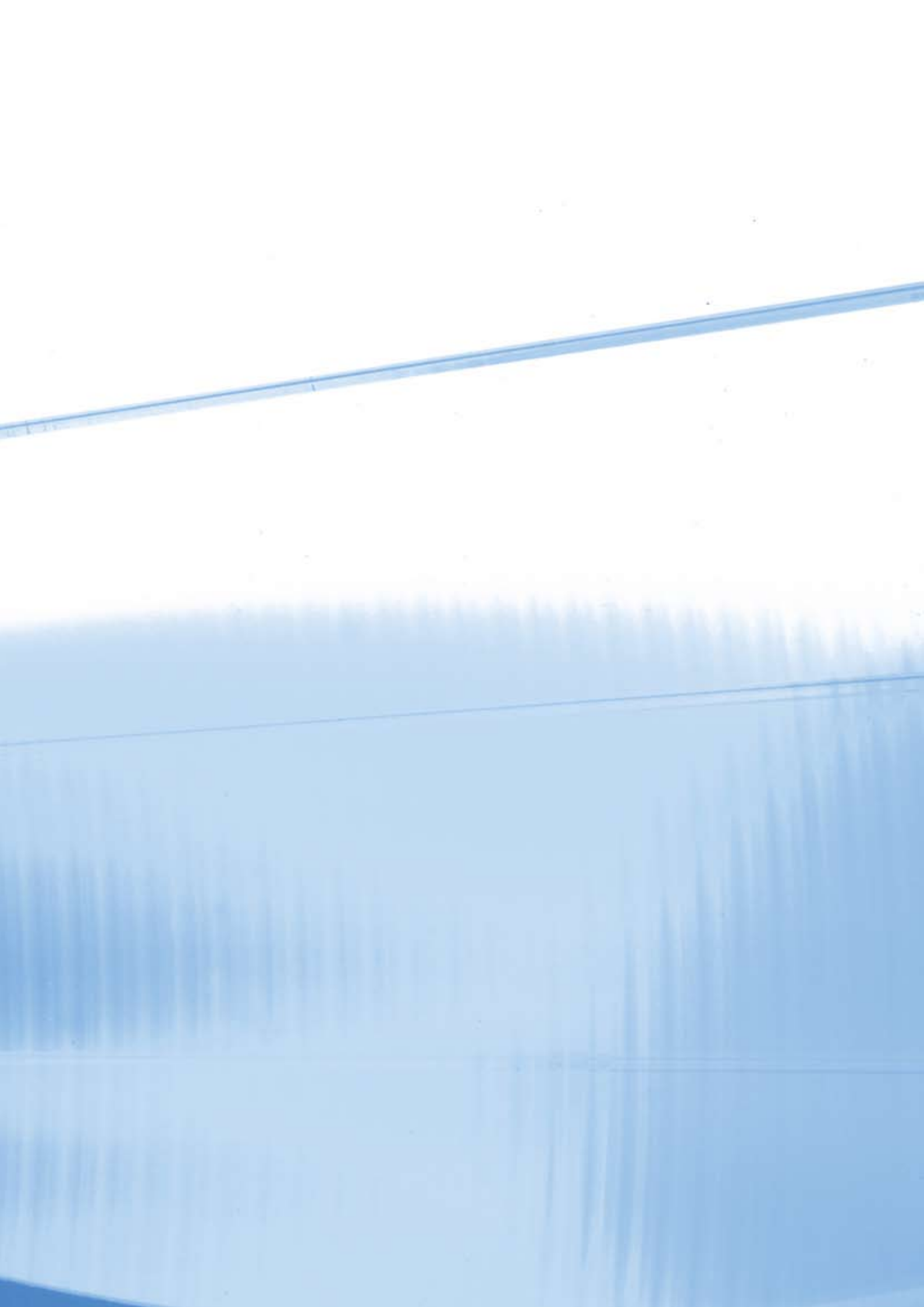
Abstract
Report on the activities, accomplishments and resources related to the JRC's work carried out in 2008. An overview is given of the mission, its implementation, the scientific achievements and activities, and its external relations.





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