

National Research Fund Luxembourg



A N N U A L R E P O R T

2005



FONDS NATIONAL DE LA RECHERCHE

6, rue Antoine de Saint-Exupéry (3^e étage) – B.P. 1777 – L-1017 Luxembourg – Kirchberg
Tél. +352 26 19 25-1 – Fax +352 26 19 25-35
fnr@fnr.lu – www.fnr.lu

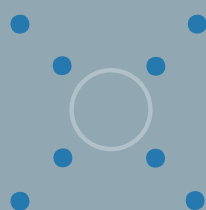
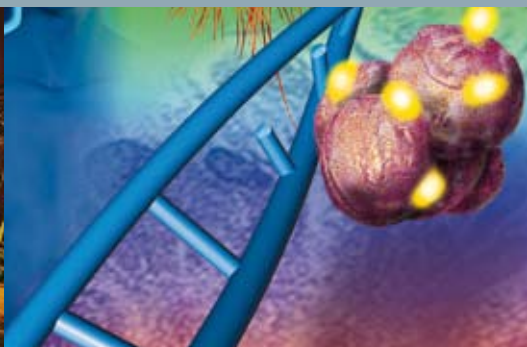


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Summary

The National Research Fund was set up in 1999 in order to stimulate research activities in Luxembourg with the aim

- to create new competence and knowledge,
- to strengthen existing competence and knowledge and
- to develop national and international synergies in order to increase the attractiveness of Luxembourg as a scientific and economic site of excellence.

Multi-Annual National R&D Priority Programmes:

The following multi-annual research programmes have been launched since 2000:

Duration	Programme Title	Budget (in €)
2000–2007	Security and Efficiency of New Practices in E-Commerce for All Socio-Economic Actors (SE-COM)	7,500,000
2000–2008	New Materials and Nanotechnology (NANO)	6,700,000
2000–2007	Sustainable Management of Water Resources (EAU)	5,000,000
2000–2008	Health and Biotechnology (BIOSAN)	6,000,000
2002–2009	Living Tomorrow in Luxembourg (VIVRE)	12,000,000
2004–2008	Medical Aspects of Ageing (PROVIE), Extension of BIOSAN	2,500,000
2003–2009	Surface Treatment (TRASU)	6,000,000
2003–2010	Food Safety (SECAL)	6,000,000
2006–2011	Promotion of International Cooperation (INTER)	6,000,000
Total	55 Projects	51,700,000

How to Participate in these Programmes?

In the framework of these programmes, the Fund announces periodic calls for research projects. The selected projects benefit from a financial contribution granted by the Fund.

Further information concerning the calls for research projects can be found on the Fund's website www.fnr.lu.

To Whom are the Calls Addressed?

Calls are addressed to public institutions, Luxembourg administrations and public establishments authorised to undertake R&D activities or technology transfer in their respective fields of activity.

Accompanying Measures:

In addition to the support of research as such, the Fund subsidises accompanying measures aiming to strengthen the general frame of scientific research in Luxembourg. Thus, the Fund launches regular calls for proposals concerning the promotion of

- scientific awareness,
- international scientific cooperation, and
- national coordination in research.

The accompanying measures are divided into eight categories:

MA1: Various measures for promoting scientific awareness, national R&D coordination and international scientific cooperation

MA2: Active participation of novice researchers in a scientific conference

MA3: Organisation of a scientific conference in Luxembourg

MA4: a) Publication of a doctoral thesis or b) scientific publication

MA5: Preparation of a European Union research project

MA6: Mobility of researchers

MA7: Training in research project management

SF: Science Festival

How to Participate in these Measures?

For the accompanying measures MA1/MA3/MA6 the submission dates are on 1 April and 1 October of each year. For the remaining measures, there is no fixed deadline. All the relevant information concerning the accompanying measures can be found in detail on the website www.fnr.lu.

To Whom are the Calls Addressed?

These measures are addressed to a larger public:

- Public institutions or services authorised to undertake R&D activities,
- Associations,
- Individuals who pursue activities of scientific nature, including students.

European and International Partnerships:

The National Research Fund is a member of:

- the European Science Foundation (ESF)
- the European Union Research Organisations' Heads of Research Councils (EUROHORCS)
- the European Research Consortium for Informatics and Mathematics (ERCIM)
- the International Council for Science (ICSU)

Since 2003, the Fund has been participating in three 'European Research Area Networks' (ERA-Net), concerning research in ageing, materials' research and research in neurology.

To receive further information, please visit the Fund's website www.fnr.lu or send an email to fnr@fnr.lu.

The annual report may be downloaded from www.fnr.lu.

Un rapport annuel résumé est également disponible en version française sur demande auprès de fnr@fnr.lu ou peut être téléchargé du site www.fnr.lu.

FOREWORD

Romain Henrion

*President of the
Board of Administration*



According to a study carried out by Halla Thorsteinsdóttir¹ on public-sector research in small countries and on the issues facing this research, small countries have to cope with a range of problems and challenges that ultimately prove to be similar to the problems currently faced by Luxembourg and its public-sector research.

To be more precise, Thorsteinsdóttir lists four problems and challenges:

Firstly, she notes that small countries are not generally regarded as active participants in the international scientific community. Science calls for high levels of financial resources, and it is difficult for small countries to sustain a large number of scientific activities; hence the need for these countries to be selective, or even to limit the number of areas that they are willing to finance.

In Thorsteinsdóttir's view, another dilemma these countries have to face is the difference between national and international orientation, a difference that does not exist in larger countries. In most small countries there are therefore high levels of international collaboration, often explained by a lack of both human and financial resources, or by a lack of opportunities in a given area. Yet if they concentrate solely on international research, they risk producing results of no interest to the national market and neglecting local problems. On the other hand, if they limit their activities to the national level, they run the risk of sinking into isolation, which would be detrimental to research and science in these countries. Consequently, decision-making in these small countries calls for a skilful mixture of purely national and international activities.

Next, a country's small size should in principle constitute an advantage as regards that country's scientific systems, with less bureaucracy, better distribution of research results, better ways of reacting to changes in policy, etc. Yet the sample countries investigated in Thorsteinsdóttir's study, and many other small countries, showed that the fact that a country is small does not automatically mean that it possesses either a coordinated research policy or flexibility that can be counted on. The excessive influence of certain pressure groups often prevails, and the need for a formal and effective research system is not made clear.

In addition, most small countries tend to devote themselves more to applied research than to basic research. Yet any system of public-sector research requires a basic research component in order to offer society and the private sector adequate training based on the state of the art, and to reinforce a country's capacity for innovation. It is therefore essential for small countries to find a balance between applied research and basic research and to target certain priority areas without being too restrictive.

Lastly, Thorsteinsdóttir comments that most of these challenges are very similar to those faced by the larger European countries but seem to be more intense in small countries in view of the limited resources available; systems of public-sector research in these countries also appear to need more accurate decision-making tools. Consequently, what she suggests is something that is of great interest to Luxembourg and to the Fund, which will be setting out along the same path in 2006, namely that a forecasting exercise or *technology foresight* be undertaken.

¹ H. Thorsteinsdóttir (2000), "Public-sector research in small countries: does size matter?", *Science and Public Policy*, 27(6), pages 433–442.

A forecasting exercise, which by definition brings together researchers, engineers, industrialists, policymakers and others, calls for intensive dialogue among all the players with a view to jointly identifying priority research areas and thus arriving at a shared vision of the future. This helps to improve communication and, ideally, shapes a consensus and greater commitment by the various players to the research system. Thorsteinsdóttir concludes that a forecasting exercise makes even more sense in small countries, given that a larger proportion of players in the research world are directly involved in the exercise and, as a result, the impact will probably be greater than in larger countries.

The Fund's forecasting exercise, *FNR Foresight*, which will be carried out in 2006, aims to consolidate the views of the main parties involved in public- and private-sector research in Luxembourg, and to identify for the public sector the research areas and priority aims of medium- and/or long-term socio-economic interest to society in Luxembourg. This will be a starting point for the Fund to develop new research programmes which will be launched as from 2007.

What distinguishes a forecasting exercise from an analysis of the future or a 'traditional' planning activity is its participative element, i.e. its emphasis on networking and on consulting all the players and users involved, in order to reach a consensus, a shared vision of the future. This vision of the future will then make it possible to define the National Research Fund's next research programmes.

Aided by CM International, a European group of innovation and technology management consultants, the Fund will use various resources to bring this exercise to a successful conclusion, in particular interviews, questionnaires, factual research, workshops, or discussion forums on the www.fnrforsight.lu website.

In summer 2006, the Fund expects to suggest to the Minister a list of research areas ensuing from the *Foresight* exercise. In a second phase, national and international experts will decide on the priority research aims for those areas taken up and will thus help in the production of programme proposals, which the Fund will submit to the Government with a view to launching its new research programmes in 2007.

With the aid of all the players involved in public- and private-sector research, we can see to it that these research programmes constitute strategic choices that are in keeping with Luxembourg's size and expectations.

FOREWORD

Jean-Frank Wagner

*President of the
Scientific Council*



Five calls were issued or prepared in 2005, namely the third call for the SECOM programme and the second calls for the NANO, EAU, VIVRE and PROVIE programmes. Part of the project evaluation and selection was carried out at the end of 2005, and the remaining proposals will be submitted or evaluated early in 2006. No other calls are planned for these programmes.

In 2006 the Fund will therefore concentrate on identifying and preparing for new programmes in the context of the *FNR Foresight* forecasting exercise, which will be launched in January 2006.

The vast majority of the projects supported by the Fund are showing promising results. In 2005, many projects published articles in international scientific journals, and two BIOSAN projects are planning to apply for patents.

I also have pleasure in confirming that the Fund's programmes and projects have succeeded in attracting doctoral and post-doctoral researchers to research bodies in Luxembourg. Furthermore, research teams are being developed around Fund projects. Many of the laboratories, infrastructures and research teams that currently exist in Luxembourg, and which can pride themselves on having achieved a certain critical mass, have been developed thanks to support from the Fund.

At national level, the Fund has set in motion a very large number of projects involving collaboration between two or more research centres within and outside Luxembourg. The promotion of project partnerships also involves collaboration with the private sector. For some of the Fund's calls, therefore, collaboration with one or more private enterprises is obligatory, as for example in the TRASU programme.

At international level, the Fund continued to participate in the activities of the European Science Foundation and in the ERANET MATERA and *ERA-AGE* networks in 2005, and also participated in the calls of the *National Science Foundation* (USA) in the field of materials science. With regard to the ERANET MATERA, the first joint network call is planned for 2006.

In addition to these activities, which had already been initiated in previous years but which displayed real development in 2005, coordination at international level was intensified as from the end of 2005 through the new INTER programme. This programme was born out of the need for improved collaboration between Luxembourg-based research bodies and international partners, above all with a view to making research in Luxembourg more visible outside the country. Thus the INTER programme aims to promote international scientific cooperation, to create synergies between research centres within and outside Luxembourg, to achieve a critical mass in certain fields, to adopt an improved approach in order to resolve transnational issues, and to make research in Luxembourg more competitive.

With regard to promoting scientific culture, in 2005 the Fund financed the 5th Science Festival (organised by the National Museum of Natural History), which took place in October 2005 and was a great success, with 25000 visitors. Several eminent Japanese researchers, including the Japanese astronaut Dr Chiaki Mukai, gave scientific talks at the Festival. The Fund also participated in the *Firwat net Fuerscher?* campaign, notably in the 'Researchers in schools' strand which aims to promote research as a career among secondary school students through visits by researchers from Luxembourg and Portugal to secondary schools in Luxembourg. The Fund

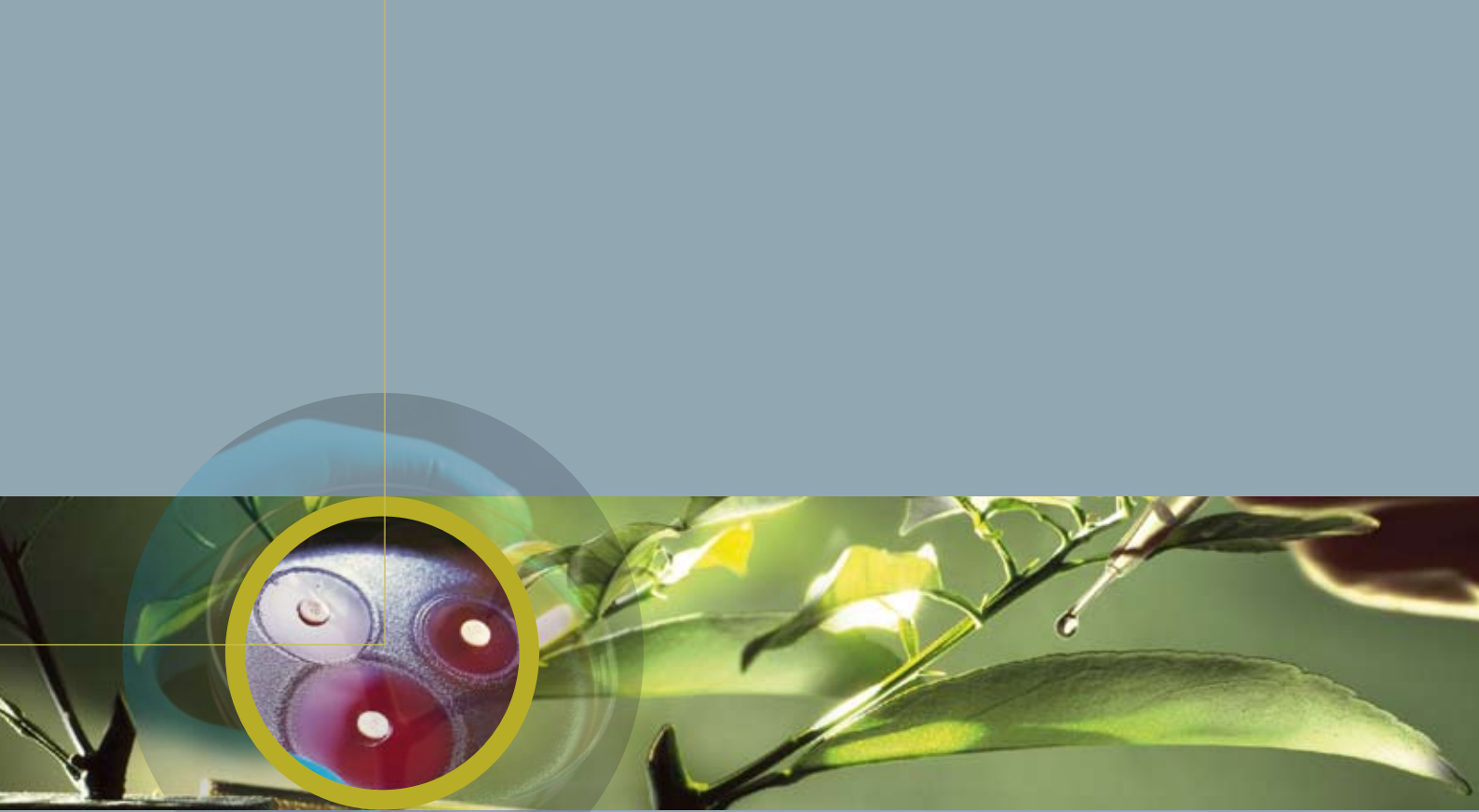
supported over 100 activities, talks and scientific publications, as well as other activities, under the heading of accompanying measures. Work began on production of a series of brief reports on research activities, which will be transmitted on RTL Télé Lëtzebuerg starting in March 2006. I am convinced that these activities need to be stepped up in order to make the general public more interested in research and to encourage young people and their teachers to see a career in research in Luxembourg as a viable career option.

In view of the major developments under way in research activities in Luxembourg, strategic guidance for the choices to be made for the future is proving more and more essential. In this context, the Ministry of Research's OECD study is a step in the right direction.

For its part, the Fund will launch a forecasting exercise in 2006, namely *FNR Foresight* (www.fnrforsight.lu), which will aim to consolidate the views of the main parties involved in public- and private-sector research in Luxembourg, and to identify for the public sector the research areas and priority aims of medium- and/or long-term socio-economic interest to society in Luxembourg. Its aim will be to identify both the Fund's new multi-annual research programmes and national priority topics in general.

As President of the Scientific Council, I am delighted about all the activities in progress, and particularly about the prospects for Luxembourg's R&D sector, namely the Government's announcement that it will continue to support public-sector research, with the Lisbon objectives and the planned development of infrastructures and resources on the Esch-Belval site in mind. In particular, it will be necessary to develop a global strategic plan for research at national level, with which all the players, both public and private, can identify.

The "Cité des Sciences" in Belval and the Fund's future programmes will breathe new life into research in Luxembourg, in both the public and private sectors. The Fund's Scientific Council looks forward to playing its part in guiding research in the coming years, together and in a coordinated way with the players involved.



Tasks and Operation

Tasks

Under the terms of Article 2 of the Law of 31 May 1999 establishing a national Research Fund in the public sector, the tasks of the Fund are:

- to receive, manage and use funds and donations from public or private sources to promote research and technological development in the public sector at national level, referred to as 'R&D', and
- to maintain an ongoing process of reflection in the field of national R&D policy orientation, according to economic data and scientific and technological developments, as well as on the basis of in-depth studies.

Role of the Fund

- To develop proposals relating to the objectives of national R&D policy;
- To suggest priority actions to achieve these objectives;
- To develop multi-annual activity programmes on the basis of the priorities adopted and thereby contribute to the establishment of a multi-annual R&D programme at national level;
- To secure the implementation of these multi-annual activity programmes by allocating the financial resources made available to it and to monitor their implementation;
- To ensure systematic and continuous evaluation of the results obtained, in order to facilitate any readjustment of priorities which may prove necessary;
- Generally, to promote the efficient coordination of national R&D activities and Luxembourg participation in international R&D cooperation programmes; and
- To present to the Minister responsible for scientific and applied research, on its own initiative, any proposal, suggestion and information regarding the implementation of national R&D policy.

The Beneficiaries

- The public research centres set up on the basis of the Law of 9 March 1987 to facilitate:
 1. the organisation of technological research and development in the public sector,
 2. technology transfer and scientific and technical cooperation between private companies and the public sector;
- The University of Luxembourg;
- The Centre d'Études de Populations, de Pauvreté et de Politiques Socio-Économiques (CEPS / INSTEAD), a public establishment created by the Law of 10 November 1989; and
- The public bodies, services and establishments authorised to undertake research and development and technology transfer activities in their fields of competence, with the aim of promoting scientific progress and technological innovation.

Resources Provided

In the performance of its tasks, the Fund may:

- organise activities to promote scientific culture,
- allocate bursaries to researchers and scientists,
- give grants to individuals and associations pursuing activities of a scientific nature, and
- enable the beneficiaries mentioned above to participate in programmes organised by the European Community or by international organisations.

Operation

The National Research Fund is a public establishment with scientific, financial and administrative autonomy and is managed by a Board of Administration, assisted by a Scientific Council and a Secretariat.

The Board of Administration

The Board of Administration consists of:

- a member nominated by each of the Ministers concerned, whose areas of responsibility cover scientific research and applied research, higher education, industrial research and development, technology transfer or the budget,
- two members nominated by the Government Council after consultation with the other Ministers organising R&D,
- six members nominated by the Government from among figures in the private sector recognised for their competence in the field of R&D.

Composition of the Board of Administration

Members of the Board of Administration from 2005–2009

President: Romain Henrion, Arcelor S.A.

Vice-President: Pierre-Marie Valenne, Banque Privée Edmond de Rothschild Europe

- Raymond Bausch, Ministry of Culture, Higher Education and Research
- Jean Bergh, Goodyear S.A., Technical Center Luxembourg
- Germain Dondelinger, Ministry of Culture, Higher Education and Research
- Yves Elsen, Hitec Luxembourg S.A.
- Jean-Marie Haensel, Inspection Générale des Finances
- Danielle Hansen-Koenig, Ministry of Health
- Romain Keiser, Galvalange s.à r.l.
- Henri Metz, Section Médicale de l'Institut Grand-Ducal
- François Meyer, Gencell SAS, France
- Marco Walentiny, Ministry of Economic Affairs

The Scientific Council

The Scientific Council assists the Board of Administration as a consultative body on scientific matters.

The Scientific Council consists of:

- a representative of each public research centre (CRP Henri Tudor, CRP Gabriel Lippmann, CRP Santé),
- a representative of the Centre d'Études de Populations, de Pauvreté et de Politiques Socio-Économiques (CEPS/INSTEAD),
- two representatives of the University of Luxembourg established by the Law of 12 August 2003,
- figures external to the bodies mentioned above, whether from Luxembourg or abroad, selected on the basis of their competence. Their number exceeds that of the bodies listed by one.

Composition of the Scientific Council

Members of the Scientific Council from 2005 to 2009

President: Jean-Frank Wagner, University of Trier, Germany

- Jean de la Hamette, Public Research Centre Henri Tudor
- Adelheid Ehmke, University of Luxembourg
- Gusty Feyder, DuPont Teijin Films Luxembourg S.A.
- Marc Gengler, École Supérieure d'Ingénieurs de Luminy/Marseille, France
- Jean-Paul Lehnert, University of Luxembourg
- Fernand Muller, Dometic s.à.r.l.
- Délia Nilles, University of Lausanne, École des HEC, Switzerland
- Fernand Reinig, Public Research Centre Gabriel Lippmann
- Gaston Schaber, Centre d'Études de Populations, de Pauvreté et de Politiques Socio-Économiques
- Fernand Wagner, Public Research Centre Santé
- Pierre Wiltzius, Beckman Institute, University of Illinois, USA

The Secretariat

The Secretariat of the Fund consists of:

- Raymond Bausch, Secretary General, raymond.bausch@fnr.lu
- Carlo Duprel, Programme supervisor, carlo.duprel@fnr.lu
- Christiane Kaell, Programme supervisor, christiane.kaell@fnr.lu
- Ulrike Kohl, Programme supervisor, ulrike.kohl@fnr.lu
- Frank Glod, Programme supervisor, frank.glod@fnr.lu
- Anne Schroeder-Van den Bulcke, Communications Officer, anne.schroeder@fnr.lu
- Jill May-Mousel, Assistant of the Secretary General, jill.mousel@fnr.lu
- Sylvie Heinisch, Administrative assistant, sylvie.heinisch@fnr.lu
- Susana Pinto, Administrative assistant, susana.pinto@fnr.lu
- Alexandra Becker, Administrative assistant, from 3 January 2005 to 17 January 2006

- Anne Van den Bulcke, on a temporary placement from 1 April to 30 April 2005
- Bob Mousel, from 15 July to 14 August 2005 (student vacation assignment)
- Frédéric Wagner, from 15 August to 4 September 2005 (student vacation assignment)

General Procedures for the Selection of Research Projects

The procedures for the selection of research projects are based on the Law of 31 May 1999 establishing the National Research Fund and the Grand Ducal Regulation of 27 July 2000. The Fund draws up multi-annual research programmes and issues calls for proposals for projects within the framework of those programmes.

The Scientific Council appoints an expert, known as a rapporteur, whose task it is to coordinate the assessment of projects submitted and to present the results of the assessment to the Fund's Scientific Council. The rapporteur appoints three to four independent experts for each research project. The Board of Administration and Scientific Council have the right to appoint additional experts where necessary.

Criteria Adopted for the Assessment of Projects

Project proposals are assessed by the experts according to the following criteria:

- Scientific quality (creativity and innovation, consistency, interdisciplinary working, internationally recognised level of competence);
- Socio-economic value;
- Ratio of planned expenditure to results anticipated;
- Consistency with the objectives and priorities of the activity programmes in progress;
- Realistic nature in relation to the Luxembourg context;
- Capacity for mobilisation at national level; and
- Balanced distribution of budgetary resources between the acquisition of skills, the research aspect and the dissemination and utilisation of research results.

Depending on the assessment results, the rapporteur submits to the Scientific Council a list of proposals to be selected for a financial contribution. The final decision is taken by the Board of Administration on an opinion from the Scientific Council. Thus a project proposal may be:

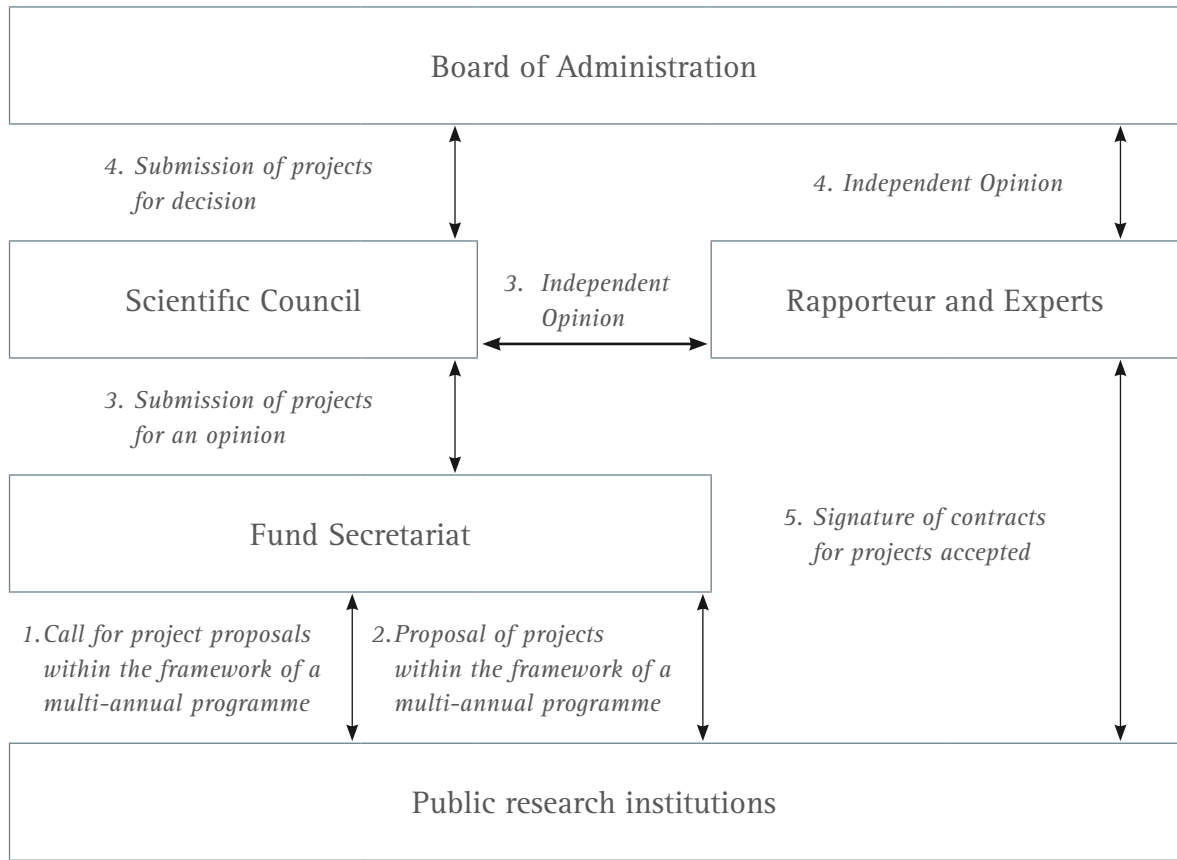
- accepted,
- rejected, or
- passed back for amendment.

Project promoters are informed of the results of the assessment of their project and reasons are given in writing in respect of each project rejected. Where a project has been accepted, an agreement is negotiated and concluded between the Fund and the contracting parties.

In the case of projects subject to amendment, the rapporteur assesses the proposals resubmitted, sometimes in consultation with other experts, and presents his comments to the Scientific Council and the Board of Administration for an opinion and final decision.

For further details on the project evaluation procedure, please visit the Fund's website www.fnr.lu.

Current Arrangements for the Execution of National Research Fund Projects



General Procedures for the Selection of Multi-Annual Programmes

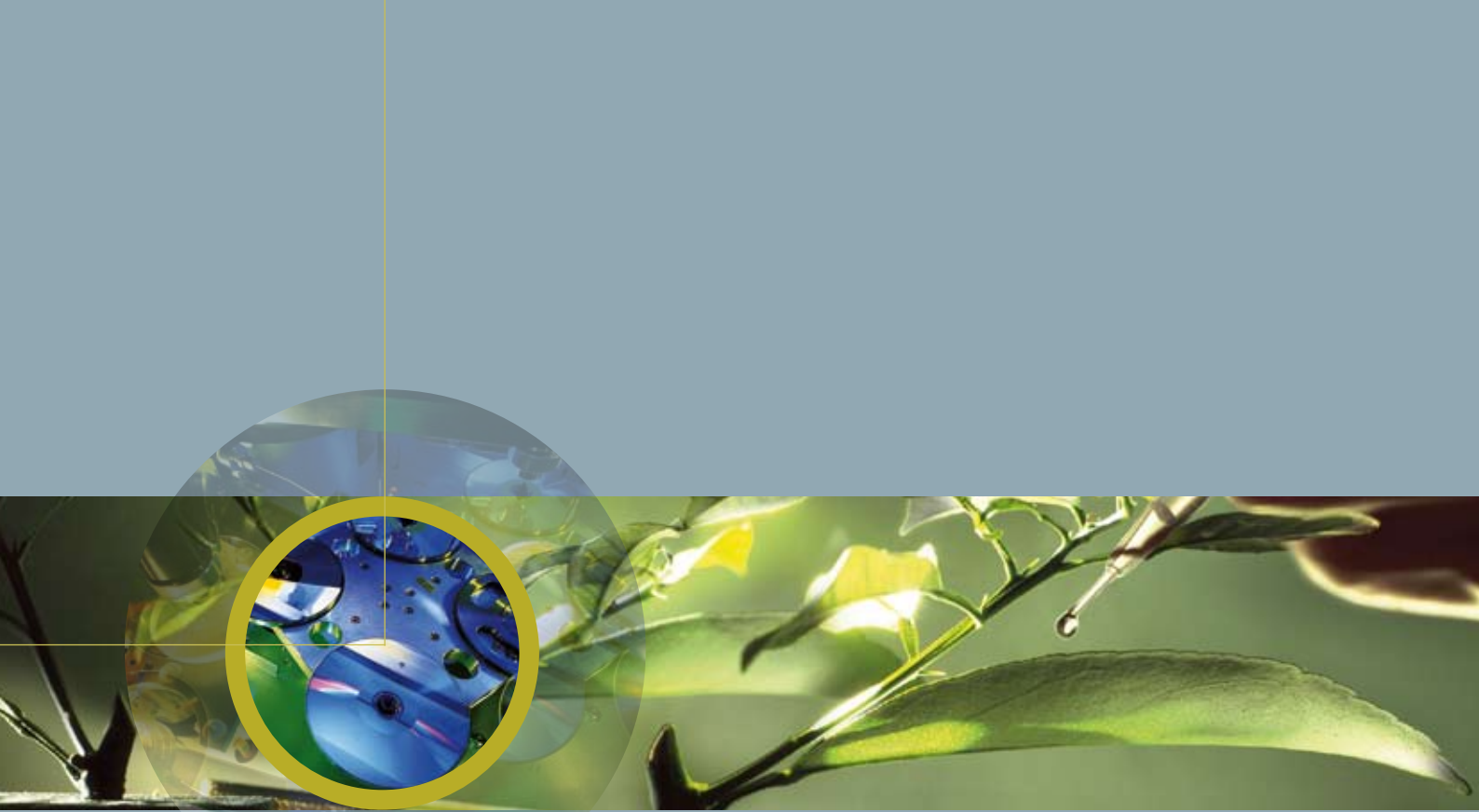
At the outset, the Fund drew up its multi-annual activity programmes on the basis of proposals from relevant national bodies in the field of R&D.

During the preparation of its first multi-annual programmes in 2000 and 2002, the Fund issued two calls for programme proposals in which relevant research bodies in the public and private sectors and individual or institutional promoters could submit suggestions. Proposals were selected following assessment by the Scientific Council and the Board of Administration on the basis of the following criteria:

- Scientific quality (creativity and innovation, consistency, interdisciplinary working, internationally recognised level of competence);
- Socio-economic value;
- Realistic nature in relation to the Luxembourg context;
- Capacity for mobilisation at national level; and
- Distribution of budgetary resources.

The Fund's Board of Administration decided what proposals to select on an opinion from the Scientific Council.

A group of experts was then formed to draw up the specific content of the programmes. After incorporating amendments suggested by the Scientific Council and international experts, a final text and proposed budget were submitted to the Government.



II

Current Multi-Annual
Research Programmes

SECOM Programme

Security and Efficiency of New Practices in e-Commerce for all Socio-economic Actors

Duration: 2000–2007

Total Budget: €7,500,000

Calls in 2001 and 2004: 9 Projects Selected (€6,707,772)

3rd Call in 2005: Evaluation Ongoing

The SECOM programme's objective is the competitiveness of the Luxembourg economy in the field of e-commerce. It aims at developing a knowledgeable demand and an effective offer correspondent to the needs of the new economy. This requires the mastery of the context of electronic commerce and cooperation, with a global quality approach that must integrate the solution of two problems, requiring joint efforts in R&D:

- Security issues, aiming at the confidentiality, the availability and the integrity of electronic exchange systems,
- Cooperation issues, aiming at the specification and the conception of the legal, organisational and software regulations linked to the implementation of virtual platforms that regroup several economic actors cooperating by electronic devices.

In order to better master the new contexts of electronic cooperation, the SECOM programme is developing an integrated research on the safety of electronic exchange and on the efficiency of new organisational and software models for electronic cooperation. The application of these research results will be particularly confronted with the realities of the service and SME sectors, bearing a strong potential for the production of goods and services in Luxembourg, however without excluding other sectors that also have a proven impact on the information society.

On 2 December 2005, a second steering committee, composed of international experts, was organised. The aim was to evaluate the progress of the ongoing projects and of the SECOM programme in general. The committee members gave a globally positive feedback on the quality and the content of the programme (as was the case during the first steering committee held in January 2004). New competencies have been created and the objectives of the programme have been met. To improve the impact of the programme, the experts issued the following recommendations:

- Establish a tighter collaboration with research institutes at national and international level as well as with the private sector, and
- Improve the valorisation of results by publishing articles in recognised scientific journals and by presenting results during international conferences.

On 4 July 2005, the Fund launched a 3rd call for proposals in the SECOM programme. 5 propositions were received and are currently being evaluated by independent international experts and the rapporteur of the SECOM programme. Projects to be funded by the FNR will be selected early 2006.

Project Code	Title	Contact	Coordinating Institution(s)	Starting Date	Closing Date	Budget Estimates (€)
FNR 01/01/01	Legal Security of e-Commerce	A. Prüm	CRP Gabriel Lippmann	15.10.2002	31.03.2006	782,840
FNR 01/01/05	NICT System Facilitating the Electronic Business of Virtual Organisation (SICOV)	F. Feltz	CRP Gabriel Lippmann	01.11.2001	31.10.2006	1,405,000
FNR 01/01/06	Cryptology & Security Initiative (CSI)	J.-C. Asselborn	University of Luxembourg	01.10.2001	30.09.2006	699,529
FNR 01/01/07	EFFICIENT: e-Business Framework	E. Dubois	CRP Henri Tudor	01.11.2001	30.04.2007	1,499,978
FNR 01/01/09	Access SME: Secure e-Commerce for SMEs	B. di Renzo	CRP Henri Tudor	01.01.2002	31.12.2005	1,000,000
FNR 04/01/02	RESIST - Towards a Secured, Efficient Platform for the e-Commerce of Personalised Health Products	N. Guelfi	University of Luxembourg	01.05.2006	31.10.2008 (planned)	399,147
FNR 04/01/03	Security Identity Management (SIM)	E. Dubois	CRP Henri Tudor	01.08.2005	31.07.2006	540,000
FNR 04/01/05	Techniques for Secure Grid and Ad-hoc Networks (TeSeGrAd)	F. Leprévost	University of Luxembourg	01.08.2005	30.11.2007	151,378
FNR 04/01/06	Monitoring of Electronic Cooperation via Graphical Tools Allowing to Analyse the Related Operations (SUGAR)	B. Otjacques	CRP Gabriel Lippmann	01.10.2005	31.08.2007	229,900
Total:	Available amount for SECOM, according to the Convention with the Government: €7,500,000					6,707,772

FNR 01/01/01

Legal Security for e-Commerce

University of Luxembourg

Contact(s): André Prüm, Faculty of Law, Finance and Economics, University of Luxembourg

E-mail: andre.prum@uni.lu

Project Website: under construction

Starting Date – Closing Date: 15th October 2002 – 31st March 2006

FNR Contribution: € 782,840

Refereed Scientific Publications:

DURIN Maryline, LEROUX Olivier, MISSONE Antoine, POULLET Corentin et VUITTON Raphaël.

(sous dir. PRÜM A., MONTERO E., POULLET Y.), *Le commerce électronique en droit luxembourgeois*, Bruxelles, Larcier, 2005, 694 pp. (ISBN 2-8044-1955-X)

DURIN Maryline, «La protection des personnes morales par le droit de la consommation:

la Cour de cassation française prend enfin position (à propos de l'arrêt de la première chambre civile du 15 mars 2005)», *Revue Européenne de Droit de la Consommation*, 2005, n° 1

POULLET Corentin, recension de l'ouvrage de Th. Verbiest sur *Le nouveau droit du commerce électronique – la loi pour la confiance dans l'économie numérique et la protection du cyberconsommateur* publié aux éditions Larcier, *Revue Européenne de Droit de la Consommation*, 2005, n° 1

POULLET Corentin et REYNAUD Pascal, "Service de la société de l'information et service de radiodiffusion télévisuelle: une frontière virtuelle au regard de la convergence des médias?" *Lamy, Droit de l'Immatériel*, n° 8, septembre 2005, pp. 58 – 65.

POULLET Corentin et VUITTON Raphaël, "La remboursabilité de la monnaie électronique", *Bulletin du Cercle François Laurent*, 2004, vol. 3, pp. 93–147

REYNAUD Pascal, *Le fournisseur d'accès et la conservation des données engendrées par les communications électroniques*, *Revue Communication, commerce électronique*, juin 2005, pp. 19–24

The main objectives of the SECOM project are to highlight the legal framework of e-commerce in Luxembourg, to suggest improvements to be carried out and to spark off a debate with enterprises to make online transactions safer for all users. In 2005, the project focused on the dissemination of the results. Besides the publication of a very detailed commentary on the law on e-commerce, the researchers proposed various solutions to burning issues in Luxembourg. Among others, a report on the implementation of a public key infrastructure was communicated to the appropriate authorities. It is also now possible to draw up by subject desirable discussions on potential legal amendments in order to promote even more the advantages for a company of selling online from Luxembourg. For instance, the recognition by the law of the electronic notary deed should be useful.

Creation of a System Based on the New Information and Communication Technologies, Facilitating the Electronic Business of Virtual Organisations (SICOV)

Public Research Centre Gabriel Lippmann

Contact(s): Fernand Feltz, Department ISC – Informatics, Systems and Collaboration,
Public Research Centre Gabriel Lippmann

E-mail: feltz@lippmann.lu

Project Website: www.sicov.lu

Partner(s): Centre d'Études de Populations, de Pauvreté et de Politiques Socio-Économiques (CEPS/INSTEAD)

Starting Date – Closing Date: 1st November 2001 – 31st October 2006

FNR Contribution: € 1,405,000

Possible Prolongation: 22 months, requested in the third SECOM call

The research project aims to facilitate the cooperative work of different economic entities by specifying, conceiving and testing an ICT-based platform. The platform will enable companies, administrations and other organisation forms to better organise their collaborative activities in an increasingly networked environment. The ultimate aim is to see organisations active on the SICOV platform evolve to virtual organisations, solidifying the links between partners and thus increasing economical competitiveness.

The platform is based on a common workspace for all organisations active on the platform. The CSCW (Computer Supported Cooperative Work) tools used previously mainly to support cooperation in an intra-organisational context are examined in order to enrich the collaboration platform.

The CEPS/INSTEAD has accomplished surveys in order to determine the potential for the adoption of the collaborative platform in Luxembourg companies. The results of this survey were encouraging, and the project team was able to contact interested companies and inform them about the advantages of using a collaborative platform.

In 2005, new users have joined the platform. One example would be the Nanobeams Network of Excellence, joining 12 research institutes in five European countries. The Nanobeams Network relies on the SICOV platform to facilitate collaborative work between its members.

The SICOV team is also developing new modules, thus aiming to extend the functionalities available on the SICOV platform. Actually, a videoconferencing module allowing more specifically the transmission of scientific images is being implemented. Other modules active on the platform are continuously being evaluated on their usefulness and are being evolved as warranted.

Security and trust are important issues for the SICOV platform. The underlying architecture has been optimised in order to guarantee a secure access to the platform using the Internet.

The SICOV platform now exists as a scientific prototype made available by the CRP Gabriel Lippmann. Organisations interested by novel ways of electronic collaboration in different contexts are invited to join the platform. In 2006, the SICOV team will focus its efforts on monitoring and evaluating the use of the platform and on insuring the viability of the platform after the project end planned for October 2006.

Cryptology & Security Initiative (CSI)

University of Luxembourg

Contact(s): Jean-Claude Asselborn, Faculty of Law, Economics and Finance, University of Luxembourg

E-mail: jean-claude.asselborn@uni.lu

Partner(s): Public Research Centre Gabriel Lippmann

Starting Date – Closing Date: 1st October 2001 – 30th September 2006

FNR Contribution: € 699,529

The project aims at establishing a strong know-how on cryptology and information security in Luxembourg, in order to provide confidentiality and authenticity of information and availability of information system resources in enterprises and administrations.

This is done by monitoring the technologic development and scientific advance in this field, by offering the research and security community access to a common documentation centre and electronic knowledge bases. Moreover a scientific research lab on cryptology and information system security is being founded at the University of Luxembourg, top level researchers are being recruited for it and teaching programmes at university level are defined and organised.

During the first phase of the project (2001–2004) emphasis was put on the cryptologic strand of the project (cryptography, cryptanalysis and steganography), whereas the second phase (2004–2006) is dedicated to the information security strand of the project. This phase is particularly concerned about security problems in the context of e-commerce and e-government applications and during it the team focuses on three specific problems:

- the **management of evidence of documents**, where the state of the art of authentication and time-stamping has to be documented and techniques to guarantee the probative value of signatures even after the expiration date of the initial digital certificate have to be proposed.
- the **management of information security**, where Luxembourg is exposed to a multitude of methodologies used in its neighbour countries; the project tries an integrative approach, developing a common framework for describing and comparing information system security methodologies; this is initiated by analysing the French MEHARI methodology and the German *Grundschutz* methodology, then trying to integrate the strong aspects of both into a common approach; moreover the more general business risk approach, as promoted by the Basel II regulations for the financial sector, will be studied in order to develop a global framework for both business risk and IT related risk.
- the **problems related to various aspects of certification**, in the context of the launching of a public key infrastructure for Luxembourg; the state of the art of identity management has to be documented in order to define a framework for attribute certificates; anonymisation and pseudonymisation techniques are studied related to the possibility to offer anonymous certificates; finally the practical problems raised by key escrow techniques are studied.

In 2005, the team focused on the German base protection manual approach for the management of information system security; the state of the art of time-stamping was documented and an overview of identity management techniques and problems was established. A distributed pseudonymisation algorithm was developed in the context of anonymous certificates, where the identity of the certificate owner is only known to the registration authority, whereas a central certification authority guarantees the uniqueness of the certificates.

A master of the engineering programme “Management of Information System Security” was elaborated; this programme is intended to improve the knowledge of information security professionals working in enterprises and institutions. Other master courses were defined.

FNR 01/01/07

EFFICIENT
e-Business Framework for an Efficient Capture and Implementation
of End-to-End Transactions

Public Research Centre Henri Tudor

Contact(s): Michael Schmitt, CITI, Public Research Centre Henri Tudor

E-mail: eric.dubois@tudor.lu

Project Website: <http://efficient.citi.tudor.lu>

Partner(s): University of Luxembourg, Public Research Centre Gabriel Lippmann

Starting Date – Closing Date: 1st November 2001 – 30th April 2007

FNR Contribution: € 1,499,978

Refereed Scientific Publications:

Rik Eshuis, Pierre Brimont, Eric Dubois, Bertrand Grégoire, Sophie Ramel. EFFICIENT: A Tool Set for Supporting the Modelling and Validation of ebXML Transactions. In P. Inverardi, editor, Proc. of the joint 9th European Software Engineering Conference (ESEC) & 11th SIGSOFT Symposium on the Foundations of Software Engineering (FSE-11), pages 359–362, ACM Press, 2003. (c) ACM. Poster.

Rik Eshuis, Pierre Brimont, Eric Dubois, Bertrand Grégoire, Sophie Ramel. Animating ebXML Transactions with a Workflow Engine, In Robert Meersman, Zahir Tari, Douglas Schmidt et al., editors, Proc. CoopIS 2003, volume 2888 of Lecture Notes in Computer Science, Springer, 2003. (c) Springer.

Michael Schmitt, Bertrand Grégoire, Sophie Ramel, Christophe Incou, Pierre Brimont, Eric Dubois. If business models could speak! Efficient: a framework for appraisal, design and simulation of electronic business transactions. International Conference on Enterprise Integration and Modelling Technology (ICEIMT'04), Toronto, October 2004.

Amel Mammar, Sophie Ramel, Bertrand Grégoire, Michael Schmitt, Nicolas Guelfi. Efficient: A Toolset for Building Trusted B2B Transactions. 17th Conference on Advanced Information Systems Engineering (CAISE'05), Porto, June 2005.

Michael Schmitt, Bertrand Grégoire, Eric Dubois. A risk based guide to business process design in inter-organizational business collaboration. International Workshop on Requirements Engineering for Business Need and IT Alignment (REBNITA 2005), Paris, August 2005.

Maria Bergholtz, Bertrand Grégoire, Paul Johannesson, Michael Schmitt, Petia Wohed and Jelena Zdravkovic. Integrated Methodology for linking business and process models with risk mitigation. International Workshop on Requirements Engineering for Business Need and IT Alignment (REBNITA 2005), Paris, August 2005.

Michael Schmitt, Christophe Incou, Eric Dubois. Supporting business experts in the design of b2b transactions through interactive process simulation. International Workshop on Enterprise and Networked Enterprises Interoperability (ENEI'2005), Nancy, September 2005.

Christophe Incou, Michael Schmitt, Patrick Blandin, Eric Dubois. Designing sound e-Government Services by modelling & interactive process animation, International Conference on e-Commerce (IADIS'05), Porto, Portugal, 15th–17th December 2005.

N. Guelfi, A. Mammar. A Formal Semantics of Timed Activity Diagrams and its PROMELA Translation, APSEC'2005: Asia Pacific Software Engineering Conference, Taipei, Taiwan, IEEE Computer Society Press, 2005.

Business networks (BN) are a group of cooperative organisations, either within an enterprise or between different enterprises, which create value for their customers. Such cooperation between independent business parties involves a maximum integration of each enterprise's business processes and relies on information sharing, common coordination and planning of the value chain. This comprises two dimensions, the design and sharing of a common business model (do the right thing) and the implementation of this model by an integrated B2B process chain (do things right). The latter involves the challenge to coordinate the flow of goods, financial resources and information.

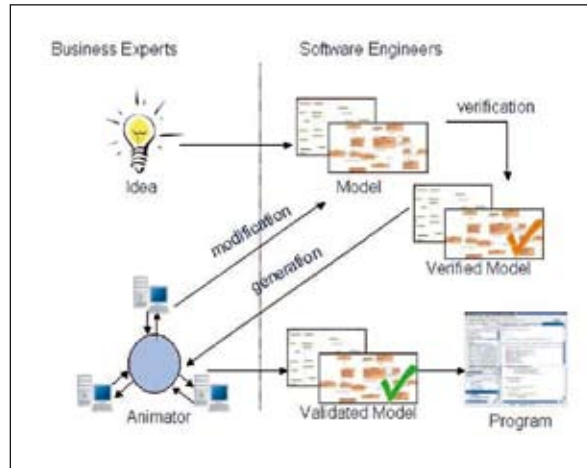


Figure 1: Efficient includes an "animator" that helps business experts to validate an electronic business transaction before its implementation.

In the Efficient project, the CRP Henri Tudor has developed an integrated toolset (called EFFICIENT) to support the design and the validation of such integrated B2B process chains.

Business experts within a business network are guided throughout the process of the design of a new electronic business transaction, from the identification of the business model to its implementation as a message-based B2B process chain. Efficient consists of a CASE tool to model the business cooperation; it verifies the correctness of the models created and automatically translates them into a transaction "Animator" (see Figure 1), a simulation environment where business experts can play through the electronic business transaction already at design time, before the actual implementation takes place. Not only does the animation phase imply a gain of resources due to an early discovery of errors but it also enhances the trust and the buy-in from business experts into the future electronic business transaction, the development of which they accompany from the beginning to its end.

In 2005, the first stable software release of EFFICIENT was compiled. A number of trials have been performed in various domains in partnership with different organisations.

FNR 01/01/09

ACCES-SME

Secure e-Commerce for SMEs

Public Research Centre Henri Tudor

Contact(s): Bernard Di Renzo, CITI, Public Research Centre Henri Tudor

E-mail: bernard.direnzo@tudor.lu

Project Website: <http://acces-pme.tudor.lu>

Partner(s): University of Luxembourg

Starting Date – Closing Date: 1st January 2002 – 31st December 2005

FNR Contribution: € 1,000,000

Refereed Scientific Publications:

Christophe FELTUS, Djamel KHADRAOUI and Filipe COSTA PINTO: Open SST-based Clearing Mechanism for e-Business. IEEE International Conference on Information & Communication Technologies: from Theory to Applications ICTTA'04, 19–23 April 2004, Damascus, Syria

Benjamin GATEAU, Djamel KHADRAOUI et Eric DUBOIS: Architecture e-Business sécurisée pour la gestion des contrats, 3rd Conference on Security and Network Architectures, La Londe, Côte d'Azur (France), 21–25 June 2004

Vincent ROSENER, Thibaud LATOUR, Eric DUBOIS: A Model-based Ontology of the Software Interoperability Problem: Preliminary Results. CAiSE'04 Workshops in connection with the 16th Conference on Advanced Information Systems Engineering, Riga, Latvia, 7–11 June 2004, Knowledge and Model Driven Information Systems Engineering for Networked Organisations, Proceedings, Vol. 3: 241–252

Djamel KHADRAOUI, Belkacem KECHICHEB: WBI based Approach for Web Monitoring and Services, ISBN: 0–7803–8482–2. IEEE International Conference on Information & Communication Technologies: from Theory to Applications ICTTA'04, 19–23 April 2004, Damascus, Syria

Nicolas MAYER, Andre RIFAUT, Eric DUBOIS: Towards a Risk-Based Security Requirements Engineering Framework, REFSQ'05, Eleventh International Workshop on Requirements Engineering: Foundation for Software Quality. In conjunction with CAiSE'05, 13–17 June 2005, Porto, Portugal.

Nicolas MAYER: Managing Security IT Risk: a Goal-Based Requirements Engineering Approach, RE'05 Doctoral Consortium, Part of 13th IEEE International Requirements Engineering Conference 29 August – 2 September 2005, Paris, France.

Vincent ROSENER, Thibaud LATOUR, Yannick NAUDET: A Model Proposal of the Interoperability Problem Poster presented at the Open INTEROP Workshop On "Enterprise Modelling and Ontologies for Interoperability" EMOI – INTEROP 2005 Co-located with CAiSE'05 Conference Porto (Portugal), 13–14 June 2005

The aim of the project was to help IT engineers to build secure IT systems, in particular in the financial sector. At the end of the project (December 2005), the outcome of the project is a risk-based methodology allowing to design secure IT systems, starting from the business assets and goals of the IT system, and ending with a secure IT architecture fulfilling the goals and securing the business assets. The method has been adapted to the design of IT systems supporting financial services.

The proposed method has many practical aspects for its tailoring to the specific needs of any organisation:

- a) The starting point is the definition of all business assets concerned by the system. The business assets can be, for instance, strategic goals, information, work-processes, IT applications, or human resources. Each institution can use its method for eliciting its business assets.
- b) Goals and requirements (functional and non-functional, in particular security goals) are derived from the business assets and the strategic goals to implement and to secure. A goal-oriented analysis method is proposed in order to allow all stakeholders to understand easily the impact of the future system on their organisation at the operational level.
- c) The derivation of security goals and requirements is based on a rigorous risk analysis. The risk analysis allows modelling (with diagrams) the threats, vulnerabilities and business impacts and a method for assessing the counter-measures allows to select the best solution and to assess the residual risk.
- d) Two extensible libraries are used to derive semi-automatically the right IT secured architecture. First, a library containing the basic security components. This library is organised by the security goals fulfilled by the components. This makes this library to be easily extensible. The second library contains architectural patterns and architectural guidelines that allow the composition of the security components with the applicative components in order to get the IT architecture. This latter library can be easily extended to specific needs.

The proposed method allows reusing knowledge of existing security standards so that one can be compliant to those standards. Moreover, custom security guidelines can also be integrated in this methodology.

The methodology can be used by service providers of SMEs, or by IT teams of international organisations for designing secured IT systems tuned to the ratio between the residual risks concerning the business assets and the costs of the security aspects of the system.

Towards a Secured, Efficient Platform for the e-Commerce of Personalised Health Products

University of Luxembourg

Contact(s): Nicolas Guelfi, Faculty of Sciences, Technology and Communication,
Laboratory for Advanced Software Systems, University of Luxembourg

E-mail: nicolas.guelfi@uni.lu

Project Website: <http://lassy.uni.lu/resist>

Partner(s): Public Research Centre Henri Tudor

Starting Date – Closing Date: 1st May 2006 – 31st October 2008 (planned)

FNR Contribution: € 399,147

The improvement of the quality of life and the comfort of the citizens, in particular through the improvement of the medical services, constitutes a priority for Luxembourg and Europe. The solutions suggested do not yet provide an acceptable support in particular for the development of personalised, secure and reliable services. The objective of the project RESIST is to contribute to solve this problem, all the while identifying, characterising and prototyping the fundamental constitutive elements of a platform that would facilitate the engineering of secure and reliable healthcare information systems. These systems should offer personalised functionalities dedicated to the citizen's remote information, follow-up and medical treatment.

The development of such systems must be done in close cooperation with specialists in the medical field, i.e. the economic actors concerned and in particular companies specialised in medical information systems and the doctors. The role of the doctors, as users of the domain, consists in contributing to the identification and the specification of the requirements, as well as the specification of the medical logic which is appropriate for the information, the follow-up and the personalised remote processing of the concerned citizen. The role of companies, as experts in medical information systems, consists in deploying, in an effective and secure way, medical logic in the form of software and an adapted medical hardware configuration (a priori, distributed system and mobile).

It should be noted that the efficiency is reflected here through fast, personalised and adapted service, at lower cost and more precision and accuracy on the level of the medical diagnosis. As for safety, it is reflected on several levels and in particular in: the confidence which the professionals can have in the management of private information and; the tolerance of the system to the faults which can occur during the execution.

The scientific difficulty of the project resides at the level of the identification and the characterisation of the components of a platform offering all of the functions previously enumerated, i.e. safety and the efficiency at several levels on the one hand, and the development, the maintenance and the collaborative deployment of the personalised systems on the other hand. Additionally, it is a question of improving the quality of life and comfort of the citizens and to find a way of controlling the costs of medical care. The development and the deployment of these personalised systems must be able to be done independently of the physical localisation of the citizen concerned, at home, while travelling or in a care-centre.

Our objective within the framework of the RESIST project consists in working in this direction, by defining the various elements as well as the architecture of such a platform and validating it through experiments in a specific field (for example cardiology).

Secure Identity Management (SIM)

Public Research Centre Henri Tudor

Contact(s): Frédéric Girard, CITI, Public Research Centre Henri Tudor

E-mail: frederic.girard@tudor.lu

Starting Date – Closing Date: 1st August 2005 – 31st July 2006

FNR Contribution: € 540,000

The domain of SECURE IDENTITY MANAGEMENT is wide-ranging and has to be precisely defined, as various acceptations currently exist. The purpose of the present project is to give *entities* access to *resources* on a network. *Entities* are physical persons most of the time but they can also be applications or network devices. *Resources* are data, web sites and network devices or transactions (like those on a credit card).

This kind of arising project will become more and more strategic inside companies. Indeed the goal will be to absorb growing systems complexity (in a distributed and mobile context), continuous and fast evolution of the organisations and to maintain and control security level regarding compliancy, regulatory and internal audit aspects.

We aim to achieve this from an organisational layer perspective. This means *entities* will be described using *attributes*, of which the main one will be their *Role* inside the enterprise. Links between *entities* and *Roles* can then be established by non technical people and typically directly by Human Resources. This aspect is quite new and implies HR activities inside those of IT. Once links are accepted through a validation *Workflow* the SIM system is able to propagate relative access rights upon *resources* all over the network.

This part is completed with an AUDIT module able to capture a snapshot of the rights directly on the network. This gives an on-time status and allows establishing the offset with a Security Policy built upon a security norm.

Currently an Enterprise Modelling research work is running. The aim is to analyse all currently available models of the domain. We measure their aptness and adaptability in order to integrate one inside the project. This organisational modelling is important and useful as it is the basis upon which rules could be activated to animate the SIM function. It is then possible to implement advanced functionalities like mutual exclusion or inclusion upon various or customised parameters or having real time behaviour with rights. Even if the famous Role-Based Access Control (RBAC) Model is a well-known one, we tend to use the most recent Usage Control Model (UCON, see Figure 1.). This one will be adapted to our project and contains characteristics helping us to implement the characteristics described above.

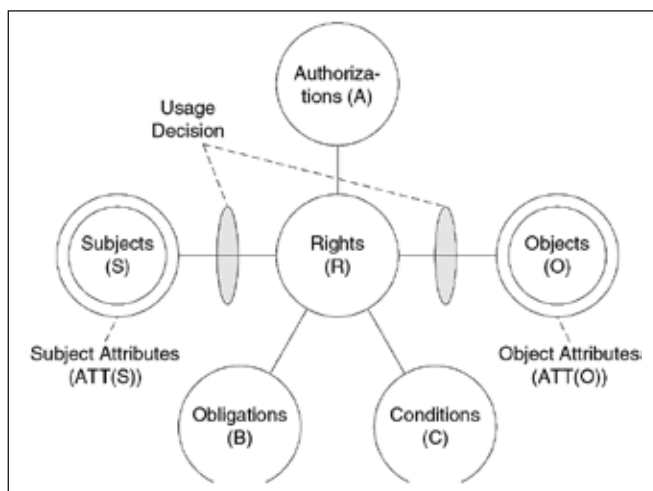


Fig. 1: Usage Control Model (UCON)

A deep and exhaustive watch is continuously running upon technical, existing products, market needs and tendencies. A multilayer partnership is being shaped to establish a community of interest. All this helps through workshops to define and build goals, scope and architecture for the intermediate prototype.

Techniques for Secure Grid and Ad-Hoc Networks (TeSeGrAd)

University of Luxembourg

Contact(s): Franck Leprévost, University of Luxembourg

E-mail: Franck.Leprevost@uni.lu

Starting Date – Closing Date: 1st August 2005 – 30th November 2007

FNR Contribution: € 151,378

Refereed Scientific Publications:

[BKS05] Pascal Bouvry, Gilbert Klein and Franciszek Seredynski. Weak Key analysis and Micro-controller implementation of CA stream ciphers. In KES 2005. Knowledge-Based Intelligent Information and Engineering Systems, 9th International Conference, Melbourne, Australia, September 2005. Published by Springer LNCS.

[DB05] Nathalie Dagorn and Nicolas Bernard. Web Hacking. Proceedings of the Fourth IADIS International Conference on the World Wide Web and the Internet (Internet/www 2005), October 2005.

[LEW06] Franck Leprévost, Touradj Ebrahimi, Bertrand Warusfel (Eds). La Sécurité Multimédia (2 tomes), Hermes, January 2006

[SSB06] Miroslaw Szaban, Franciszek Seredynski, and Pascal Bouvry. Collective behaviour of cellular automata rules and symmetric key cryptography. In Intelligent Information Processing and Web Mining, Proceedings of International IIS: IIPWM'06 Conference. Springer Verlag series Advances in Soft Computing, June 2006.

[LLPB06] H. M. Le, H. A. Le Thi, D. T. Pham, and P. Bouvry. A deterministic optimization approach for generating highly nonlinear balanced boolean functions in cryptography. In International Conference on High Performance Scientific Computing (Modeling, Simulation and Optimization of Complex Processes), Hanoi, Vietnam, 2006.

Started in the summer of 2005, the TESEGRAD project (Techniques for Secure Grids and Ad-Hoc Networks) aims at developing new tools and infrastructures for secure grid and ad-hoc computing. Existing tools face severe limitations that hinder their use in a truly distributed environment. This project explores two main axes. The first of them is the application of evolutionary computing to security and cryptography, while the second is anonymity on the Internet.

The goal of the first axis is to provide implementation of new cryptographic applications to meet the growing requirements for high-speed, high level secure communications. We will notably work on extensions of recent studies on application of one-dimensional Cellular Automata for the secret key cryptography and its hardware implementation. We also want to achieve better quality S-boxes for algorithms like the AES one and will also try to evaluate opportunities in terms of using Evolutionary computing for public-keys systems. Cellular Automata are interesting as their parallelism can be efficiently exploited in FPGA (Field Programmable Gate Array), as opposed to the serial fashion of computing in a processor environment. At the cryptographic-round level, multiple operations can be executed concurrently, while at the block-cipher level, certain operation modes allow concurrent processing of multiple blocks of data. FPGA implementations of some algorithms have already started.

The second axis concerns anonymity or more exactly non-observability of low latency communications over the Internet, which means how to create connections without allowing a global observer to know who is communicating with whom. If it has been possible for some years now to obtain such non-observability for high latency communications (like email), this is not the case for low latency ones (like web-surfing, VoIP, etc.). Indeed the most useful techniques used to prevent traffic analysis when a high latency is allowed induce delays and so are not usable in the cases we focus on. Our goal here is to develop a software framework which could be used to test and try some hypotheses.

FNR 04/01/06

Monitoring of New Forms of Electronic Cooperation via Graphical Tools for Operations Analysis (SUGAR)

Public Research Centre Gabriel Lippmann

Contact(s): Benoît Otjacques, Department ISC – Informatics, Systems and Collaboration,
Public Research Centre Gabriel Lippmann

E-mail: otjacque@lippmann.lu

Starting Date – Closing Date: 1st October 2005 – 31st August 2007

FNR Contribution: € 229,900

The SUGAR project studies the new forms of electronic cooperation with a special interest in virtual enterprises and network organisations. More specifically, it aims to design and develop graphical software tools that allow analysing the operations carried out on a virtual collaboration platform. Considering the large amount of information that could be graphically represented in such a context, the project has chosen to focus on the visualisation of the history of the collaboration. The SUGAR tools are intended to be used by the virtual platform users but also by the potential platform managers.

The SUGAR project is in its first phase, entitled: “Pre-conception phase”. During 6 months, the project team will be carrying out a literature review on the topics of information visualisation and computer-supported cooperative work. In addition, a thorough functional and technical analysis of a virtual platform designed in the FNR-funded SICOV project is undertaken in order to determine the best way to collect the data to be visualised. In this context, a specific example of the SICOV platform, supporting the EU-funded Network of Excellence ‘Nanobeams’, appears as a strong candidate to become the test bed of the SUGAR research findings. Finally, a questionnaire has been designed to collect information about the users of some virtual platforms.

NANO Programme

New Materials and Nanotechnology

Duration: 2000–2008

Total Budget: € 6,700,000

1st Call in 2001: 3 Projects Selected (€ 6,000,000)

2nd Call in 2005: 3 Projects Selected (€ 675,000)

The NANO programme aims at creating a European Centre specialised in the characterisation of materials on the nanometre scale. The characterisation of a material (plastic, metal, glass, and biological tissue or cell) can be analytical, morphological or functional.

In order to reach the nanometre resolution necessary to the development or the study of these new materials, it is necessary:

- to have available a series of scientific devices developed very recently by a few manufacturers (Spectrometers of Secondary Ion Mass devices, under development notably for Harvard Medical School or NASA), devices that analyse the nanomechanical properties of surfaces, methods compatible with measurements on individual cells like bio-impedance, ...;
- to optimise / to modify these devices according to the fields of application and materials to be analysed;
- to develop new analysis technologies.

These techniques are very recent and widely stem from European fundamental research. Numerous manufacturers and scientists look forward to the day when they will be able to apply these new analysis techniques to their products.

NANO Projects:

Projet Code	Title	Contact	Coordinating Institution(s)	Starting Date	Closing Date	Budget Estimates (€)
FNR/01/02/01a	Analysis of Biological Tissues with Nano/SIMS	C. Muller	National Health Laboratory	01.01.2003	31.03.2007	731,774 (1st phase) 407,297 (2nd phase)
FNR/01/02/01b	Analysis of Environmental Samples at Nanometre Scale	H.-N. Migeon, L. Hoffmann	CRP Gabriel Lippmann	01.04.2002	30.09.2006	860,931
FNR/01/02/02	European Centre Specialised in the Characterisation of Materials at Nanometre Scale	H.-N. Migeon	CRP Gabriel Lippmann	16.07.2001	30.06.2008	4,000,000
FNR/05/02/01	Viscous Effects Investigated by Applied Numerics and Experimental Nanoindentation – VEIANEN	G. Rauchs	CRP Henri Tudor	01.04.2006	31.03.2008	250,000
FNR/05/02/05	Negative Ion Sources – NIS	T. Wirtz	CRP Gabriel Lippmann	01.04.2006	30.09.2008	260,000
FNR/05/02/07	Application of SIMS Nanoanalysis to the Development of New High-Strength Steel – SIMSSTEEL	H.-N. Migeon	CRP Gabriel Lippmann	01.04.2006	30.09.2006	165,000
Total :	Available amount for NANO, according to the Convention with the Government: € 6,700,000					6,675,000

Analysis of Biological Tissues with Nano/SIMS

National Health Laboratory

Contact(s): Claude Muller, Institute of Immunology, National Health Laboratory

E-mail: claudemuller@lns.etat.lu

Project Website: <http://www.etat.lu/LNS>

Partner(s): Laboratory for the Analysis of Materials (LAM), Public Research Centre Gabriel Lippmann

Starting Date – Closing Date: 1st January 2003 – 31st March 2007

FNR Contribution: € 731,774

Possible Prolongation: 24 months, maximum financial contribution by FNR € 407,297

Improvements of probe technology in bright-field microscopy are reflected by the large number of commercial probes targeting a wide range of molecules. Fluorescence microscopy is the unchallenged technology for structural analysis of cells and sub-cellular organelles. Some of the shortcomings can be resolved by alternative techniques such as micro-autoradiography and more recently secondary ion microscopy. This technology, which combines chemical elemental microanalysis with lateral, 2D resolution, is based on the detection of secondary ions emitted upon the impact of an intensive primary ion beam (several keV). The present project investigates potential applications and limitations of SIMS technology in cell biology. During the initial phase of the project, the technology for the preparation of biological samples compatible with the analysis by SIMS was developed. Now these methods are used to study lymphatic tissues and the uptake of various labelled antigens by human and murine antigen-presenting cells, which can be induced to develop a phagocytic phenotype.

Figure 1 shows the internal structure of Peyer's patches, a gut associated lymphoid tissue (GALT) found in the ileum. GALT (or aggregated lymphatic follicles) plays a major role in immune response to gut lumen antigens. M-cells are specialised in the trans-epithelial transport of antigens and micro-organisms to underlying antigen presenting cells (surface IgM positive B-cells and macrophages).

Bacteria metabolically labelled with ^{15}N were characterized by Maldi-TOF MS/MS analysis of protein digests from labelled and unlabelled bacteria. Mass spectrometry confirmed that the metabolic labelling resulted in a very high incorporation of ^{15}N . For instance for the dipeptide binding protein the preferential incorporation of ^{15}N over ^{14}N was of 55 for a total of 58 nitrogen atoms. Figure 2 shows *Escherichia coli* metabolically labelled by ^{15}N and in the process of being phagocytised by THP cells, which had incorporated the thymidine analogue 5-bromo-2'-deoxyuridine into their DNA. Figure 3 shows a ^{15}N -labelled bacteria associated with the M1241, a murine lymphoblastic cell line.

These images were compared to double-labelled *E. coli*. The high mass resolution of the NanoSIMS 50 allows for the semi-quantitative analysis of isotopic species. By measuring the ratio between $^{12}\text{C}^{14}\text{N}$ and $^{12}\text{C}^{15}\text{N}$ the ^{15}N enrichment of the labelled *E. coli* was estimated by image-processing methods at 77.2% (natural ratio 0.3%). Peptide-mass finger-printing by MALDI-TOF has been further developed to study protein expression profiles of the proteome after two-dimensional gel electrophoresis. The development of the MALDI-TOF mass-spectrometry will allow the comparison of imaging by MALDI-TOF with imaging by SIMS technology in the second phase.

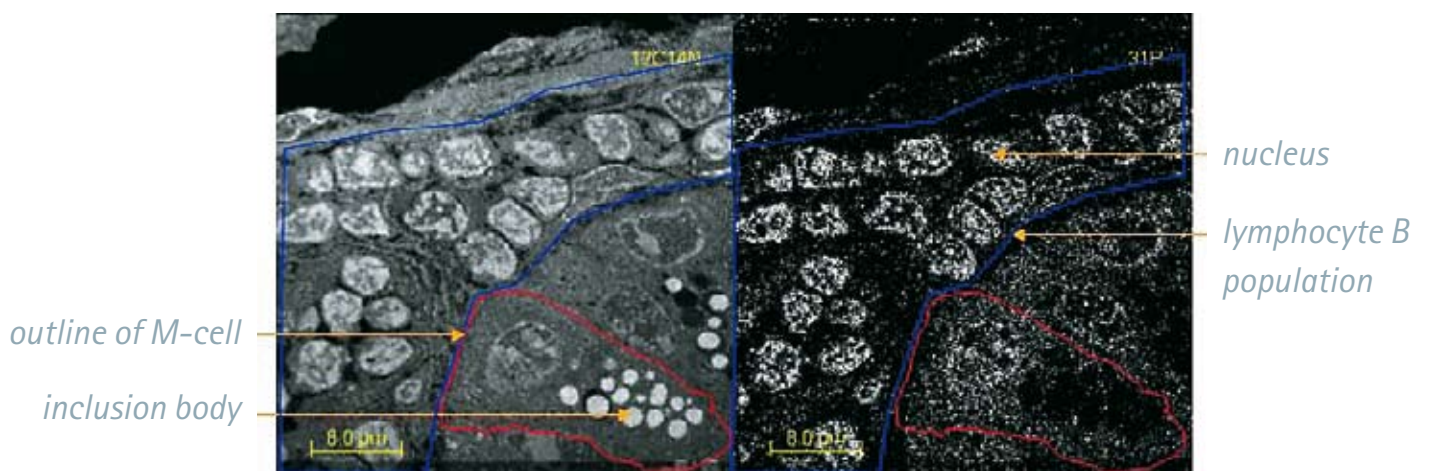


Figure 1: NanoSIMS image of mouse Peyer patches.
Cyanide hypersignals probably correspond to the protein rich inclusion bodies found in M-cells.

Analysis of Environmental Samples at Nanometre Scale

Public Research Centre Gabriel Lippmann

Contact(s): Henri-Noël Migeon, Laboratory for the Analysis of Materials (LAM),

Public Research Centre Gabriel Lippmann

Lucien Hoffmann, Department Environment and Agro-biotechnologies (EVA),

Public Research Centre Gabriel Lippmann.

E-mail: migeon@lippmann.lu, hoffmann@lippmann.lu

Starting Date – Closing Date: 1st April 2002 – 30th September 2006

FNR Contribution: € 860,931

Refereed Scientific Publications:

J.-N. Audinot, C. Guignard, H.-N. Migeon and L. Hoffmann. Accepted for publication in *Applied Surface Science*

P. Hallégot, J.-N. Audinot, and H.-N. Migeon. Accepted for publication in *Applied Surface Science*.

During the year 2005, the investigations were focussed on the detection of pollutants in living organisms by NanoSIMS50 imaging (dynamic SIMS).

The first part of this study was devoted to the incorporation of heavy metals in aquatic mosses (*Fontinalis anti-pyretica*). The objectives were to follow the occurrence of pollutants in the tissues at the cell level, for a better understanding of the bioaccumulation processes.

Moss samples were collected and submitted to high amounts of metallic pollutants (Pb, Fe and Cu). After a contact period of 48H, leaves were sampled and analysed by Nano-SIMS to localise pollutants in cells. Inhomogeneous distributions of metals were noticed, showing that inorganic pollutants were mainly located along cell walls.

Furthermore, these experiments allowed us to evaluate the capabilities and limits of the Nano-SIMS concerning biological samples (lateral resolution, sensitivity, matrix effects ...). As a result, the lateral resolution of the Cs⁺ source appeared to be sufficient for a good recognition of cell structure. However, the sensitivity of SIMS for trace amounts of some elements (Pb) is, for the moment, lower than expected. The preparation protocol of biological samples by chemical fixation and resin embedding seems to preserve the cell structure. Nevertheless, a better fixation of xenobiotics can certainly be obtained with cryopreparation techniques, which will be tried during 2006.

The second part of the study concerned diatoms. Diatoms are microscopic aquatic organisms, which are highly dependent on the environmental conditions. For this reason, diatoms are of great interest in environmental research and water quality monitoring. These unicellular organisms are enclosed in a silica frustule constituted by two valves. Their multiplication occurs by ordinary mitotic cell division: each cell produces two daughter cells, each of them keeping one of the two valves of the mother cell and producing a new valve by absorbing the silicon present in the environment. This multiplication mechanism was evidenced by isotopic measurements: Diatom cultures were allowed to grow in a medium enriched in ²⁹Si (²⁹Si/²⁸Si ratio of 1 instead of 0.05 in natural conditions), then an aliquot was sampled, prepared and analysed by NanoSIMS50. Thus, it was possible to distinguish undoubtedly the newly formed valves, by the help of their higher ²⁹Si/²⁸Si ratio (Fig. 1 and 2). These results confirmed the commonly accepted division mechanism of diatoms, and demonstrated the usefulness of NanoSIMS50 in diatom studies.

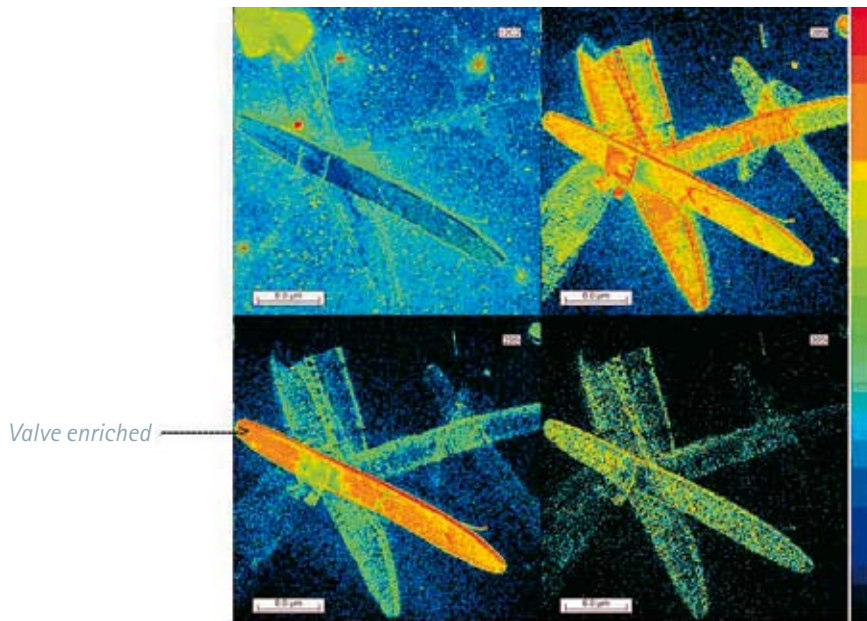
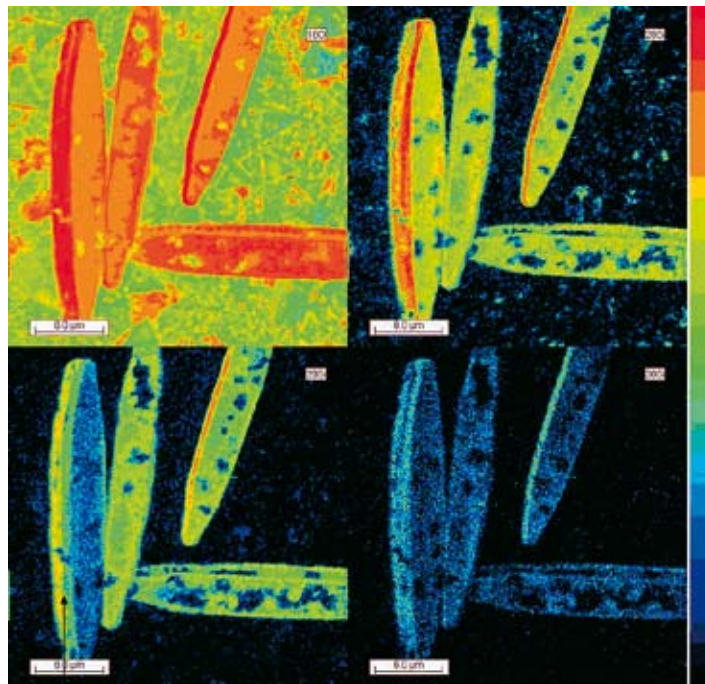


Figure 1: ^{12}C , ^{28}Si , ^{29}Si and ^{30}Si distribution in diatoms after culture in medium enriched in ^{29}Si . Image field $30 \times 30 \mu\text{m}^2$



Formation of a new valve of diatom

Figure 2: ^{16}O , ^{28}Si , ^{29}Si and ^{30}Si distribution in diatoms after culture in medium enriched in ^{29}Si . Image field $30 \times 30 \mu\text{m}^2$.

European Centre Specialised in the Characterisation of Materials at Nanometre Scale

Public Research Centre Gabriel Lippmann

Contact(s): Henri-Noël Migeon, Laboratory for the Analysis of Materials (LAM),

Public Research Centre Gabriel Lippmann

E-mail: migeon@lippmann.lu

Starting Date – Closing Date: 16th July 2001 – 30th June 2008

FNR Contribution: € 4,000,000

Refereed Scientific Publications:

L. Kailas, B. Nysten, J.-N. Audinot, H.-N. Migeon and P. Bertrand. *Surf. Interface Anal.* 2005; 37: 435–443.

N.Valle, J. Drillet, O. Bouaziz, H.-N. Migeon; accepted for publication in *Applied Surface Science*

Besides the collaborative research with the industry and the academic partners, another highlight in 2005 was the development and design of specific parts for the Nano/SIMS.

The following activities were carried out:

1) Research in the field of material science in collaboration with several Luxembourg industries and the universities of Nancy, Namur and Louvain la Neuve:

- R&D performed by Novélis (ex-Péchiney-Eurofoil) aimed at the characterisation of the nanometric oxide layer on the surface of aluminium foils. Hydroxide groups were evidenced and the correlation between the thickness of oxide layers and the presence of various types of contaminants was studied.
- In collaboration with Goodyear, the precursors and rubber constituents for tires (nanometric powders, additives ...) were studied, as well as the surface of moulds, treated or not.
- Ceramic materials developed by Cératizit have been the subject of a number of SIMS and Auger studies in order to characterize TiC_xN_{1-x} multi-layers samples. In particular AlON nanometric layers were evidenced. Thanks to its analytical potential, the project contributed to the development of a new class of composite materials for wear and cutting applications. New procedures for the Auger characterisation of submicronic to nanometric powders were developed.
- A number of feasibility studies for Circuit-Foil materials were performed. They concerned the capability to characterise the secondary germination of nanometric nodules on copper foils, and to detect and identify various defects and contaminants on the surface of the copper foils.
- In collaboration with the LISE laboratory, new silica fibre materials (optical fibres) incorporated in organic matrices were studied. The adhesion problems depending on the nature of those different materials were taken in consideration by studying the interface of this nano-composite material (Figure 1).

2) Development of a high brightness Cs⁺ source for the NanoSIMS instrument:

In 2005 a new Cs⁺ source was designed, based on the results obtained during the various studies performed since the beginning of this project. The prototype is composed, among other things, of a differential extraction system and a direct heating system generated by electron impact on the ioniser.

3) Design of a Ultra High Vacuum conditioned system for sample transfer between the NanoSIMS and the Auger instruments:

At last, a vacuum-conditioned system for sample transfer between the NanoSIMS and the Auger instruments was designed and manufactured.

The system allows transferring the samples to be analysed between the two instruments under UHV conditions.

EAU Programme

Sustainable Management of Water Resources

Duration: 2000–2007

Total Budget: € 5,000,000

1st Call in 2001: 8 Projects Selected (€ 4,804,630)

Restricted 2nd Call in 2005: Evaluation Ongoing

Water, a natural resource essential to life, has become a highly coveted economic good and its management constitutes a major global problem. Moreover, water technologies represent a growing market for economic activity and employment. The programme's general objective is to establish a pool of excellence in the field of water in Luxembourg, capable of grasping the complex mechanisms of the natural water cycle, of evaluating the means to protect water resources and water quality, of developing the most appropriate and the least expensive innovative technologies for control and water purification, and of fighting against water wasting.

The present research, development and innovation programme presents five priority areas:

- quality of surface waters and aquatic ecosystems,
- hydrological functioning of rivers,
- protection of ground water,
- advanced technologies for water management,
- socio-economic aspects of water resource management, in view of a sustainable development.

A restricted 2nd call was launched in 2005. The evaluation will be finalised in 2006. The retained project proposals should contribute to the cooperation of several existing projects in the EAU programme and to the valorisation of the results obtained by the projects of the first call.

EAU Projects:

Project Code	Title	Contact	Coordinating Institution(s)	Starting Date	Closing Date	Budget Estimates (€)
FNR/01/03/01	Diagnosis of Lacustrine Ecosystems by Analysis (DIADECOL)	I. Thys	CRP Gabriel Lippmann	01.01.2002	30.6.2005	809,971
FNR/01/03/02	Study of the Water Cycle Components in the Attert River Basin - CYCLEAU	L. Pfister	CRP Gabriel Lippmann	01.01.2002	31.12.2004	750,000
FNR/01/03/03	Development of a Fauna and Flora Prediction Model - MODELECOTOX	A. Dohet	CRP Gabriel Lippmann	01.04.2002	31.03.2005	800,000
FNR/01/03/04	Detailed Hydro-chemical Characterisation of Subterranean Waters in Luxembourg - GEASOUT	R. Maquil	Department of Geology, Department of Civil Engineering	01.08.2002	29.02.2004	57,760
FNR/01/03/05	New Concepts and Innovative Technologies for a Sustainable Management of the Urban Water Cycle - CONCEPT	P. Schosseler	CRP Henri Tudor	01.03.2002	28.02.2006	386,899
FNR/01/03/06	Scientific Monitoring of the Implementation of a New Technique for the Treatment of Waste Water in Luxembourg - LITFLUID	M. Plattes	CRP Henri Tudor	01.01.2002	30.06.2006	579,765
FNR/01/03/07	Modelling of a Sewage Network: Contribution to the Management of Pollution Risks at the Haute-Sûre Drinking Water Reservoir - RESEASURE	E. Henry	CRP Henri Tudor	01.01.2002	30.06.2007	920,235
FNR/01/03/08	Material Flows in the Alzette River Catchment - FLUXALZETTE	J. Welfring	CRP Henri Tudor	01.02.2002	31.01.2007	500,000
Total:	Available amount for EAU, according to the Convention with the Government: €5,000,000					4,804,630

Diagnosis of the State of Lacustrine Ecosystems by the Analysis of the Biodiversity and the Functioning of the Microbial Loop (DIADECOL)

Public Research Centre Gabriel Lippmann

Contact(s): Isabelle Thys, Henry-Michel Cauchie, Department Environment and Agro-biotechnologies (EVA),
Public Research Centre Gabriel Lippmann

E-mail: thys@lippmann.lu, cauchie@lippmann.lu

Starting Date – Closing Date: 1st January 2002 – 30th June 2005

FNR Contribution: € 809,971

The project DIADECOL aimed to establish the theoretical basis of a method to diagnose the ecological state of lacustrine ecosystems. The method integrates microbial organisms that represent a fundamental functional unit of aquatic ecosystems. The applied purpose was to develop pertinent microbial indicators for assessing efficiently and rapidly the ecological state of lakes and reservoirs. The project focused on eutrophication, which is one of the major stresses affecting natural waters. To reach these objectives, we developed techniques allowing the multi-disciplinary study of microbial organisms and especially heterotrophic bacteria (including taxonomic, physiologic and metabolic approaches). We described the seasonal dynamics of bacteria and of their main controlling factors in 4 reservoirs displaying a gradient of eutrophication (oligo-mesotrophic to hypertrophic reservoirs). The importance of the controlling factors was assessed experimentally during a key period of the seasonal dynamics. Among the controlling factors, we distinguished resources and predation. In 2005, we tested the reliability of bacteria to diagnose the trophic state of waterbodies. Bacterial activity and density as well as common limnological parameters; Secchi depth (SD), total phosphorus (TP) and chlorophyll-a (Chl-a) were surveyed during the summers of 2004 and 2005 in 22 oligotrophic to hypertrophic lakes and reservoirs of the Ardennes-Eifel region. The assimilation of monosaccharides (^{14}C -glucose and ^{14}C -glucosamine) and amino acids (^{14}C -leucine) were chosen to express the metabolic activity of bacteria. According to SD, Chl-a and TP, the studied waterbodies presented a clear eutrophication gradient. The bacterial abundance, assimilation and production rates were strongly related to the eutrophication level of the systems. In order to classify lakes, a Trophic State Index (TSI) was calculated for bacterial density (TSI_{Bac}), bacterial glucose assimilation (TSI_{Glu}), Chl-a (TSI_{Chl}) and TP (TSI_{TP}) using Carlson's equations (Carlson, 1977). The TSI are indices based upon relationships between Secchi depth (TSI_{SD}) and any parameters defining trophic status. Using TSI_{SD} as reference, TSI_{Bac} and TSI_{Glu} provided similar trophic states for the studied waterbodies. TSI_{TP} showed a more pessimistic result for 19 waterbodies. The difference was particularly important for higher eutrophication levels. TSI_{Chl} was more pessimistic than TSI_{SD} for weakly eutrophicated waterbodies, in accordance with TSI_{SD} for mesotrophic waterbodies and provided a lower result for eutrophicated lakes. Our results underlined the importance of using multi-parameters indices and of including bacteria for the definition of lakes trophic state.

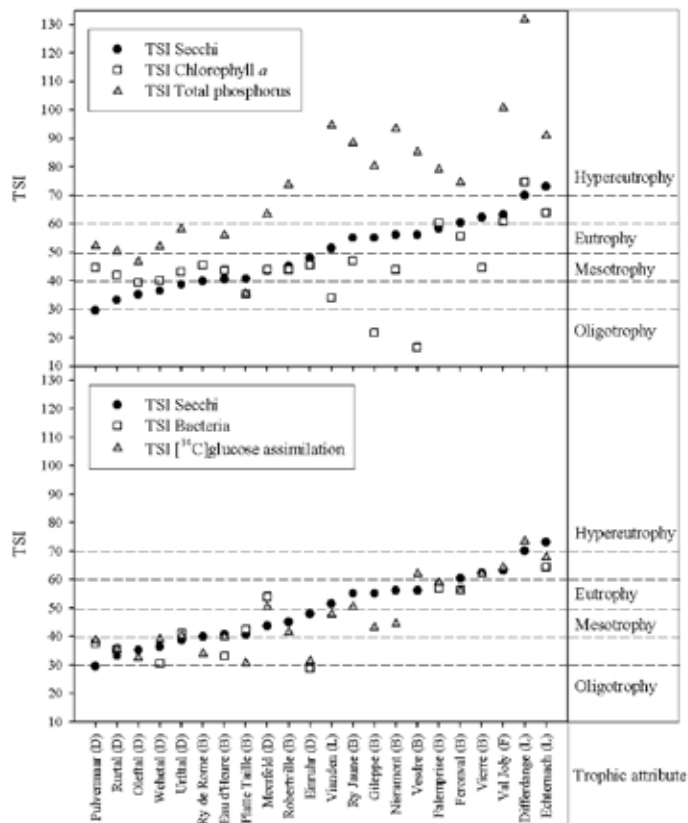


Figure 1: Trophic state index of 22 waterbodies located in the Ardennes-Eifel region (G-D. Luxembourg, Belgium, France, Germany). a) Results of the TSI parameters Secchi-depth, chlorophyll a and total phosphorus calculated according to Carlson adapted equations. b) Results of the TSI parameters Secchi depth, Bacterial abundance and [14C]glucose assimilation. Waterbodies are classed according to the Secchi-depth.



Figure 2: Aerial view of the Urft reservoir (Germany)

Study of the Water Cycle Components in the Attert River Basin (CYCLEAU)

Public Research Centre Gabriel Lippmann

Contact(s): Laurent Pfister, Department Environment and Agro-biotechnologies (EVA),

Public Research Centre Gabriel Lippmann

E-mail: pfister@lippmann.lu

Partner(s): Laboratory of Radiation Physics, University of Luxembourg

Starting Date – Closing Date: 1st January 2002 – 31st December 2004

FNR Contribution: € 750,000

Refereed Scientific Publications:

Fenicia F., Savenije H.H.G., Matgen P. & Pfister L.: 'Is the groundwater reservoir linear?

Learning from data in hydrological modelling'. In press, *Hydrological and Earth System Sciences*.

Kies A., Hofmann H., Tosheva Z., Hoffmann L. & Pfister L.: 'Using ²²²Rn for hydrograph separation in a micro basin (Luxembourg)'. *Annals of Geophysics*, 48, 101–107.

Van den Bos R., Hoffmann L., Juilleret J., Matgen P., Salvia-Castellvi M. & Pfister L.:

'Regional runoff prediction through aggregation of first-order hydrological process knowledge: a case study'.

Submitted to 'Hydrological Sciences Journal'.

Krein A., Iffly J.-F., Salvia-Castellvi M., Hoffmann L., Pfister L., Hofmann H., Tosheva Z. & Kies T.:

'Comparison of chemical and isotope hydrograph separation techniques in small experimental basins'.

In preparation.

The CYCLEAU project focused both on a better understanding of hydrological processes and their spatial variability. The embedded approach was used in the Alzette and Attert river basins in order to gather as much information as possible on the different hydrological behavioural patterns, their spatial variability, as well as the scale-related variability of the weight of the various hydrological processes that take place in the runoff generation. Research focused on transposing hydrological information, as well as on the application of hydrological models to ungauged basins by linking the model parameters to physiographical characteristics of the basins.

Within the framework of the CYCLEAU project, the interception process was studied in order to provide information on the losses due to interception in a beech stand, the interception capacity of the canopy, as well as the evolution of the different components of the interception process (throughfall, stemflow, evaporation). This information was eventually used to model the interception process and to improve hydrological models.

In order to determine the spatio-temporal origin of runoff, hydrograph separations were carried out in schistous and sandstone micro-basins of the Attert river basin. These separations were performed in two micro-basins of the Attert basin: the Huewelerbach basin and the Weierbach basin by means of geochemical tracers, applying the EMMA (End Member Mixing Analysis) technique.

The hydrological behaviour of the studied basins during several rainfall events differed notably as a consequence of their different geology. In the Huewelerbach basin the main contribution to the stream discharge is a very constant groundwater component generated from the sandstone springs. In the Weierbach basin, the rationale for runoff generation differs largely. Here base flows are quite low before the rainfall events, rise continuously throughout the rainfall event and remain high for several days.

Once the dominating hydrological processes had been identified and quantified, their spatio-temporal variability and scale-dependency were linked to physiographical properties. Hydrological models were first calibrated in a series of basins where a lot of hydrological information was available. The various values obtained for those parameters were then linked to the physiographical properties of the basins. The thus obtained relationships between the model parameters and the physiographical characteristics were furthermore to be used for estimating the values of the model parameters for ungauged basins, but where information was available on physiographical characteristics.



Stemflow and throughfall measurement device in the Huewelerbach experimental plot.

Development of a Predictive Model of Fauna and Flora to Evaluate the Ecological Status of Luxembourg's Rivers: Impact of Pollutants and Toxic Compounds on Aquatic Communities (MODELECOTOX)

Public Research Centre Gabriel Lippmann

Contact(s): Alain Dohet, Department Environment and Agro-biotechnologies (EVA),
Public Research Centre Gabriel Lippmann

E-mail: dohet@lippmann.lu

Project Website: <http://riga.crppl.lu:8080/Modelecotox/>

Starting Date – Closing Date: 1st April 2002 – 31st March 2005

FNR Contribution: € 800,000

Refereed Scientific Publications:

Ferréol M., Dohet A., Cauchie H.M. & L. Hoffmann, 2005. A top down approach for the development of a stream typology based on abiotic variables. *Hydrobiologia* 551: 193–208.

Gevrey M., Rimet F., Park Y.-S., Giraudel J.-L., Ector L. & S. Lek, 2004. Water quality assessment using diatom assemblages and advanced modelling techniques. *Freshwater Biology* 49: 208–220.

Monnier O., Lange-Bertalot H., Rimet F., Hoffmann L. & L. Ector, 2004. *Achnantheidium atomoides* sp. nov., a new diatom from the Grand-Duchy of Luxembourg. *Vie et Milieu* 54: 127–136.

Monnier O., Lange-Bertalot H., Hoffmann L. & L. Ector, 2005. The genera *Achnantheidium* Kützing and *Psammothidium* Bukhtiyarova et Round in the family *Achnantheidiaceae* (Bacillariophyceae): A reappraisal of the differential criteria. *Cryptogamie Algologie* (accepted).

Monnier O., Ferréol M., Dohet A., Hoffmann L., Cauchie H.M. & L. Ector, 2005. Le grès du Luxembourg: un îlot de biodiversité pour les diatomées des ruisseaux. *Ferrantia* 44: 109–112

Rimet F., Ector L., Dohet A. & H.M. Cauchie, 2004. Impact of fluoranthene on diatom assemblages and frustule morphology in indoor microcosms. *Vie et Milieu* 54: 145–156.

Rimet F., Hoffmann L., Cauchie H.M. & L. Ector, 2004. Regional distribution of diatom assemblages in the headwater streams of Luxembourg. *Hydrobiologia* 520: 105–117.

Rimet F., Cauchie H.M., Hoffmann L. & L. Ector, 2005. Response of diatom indices to simulated water quality improvements in a river. *Journal of Applied Phycology* 17: 119–128.

Rimet F., Ector L., Cauchie H.M. & L. Hoffmann. Evolution of epilithic algal biofilms confronted to a simulated improvement of quality in a river: implications for diatom bioindication. *European Journal of Phycology* (accepted with revisions).

The main goal of the MODELECOTOX project was to develop a Water-Framework-Directive-compliant predictive model which, on the basis of physical and chemical key variables of the habitat, enables us to predict the aquatic fauna (benthic macro-invertebrates) and flora (benthic diatoms) expected in non-disturbed running water sites (reference sites). In addition, according to the WFD, toxic compounds poured by industries and agriculture into rivers are to be controlled. A second objective of the project was therefore to estimate the influence of some priority toxic substances on target organisms, by the means of microcosm experiments. A third objective

was to study, by means of molecular and morphological techniques, the taxonomy of benthic algae, which are important for bio-indication but present difficulties of identification.

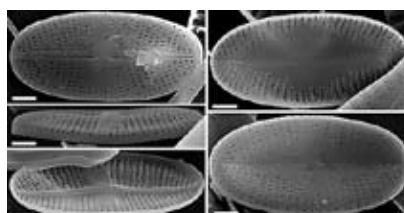
In 2005, research activities focused on the implementation of our model, the development of a graphical user interface based on the results obtained by the predictive model and the completion of the revision of the taxonomy of epilithic diatoms from Luxembourg rivers.

The principle of the model consists in estimating the probabilities of occurrence of taxa at a given site in the absence of significant anthropogenic stress. The deviation between the observed and expected (near reference) conditions enables to calibrate an index value to estimate the quality of the river studied. Various combinations (seasons, taxonomic level) of the model were tested. The results obtained consolidate the relevance of the model as a tool for the assessment of the quality of the rivers. At a family level, the model logically has fewer taxonomic units, which accordingly reduces the uncertainty of the model. In collaboration with the CREDI research unit of the Public Research Centre Gabriel Lippmann, a graphical user interface was designed on the basis of the results obtained by the predictive model. The development of this tool aimed to provide to the water managers a convivial interface allowing an optimal assessment of the ecological status of the rivers, which fulfils the principal recommendations of the WFD.

The revision of the taxonomy of the epilithic diatoms from Luxembourg rivers has been completed, as well as the writing of the monograph "Diatoms of the Grand-Duchy of Luxembourg. The benthic flora of watercourses", which is about to be submitted for publication in the book series "Iconographia Diatomologica". Most diatoms of Luxembourg are described and 150 taxa are illustrated in optical microscopy and scanning electronic microscopy. This taxonomic work opens important perspectives in the field of biogeography and ecology of the algae.



Illustration of the Web interface developed within the framework of the project: determination of the ecological quality status of a test site from the comparison between the taxa list expected for this river type in near-reference conditions and the taxa list observed at this test site.



*External and internal views in scanning electron microscopy of *Achnanthidium daonense*, a characteristic diatom of clean streams of Luxembourg. Scale bars = 1 μ m.*

Hydro-chemical Characterisation of Ground Waters of the Grand-Duchy of Luxembourg (GEAUSOUT)

Department of Geology, Department of Civil Engineering

Contact(s): Robert Maquil, Department of Geology, Department of Civil Engineering

E-mail: robert.maquil@pch.etat.lu

Partner(s): Department of Water Management, Ministry of the Interior,
Laboratory of Radiation Physics, University of Luxembourg

Starting Date – Closing Date: 1st August 2002 – 29th February 2004

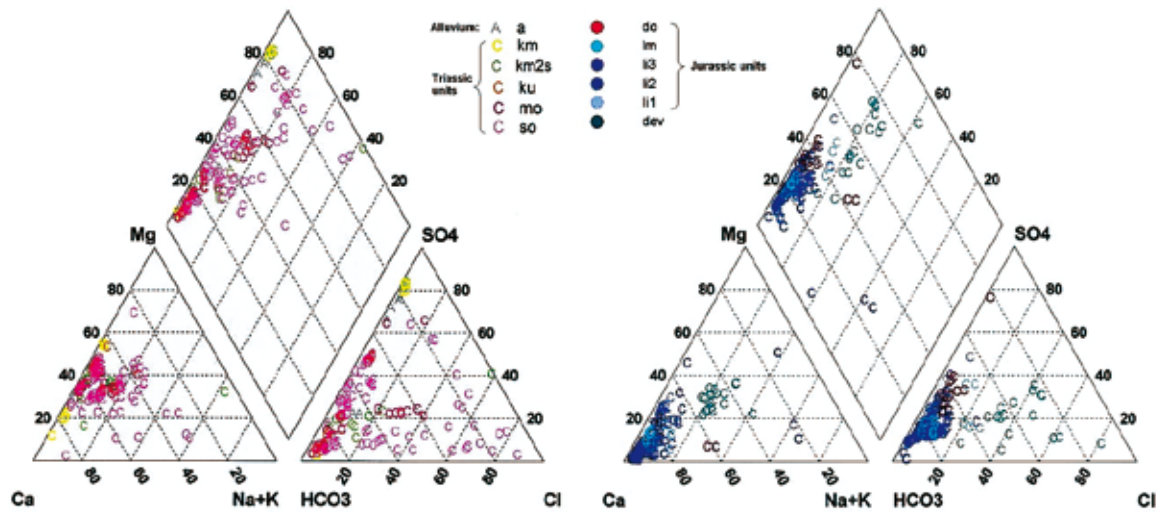
FNR Contribution: € 57,760

The aim of the GEAUSOUT project was the characterisation of different aquifers in Luxembourg by the chemical composition of the water. Besides the main chemical compounds some metal ions as well as stable and radioactive isotopes were measured. Samples were taken from natural springs and from boreholes, some of which are used as drinking water supply, with emphasis on the importance of the aquifer capacities. The obtained results were compared to the existing data sets of groundwater chemistry. A classification of the aquifers was implemented on the basis of the stratigraphy where six main hydro-geological units could be differentiated.

The observed geological units encompass the Palaeozoic formations of the Devonian, the Triassic formations of the Buntsandstein (so) and the Keuper (k, ku, km, km²s), as well as the Jurassic formation of the lower (li1, li2, li3) to middle Liassic (lm).

A large chemical variability was observed between the different hydro-geological units but also within single units. Changing lithology due to lateral facies changes, as well as secondary mineralization and alteration processes, can explain some chemical trends. Three major hydro-chemical groups could be assigned to distinct stratigraphical units; this is due to the different petrographic properties and the chemical reaction within the aquifers (dissolution and redox processes). The carbonates, mostly calcite CaCO₃ and dolomite CaMg(CO₃)₂, spawn waters rich in calcium and magnesium ions, due to the dissolution of carbonate cements and bioclastic particles. The Ca/Mg ratio is related to the calcite / dolomite ratio as well as calcite or gypsum dissolution process. Primary gypsum occurs within the Triassic formations, whereas secondary gypsum is present in the Jurassic strata originating from the oxidation of pyrite.

Within the Devonian (dev) units the sampled waters were very weakly mineralised and could not be assigned to a specific type. The degree of mineralization of the waters in the Triassic aquifers varies in a large extend. In general, they can be assigned to the calcium- and magnesium-bicarbonate type. Tendencies towards a chlorite type were observed in the Buntsandstein unit and towards a sulphate type in the Muschelkalk (mo) and Keuper units. Waters from Jurassic aquifers are in general of the calcium-bicarbonate type with the exception of some Na-rich waters. They have a low to medium mineralization.



Two samplings were performed in the GEAUSOUT project on roughly hundred sites. Additional data for further comparisons was gathered from archives and from local water supply authorities. Natural variations in time or temporal variations caused by human impacts were not taken into consideration in this work, but they are the subject of ongoing studies.

The results are presented as tables and they are shown in graphs and maps within GIS. A database was used to gather information about the topography, the geology of the sampling point, photos of the sites, technical drafts and other information, which provide knowledge for a potential exploitation.

New Concepts and Innovative Technologies for a Sustainable Management of the Urban Water Cycle (CONCEPT)

Public Research Centre Henri Tudor

Contact(s): Paul Schosseler, Torben Lohmann, Resource Centre for Environmental Technologies (CRTE),

Public Research Centre Henri Tudor

E-mail: paul.schosseler@tudor.lu, torben.lohmann@tudor.lu

Project Website: www.crte.lu (water section)

Starting Date – Closing Date: 1st March 2002 – 28th February 2006

FNR Contribution: € 386,899

Traditional sanitation with conventional toilets, large sewer systems and central wastewater treatment plants has a number of negative environmental and socio-economic impacts. Innovative sustainable alternatives are being developed and tested throughout the world with great success. Ecological sanitation (ECOSAN) relies on an ecologically and economically sound management of water, nutrient and energy fluxes. Sustainable sanitation solutions should be adapted to the socio-economic context and decision-making based on a multi-criteria evaluation, taking into account technical, economical and ecological and social aspects. This project, therefore, aims at promoting a sustainable urban water management in Luxembourg, following the given working scheme:

- Technology watch and collection of information through the review of scientific literature, database and Internet searches, as well as interviews and surveys;
- Analysis of sustainable sanitation alternatives taking into account the socio-economic context in Luxembourg, provision of decision support, realisation of pilot projects in collaboration with local councils and investors;
- Broad dissemination of results to the stakeholders (regulators, engineers and architects, sanitary firms, end-users).

Throughout the year 2005, results were disseminated through the EcoSanLux Newsletter. The six editions were sent to over 600 direct subscribers and covered the following themes: EcoSan News in and outside Luxembourg, Scientific background, Technical Applications, Documentation and Information. Furthermore, the EcoSan web pages hosted on the CRTE homepage were largely extended. Published in French, English and German they provide amongst others the presentations from various seminars and workshops, such as the workshop *Dezentrale Abwassereinigung und Regenwasserbewirtschaftung - Stand der Technik und Ausblick*, organised in Esch-sur-Alzette in July 2005.

In collaboration with the Service national de la Jeunesse (SNJ), the educational installation *Wasserwerkstatt* was developed, promoting sustainable water use and ecological sanitation during the *Ökofoire* and the 'Science Festival 2005' to the broad public and school classes. It has been permanently integrated into the environmental education courses for students in the Centre écologique Hollenfels.

In addition to these awareness-raising measures, the CRTE continued its consulting activities for investors, architects and companies in the field of sustainable sanitation and water consumption, thus initiating potential pilot projects. During the last phase of the project, CRTE will focus on scenario analysis concerning water, energy and nutrients fluxes in a virtual office building. By these means the large resources saving potential of ecological sanitation concepts for Luxembourg shall be pointed out and at the same time a decision making tool is created for future consulting activities.



"Wasserwerkstatt" at the Science Festival 2005



School class experiencing water consumption in household applications

Scientific Monitoring of the Implementation of a New Technique for the Treatment of Waste Water in Luxembourg (LITFLUID)

Public Research Centre Henri Tudor

Contact(s): Mario Plattes, Resource Centre for Environmental Technologies (CRTE),

Public Research Centre Henri Tudor

E-mail: mario.plattes@tudor.lu

Project Website: www.crte.lu (water section)

Partner(s): Department Environment and Agro-biotechnologies (EVA), Public Research Centre Gabriel Lippmann

Starting Date – Closing Date: 1st January 2002 – 30th June 2006

FNR Contribution: € 579,765

Refereed Scientific Publications:

Plattes M., Henry E., Schosseler P.M. and Weidenhaupt A. Modelling and Simulation of a Nitrifying Moving Bed Biofilm Reactor using an Adapted Model Structure based on the Activated Sludge Model No. 1, *Journal of Biochemical Engineering* (submitted).

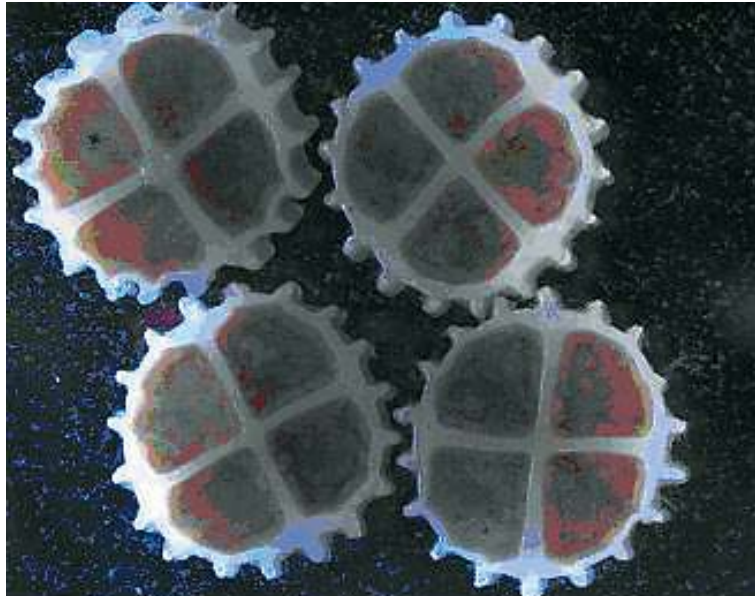
Plattes M., Fiorelli D., Gillé S., Girard C., Henry E., Minette F., O’Nagy O., Schosseler P.M. and Weidenhaupt A. Modelling and Simulation of a Moving Bed Biofilm Reactor Using Respirometry for the Estimation of Kinetic Parameters *Water Science and Technology* (submitted).

The project aims at the scientific investigation of a new wastewater treatment technology in Luxembourg, i.e. the moving bed biofilm reactor (MBBR). The MBBR technology uses suspended carrier elements with biomass attached in the form of a biofilm (Figure 1). The MBBR technology will be implemented at the wastewater treatment plant Hesperange and in this context it is studied on a pilot scale plant located on-site in Hesperange using process modelling and modern microbiological analysis techniques.

In 2005 the MBBR process was studied in denitrification mode. An intensive measurement campaign was conducted from the 22/05/05 to the 27/05/05. The MBBR was found to perform well and 55% of total wastewater nitrogen were eliminated during the period of the measurement campaign. The influent data resulting from the measurement campaign was used as input for the MBBR model developed in 2004. Respirometric experiments were performed in order to estimate kinetic parameters in the model. Known amounts of substrate, i.e. acetate and ammonium, were added to a respirometer filled with carrier elements originating from the pilot scale plant and the oxygen uptake rate (OUR) of the biofilm was recorded. The OUR response was then simulated and the resulting kinetic parameters were transferred to the MBBR model. It was found that the proposed MBBR model was able to predict effluent quality parameters of the pilot scale plant since the simulated data resulting from the model fitted the effluent data resulting from the measurement campaign. The use of the proposed model to support design, operation and control of the future wastewater treatment plant in Hesperange appears therefore promising.

Biofilms developing on the suspended carrier elements were characterised morphologically using epifluorescence and scanning electron microscopy. It was demonstrated that the microscopic structure of the biofilms is different from one compartment to another. The first compartment presented biofilms essentially composed of bacteria. The second compartment displayed more complex biofilms in which filamentous bacteria were numerous and created a composite 3-D environment. These biofilms hosted numerous protozoan and metazoan organisms.

The heterotrophic and autotrophic activities of the biofilms and the suspension were estimated using a radio-tracer. It clearly appeared that the activities on the carriers were significantly higher in the biofilm (up to 30,000 times higher) than in the suspension. The second compartment presented a higher nitrification capacity. The presence of ammonia oxidising bacteria (*Nitrospira* and *Nitrisomonas*) was detected on the carriers using molecular biology techniques.



*Figure 1: Biofilm attached to carrier elements
(the carriers are 1 cm in diameter)*

Modelling of a Sewage Network: Contribution to the Management of Pollution Risks at the Haute-Sûre Drinking Water Reservoir (RESEASURE)

Public Research Centre Henri Tudor

Contact(s): Emmanuel Henry, Kai Klepizewski, Resource Centre for Environmental Technologies (CRTE),
Public Research Centre Henri Tudor

E-mail: emmanuel.henry@tudor.lu, kai.klepizewski@tudor.lu

Project Website: <http://www.crte.lu> (water section)

Starting Date – Closing Date: 1st January 2002 – 30th June 2007

FNR Contribution: € 920,235

The research project, which accompanies the planning and construction of the sewer system surrounding the Haute-Sûre Lake and its downstream wastewater treatment plant (WWTP) Heiderscheidergrund, focuses on several objectives. One main objective is to reduce the combined sewer overflow volume spilled into the drinking water reservoir and other receiving waters in the catchment. This will also decrease the pollutants emissions. The lower emissions will be achieved by implementation of real time flow control of the effluents of sewage facilities (e.g. storage tanks with combined sewer overflow -CSO-, pumping stations) at the WWTP. A mathematical model of the sewer network under investigation is used for hydraulic and pollution load simulations to test and to optimise the application of the real time control (RTC) system. Another aim of the project is to improve the treatment processes at the WWTP, taking into account the wastewater quantity and quality at specific locations in the upstream sewer system. Finally, the developed RTC system will be transformed into a programmable logic control (PLC) tool to support the sewer network manager.

The hydraulic and pollution load simulations are carried out using InfoWorks™ CS software. A large number of input data sets are needed for the simulation. Therefore, several monitoring campaigns have been accomplished in 2005 to get information on quantity and quality of flows in the local sewer systems of the sub-catchments Eschdorf, Kaundorf and Goesdorf. Furthermore, precipitation data has been evaluated for the sub-catchments mentioned above as well as for additional rain gauges of SIDEN and ASTA.

Initial simulations with uncontrolled and controlled scenarios for a subsystem of the sewer network indicate a significant reduction of CSO volume and pollution load as well as potentialities to decrease the emptying time of the storage tanks by using RTC.

Additionally first experiments to establish an interface between the RTC tool of the simulation program and the PLC instrument of the pumping station Breidfeld based on the program MATLAB[®] showed promising results.



Figure 1: Measurements site at Kaundorf (Raingauge, Flowmeter and Sampler)

**Material Flows in the Catchment Area of the River Alzette:
Impacts of Contaminants on the Water Resources' Quality
(Micro/Macropollutants and Nutrients)
(FLUXALZETTE)**

Public Research Centre Henri Tudor

Contact(s): Joëlle Welfring, Tom Gallé, Resource Centre for Environmental Technologies (CRTE),

Public Research Centre Henri Tudor

E-mail: joelle.welfring@tudor.lu, tom.galle@tudor.lu

Project Website: <http://www.crte.lu> (water section)

Starting Date – Closing Date: 1st February 2002 – 31st January 2007

FNR Contribution: € 500,000

The project FluxAlzette aims at establishing substance flows for nutrients and pollutants at the catchment scale that will eventually allow the simulation of different water management scenarios. The Alzette catchment (1176 km²), especially in the southern part is under strong anthropogenic pressure, as rather low natural discharges meet substantial contributions by waste water treatment plants and sewer systems. The Alzette is notorious for its bad water quality and if settlements continue to grow at the current pace, the river will not meet the good ecological status required by the European Water Framework Directive. The concept of the project relies on localised substance flow balances at selected gauging stations throughout the catchment: Six gauging stations have been monitored on 80 occasions under different hydrological and biological conditions from 2002 to 2004. The main focus rests on contributions of wastewater management systems to the river. Wastewater treatment plant outlets and a selected combined sewer overflow were part of an extensive sampling programme. The year 2005 saw the team of the project working on this vast dataset to calculate substance flows following thorough data quality checks and discharge-concentration relationship evaluation. Discharge measurements were performed in cooperation with the Water Administration to quantify errors in hydraulic calculations. The subject of transient storage of sediments and pollutants was investigated in a heavily impacted river segment and sediment transport in flood waves is currently being monitored in a separate project with the Water Administration. Furthermore a GIS database with a focus on urban areas (impervious surfaces, sewer networks, combined sewer overflows) is being set up and a combined sewer overflow contributions model in flood waves is getting calibrated with the overflow data from our monitoring site in Bonnevoie. Brought together these tools will permit the extrapolation of sewer network contributions at high resolution over the entire hydrological year on the catchment scale.



A very vivid substance flow: outlet of the wastewater treatment plant in Beggen

BIOSAN Programme

Biotechnology and Health

Duration: 2002 – 2008

Total Budget: € 6,000,000

1st Call in 2001: 7 Projects Selected (€ 6,000,000)

The most frequent causes of mortality in the developed countries stem from cardio- and cerebrovascular diseases and from cancer. Statistical studies, conducted by the Luxembourg Health Ministry on the primary causes of mortality confirm these international observations for Luxembourg. Thus, a very significant proportion of the active population is concerned by these diseases, and the observed morbidity or even early mortality entails important repercussions on the socio-economic level. Consequently, on the level of public health, biomedical research aiming at improving the prevention, the diagnosis and the therapy of these diseases remains an absolute priority.

The “Biotechnology and Health Programme” is structured around three main axes: cancer, cardio- and cerebrovascular diseases and immunology intervention. Its objective is to contribute to the qualitative improvement of the prevention, the detection and the treatment of both cancer and cardio- and cerebrovascular diseases, as well as to develop new strategies for the specific modulation of the immune system. Thereby biomedical research in Luxembourg, on the fundamental and clinical level as well as in the field of new biotechnologies in support of the health system, will be reinforced, thus increasing the competitiveness and mobilising the actors in this domain.

The programme presents six priority areas:

- cancer,
- cardio- and cerebrovascular diseases,
- new strategies for immunology intervention,
- development of expression libraries for the functional and topographical targeting of complex biological systems,
- epidemiology,
- intelligent data-processing environments in the field of health.

BIOSAN Projects

Project Code	Title	Contact	Coordinating Institution(s)	Starting Date	Closing Date	Budget Estimates (€)
FNR/01/04/01	Anti-tumour Vaccination with Dendritic Cells Pulsed with the Help of Apoptotic Mammary Tumour Cells	G. Berchem	Centre Hospitalier de Luxembourg / CRP Santé	01.03.2003	31.08.2005	291,285 (1st phase) 267,285 (2nd phase)
FNR/01/04/03	Study on the Prevalence of Respiratory Symptoms, Bronchial Hyperactivity and Atopy	R. Nati	Centre Hospitalier de Luxembourg / CRP Santé	01.04.2002	31.12.2005	184,927
FNR/01/04/04	Recombinant Modified Allergens for Immunotherapy Design and Testing by means of an in vitro System	F. Hentges	Centre Hospitalier de Luxembourg / CRP Santé	01.07.2002	31.12.2005	490,000
FNR/01/04/06	A Molecular Pathology Approach for Prostate Cancer Research: Application of the Laser Capture Micro-Dissection Technology	N. Kieffer	University of Luxembourg / CRP Santé	01.11.2002	31.05.2007	1,100,000
FNR/01/04/08	Luxembourg Heart Failure Project: Home-Monitoring of Patients with Severe Heart Failure	D. Wagner	Centre Hospitalier de Luxembourg / CRP Santé	01.01.2002	31.08.2007	720,000
FNR/01/04/09	Creation of a New Competence in Bio-Informatics and of a Technological Platform for Large-scale Genic Analysis (DNA Chips)	E. Friederich	CRP Santé	01.02.2002	31.01.2007	1,400,000
FNR/01/04/11	Vaccines against Low Molecular Weight Antigens: Novel Strategies and Application	C. Muller	National Health Laboratory	01.06.2002	01.01.2006	773,509 (1st phase) 772,994 (2nd phase)
Total:	Available amount for BIOSAN, according to the Convention with the Government: € 6.000.000					6,000,000

Vaccination with Apoptotic B Leukemic Cells Loaded Antigen Presenting Cells in Chronic Lymphoid Leukaemia: Comparative Study of Immunogenic Effect with Different Apoptosis Induction Methods

Centre Hospitalier de Luxembourg / Public Research Centre Santé

Contact(s): Guy Berchem, Haematology, Centre Hospitalier de Luxembourg

E-mail: berchem.guy@chl.lu

Starting Date – Closing Date: 1st March 2003 – 31st August 2005

FNR Contribution: € 291,285

Possible Prolongation: 30 months, maximum financial contribution by FNR € 267,285

Refereed Scientific Publications:

Palissot V., Morjani H., Belloc F., Cotteret S., Dufer J., Berchem G.

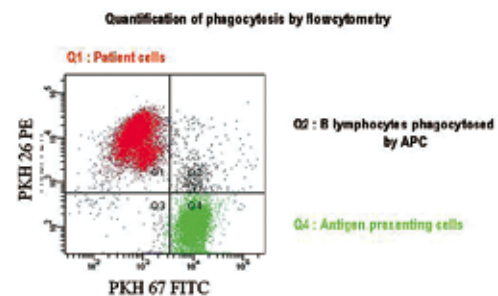
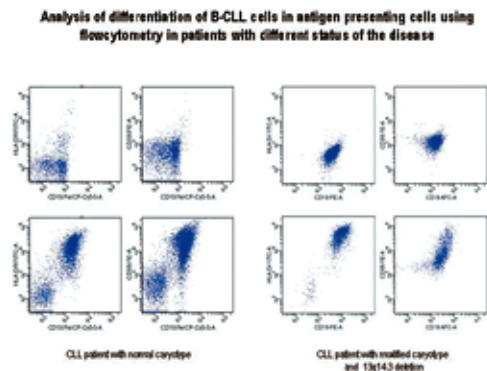
From molecular characteristics to cellular events in apoptosis-resistant HL-60 cells.

Int J Oncol. 2005 Mar; 26(3):825–34.

Beaujouin M., Baghdiguan S., Glondu-Lassis M., Berchem G., Liaudet-Coopman E.

Overexpression of both catalytically active and inactive cathepsin D by cancer cells enhances apoptosis-dependent chemo-sensitivity. Oncogene. 5th December 2005.

Despite the still poorly understood complexity of tumour-host immune interactions, the use of cellular vaccines has made it possible to reliably generate tumour antigen specific T cells, both in animals and humans. Induction of productive T cell immunity requires efficient presentation of peptide antigens by professional antigen-presenting cells (APC). Although dendritic cells (DCs) have been selected as the “APC of choice” for immunotherapy, the complexity and cost of preparation of DC precursors and generation of functional DCs limits their utility as APC for the ex vivo generation of antigen specific T cells. In this project our laboratory developed a new vaccination strategy using B lymphocytes of peripheral blood from chronic lymphoid leukemic patients as APCs. These cells, re-injected in the donor after in vitro pulse with autologous apoptotic B cells, should induce a specific cytotoxic response against cancer cells. In 2005, the phagocytosis level of apoptotic B lymphocytes by APC was quantified using flow cytometry after membrane cell staining. These experiments were done on different patient cells in different culture conditions. The results showed low levels of phagocytosis and highlight the need for a better characterisation of CLL cells. Therefore, extended phenotyping in CD markers was implemented in the cytoflow core facility and a collaboration with the Curie Institute was started to develop in Luxembourg a global analysis of the genome of tumour cells by a molecular approach using comparative genomic hybridization-array (CGH). CGH array identifies the regions of the genome that are amplified or deleted in tumours on DNA chips. In order to improve the use of this cellular therapy in clinical trial, obtention of APC with soluble CD40 ligand was tested.



Prevalence of Respiratory Symptoms, Bronchial Hyper-Reactivity and Atopy in Young Adults in Luxembourg

Centre Hospitalier de Luxembourg

Contact(s): Romain Nati, Department of Pneumology, Centre Hospitalier de Luxembourg

E-mail: nati.romain@chl.lu

Partner(s): Public Research Centre Santé

Starting Date – Closing Date: 1st April 2002 – 31st December 2005

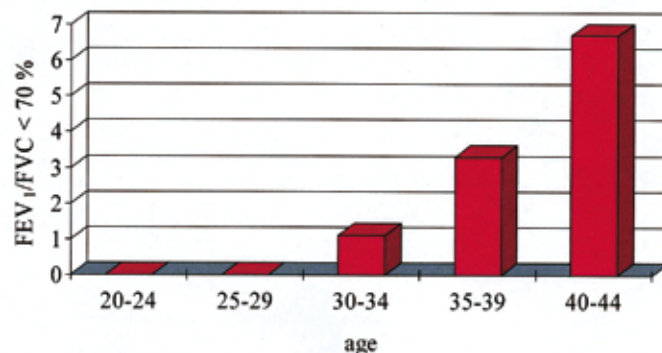
FNR Contribution: €184,927

The purpose of our project was:

- To produce epidemiological data on indicators of asthma and allergy in the adult population in Luxembourg. Luxembourg lacked internationally comparable information in order to have a full picture of the prevalence and risk factors, the process of care, measures for prevention and the main outcomes for these two conditions.
- To study differences in these indicators between the Luxembourg and the immigrant Portuguese population. Several studies carried out in different countries suggest an influence of migration on symptoms, allergic sensitisation and access to healthcare in asthma. Luxembourg's immigration rate rose sharply in the course of the last century, with a noticeably important influx of Portuguese immigrants during the last 40 years. This particularity gave us the opportunity to study this issue and the implications of immigration on respiratory care in Luxembourg.

In stage I, a self-administered questionnaire was sent to 7,259 20 to 44-year old persons, randomly selected for age and sex. This questionnaire was available in three languages (French, German, and Portuguese). The overall adjusted response rate was 82.1%.

In stage II, 712 participants performed a spirometry, a methacholine challenge test, measurements of exhaled nitric oxide levels and serum testing for total and specific IgE. Wheezing was reported by 17.5% of the participants; the prevalence of asthma is evaluated at 6.9%. The use of anti-asthmatic drugs in asthmatic participants is with 62% lower than the European mean value. Nasal allergies are reported by 23.6% of the participants. Bronchial hyper-responsiveness was found in 15.4%. Atopy is a very common condition present in 37.8% of the young adults. The prevalence of chronic bronchitis is estimated at 2.6%. 7.5% of the smokers had an abnormal lung function compatible with a COPD stage GOLD I at least, compared to 2.5% of the non-smokers.



Percentage distribution of prevalence of obstructive spirometric pattern in relation to age in young adults

Our community-based study provides consistent data to the hypothesis of a greater susceptibility of women to smoking in terms of effects on lung function, bronchial responsiveness and self-reported respiratory symptoms.

The pattern of respiratory symptoms and allergic sensitisation differs between Luxembourg residents, first generation immigrants and second generation immigrants of Portugal. Portuguese immigrants have a higher prevalence of asthma-like symptoms and a lower prevalence of nasal allergies than residents with Luxembourg nationality. The increased prevalence of different respiratory symptoms is accentuated in second generation immigrants. First generation but not second generation immigrants of Portugal show a lower prevalence of allergic sensitisation against cat and timothy grass than residents of Luxembourg nationality.

FNR 01/04/04

Recombinant Modified Allergens for Immunotherapy Design and Testing by means of an In Vitro System

Public Research Centre Santé / Centre Hospitalier de Luxembourg

Contact(s): François Hentges, Laboratory of Immunogenetics and Allergology, Public Research Centre Santé

E-mail: hentges.francois@chl.lu

Partner(s): National Health Laboratory

Starting Date – Closing Date: 1st July 2002 – 31st December 2005

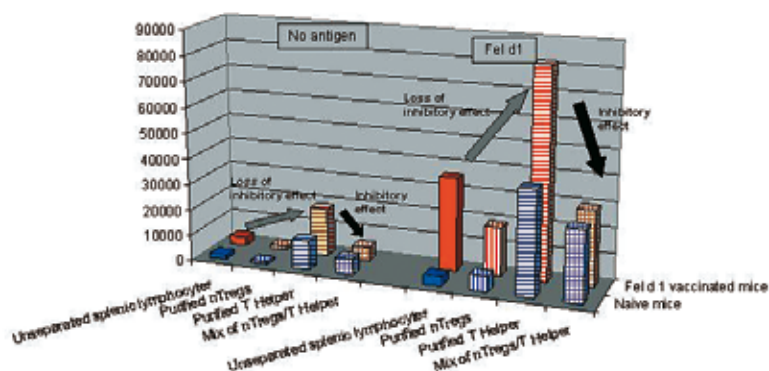
FNR Contribution: € 490,000

The goals of this project were to study the mechanisms of immune response and tolerance in order to acquire the skills and tools to make allergic persons tolerant to the allergens they are sensitised to. The problem addressed was the allergic sensitisation to the major cat allergens Fel d1 (an uteroglobin) and cat serum albumin (CSA). Analysis of the cellular immune response at the T cell level, the crossroad of all cognate immune responses, was performed by an *in vitro* assay where T cells were stimulated by matured allergen-pulsed myeloid dendritic cells (DCs). This allowed the definition of T cell epitopes (the allergen parts recognised by T lymphocytes).

During the first year, the human T cell response to 12 recombinant fragments of CSA was studied for 35 persons, according to their different HLA-class II specificities. During the second year, the *in vitro* proliferation of splenocytes from naïve and immunised BALB/c mice was studied for Fel d1 (by overlapping peptides) and CSA (by 12 recombinant fragments) presented by myeloid DCs. First data on natural regulatory T cells was obtained.

In 2005, focus was given on the regulation of immune responses to CSA and Fel d1. The role of natural T regulatory cells (nTregs) was primarily addressed and that of inducible T regulatory cells (iTregs) secondarily.

Proliferation of T Helper splenocytes after addition or subtraction of nTregs



Proliferation of T cell subtypes from naive mice (blue) or Fel d 1 vaccinated mice (orange) when dendritic cells are pulsed with no antigen (left part) or with Fel d 1 (right part). The effects due to the addition (black arrows) or subtraction (grey arrows) of nTregs on the proliferation of responding splenocytes are indicated. The nTregs/T Helper cell ratio is 1/2 for the naive mice and 1/3 for the Fel d1 vaccinated mice.

The cellular proliferation of unseparated splenocytes, separated T helper cells, nTregs, in chosen compositions, was tested. The tested cells originated from naive or immunised mice. Tests were performed with DCs pulsed with the major CSA epitopes (fragments IV, V, VI), and with Fel d1 and its major epitope F1.4. Culture supernatants were screened on day 1, 2, 3, and 4 for cytokine secretion (IFN-gamma, IL-10, IL-2, IL-4, IL-12, and IL-5). nTregs were able to suppress proliferation of T helper cells in a quantitative manner, proliferation inhibition being complete for a 1/2 ratio (nTregs/T helper). Cytokine secretion was independent of T cell proliferation inhibition and differed depending on the cytokines tested.

For the investigation of iTregs in mice, a hybrid MSA-CSA (CSA fragment V on a mouse SA backbone) was constructed and tested. To make further progress in nTreg analysis, the *in vitro* amplification of nTregs of desired specificity in quantities allowing to test their regulatory effect *in vivo* is a major goal.

A Molecular Pathology Approach for Prostate Cancer Research: Application of the Laser Capture Micro-Dissection Technology (LMD) to the Molecular Investigation of Patients with Prostate Cancer Metastasis

University of Luxembourg

Contact(s): Nelly Kieffer, Laboratory LBPI (CNRS/GDRE-ITI), University of Luxembourg

E-mail: nelly.kieffer@uni.lu

Partner(s): National Health Laboratory, Centre Hospitalier E. Mayrisch

Starting Date – Closing Date: 1st November 2002 – 31st May 2007

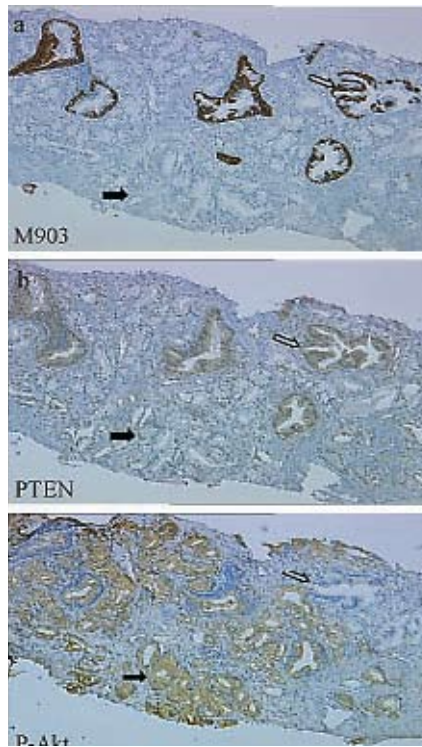
FNR Contribution: € 1,100,000

Refereed Scientific Publications:

N. KIEFFER, M. SCHMITZ, S. PLANCON, C. MARGUE, F. HUSELSTEIN, G. GRIGNARD, W. DIPPEL, M. NATHAN, S. GIACCHI and R. SCHEIDEN. ILK as a potential marker gene to ascertain specific adenocarcinoma cell mRNA isolation from frozen prostate biopsy tissue sections. *Int. J. Oncol.* 2005, 26, 1549–1558

M. SCHMITZ, G. GRIGNARD, C. MARGUE, W. DIPPEL, S. GIACCHI, C. CAPESIUS, M. NATHAN, R. SCHEIDEN, and N. KIEFFER. Complete loss of PTEN expression as an early prognostic marker for prostate cancer metastasis. *Int. J. Cancer* (2006, in revision)

Prostate cancer is the most commonly diagnosed non-cutaneous cancer and the second leading cause of cancer-related death in men in Western industrialised countries. Large scale screening based upon the serum level measurement of prostate specific antigen (PSA) has resulted in a marked increase in the early detection of prostate cancer. However, at present it is unclear which percentage of these early detected cases represents subclinical disease which might not require aggressive treatment. Therefore, the objective of this project is to set up new, state-of-the-art molecular biology technologies in order to search for and identify new prognostic biomarkers able to discriminate indolent prostate cancers from tumours having the potential to progress to lethal metastatic disease. Using laser micro-dissection technology and real-time PCR, together with immunohistochemistry, we have explored the growth factor and integrin dependent PI3-kinase/PTEN/Akt signalling pathway regulating cancer cell proliferation and metastasis, in prostate cell lines and patient tumour samples by analysing EGF-R, IGF1-R, ILK, 3 integrin, PTEN and phospho-Akt protein expression. Our data provides evidence that loss of PTEN expression rather than upregulated growth factor receptor expression is responsible for increased Akt phosphorylation in neoplastic prostate cells (figure 1). In addition, a retrospective study of 42 patients with lymph node metastasis revealed that PTEN expression was lost in both the neoplastic glands of the prostate and the invasive prostate cells in the lymph node in 59% of the patients, and that loss of PTEN expression in the biopsy specimens of these patients at first time diagnosis of prostate cancer was observed in a significant number of patients. These results provide evidence for the critical importance of assessing PTEN expression at first time diagnosis of prostate cancer and to consider those patients with complete loss of PTEN expression as potential candidates that might progress to metastatic disease. Our next objectives will be (a) to develop reliable diagnostic tools that will allow routine analysis of PTEN expression in biopsy specimens of larger patient cohorts in order to strengthen our preliminary data; and (b) to use “in vitro” amplified mRNA isolated from micro-dissected prostate cancer cells for large scale gene profiling.



Immunostaining of prostate biopsy tissue specimens for PTEN, M903 and P-AKT expression. Biopsy tissue sections of a prostate cancer patient stained with antibodies to cytokeratin antigen M903 (a), PTEN (b) and phospho-Akt (c). The arrows identify M903-positive normal benign glandular epithelium (white arrow) and M903-negative neoplastic cells (black arrow). (Magnification X100). Note the absence of PTEN expression and the presence of phospho-Akt in the neoplastic cells.

Luxembourg Heart Failure Project

Centre Hospitalier de Luxembourg

Contact(s): Daniel Wagner, Cardiology, Centre Hospitalier de Luxembourg

E-mail: wagner.daniel@chl.lu

Partner(s): Public Research Centre Santé

Starting Date – Closing Date: 1st January 2002 – 31st August 2007

FNR Contribution: € 720,000

Congestive heart failure (CHF) has become a health problem of epidemic proportion in the western world. CHF is the leading cause of hospital admission for patients over the age of 65. A characteristic feature of patients with CHF is hospital readmission.

Nurse-driven disease management (DM) has been shown to increase appropriate medication prescription, to improve compliance and to reduce hospitalisations in patients with CHF. The SPAN-CHF (Specialized Primary and Network Care in Heart Failure) trial showed a significant reduction in hospital days and hospital admissions in patients followed by a telephone nurse.

The intent of home-based telemonitoring is to provide better surveillance of the patient than via heart failure clinic or telephone nurse. The TEN-HMS (Trans-European Network initiative – Home-Care Management Systems) study, which was recently published, showed that home-based telemonitoring reduced the number of days spent in hospital by 26% and led to an overall 10% cost savings compared to nurse telephone support.

Further work needs to be done to refine home telemonitoring equipment and methods. Our group has focused on non-invasive telemonitoring of heart function and studied non-invasive determination of cardiac output (CO) and pulse transit time (PTT). Non-invasive measurements of CO adapted to telemonitoring have so far been relatively variable and not accurate enough. However, PTT appears to be a potential candidate for home telemonitoring of cardiac function and neuroendocrine status. We have developed a small portable home-monitoring unit (patent pending) capable of measuring and transmitting daily the following parameters in out-patients: blood pressure, heart rate, oxygen saturation, PTT and weight. The reproducibility of measurements was assessed in over 20 volunteers. The clinical relevance of PTT was assessed in over 50 patients with chronic heart failure with a total of over 600 measurements. There was a significant correlation between PTT and blood pressure as well as heart rate. We have observed in 31 patients with heart failure NYHA class 2–3 and ejection fraction (EF) < 35% that PTT correlates with VO₂ max, a gold standard to evaluate functional cardiac status. When following the patients over longer periods of time and up to 12 months, it appeared that PTT measurements were affected by the status of the patient. Indeed, stable patients not requiring hospitalisation demonstrated stable PTT values in contrast to patients requiring repeated hospitalisations where PTT values increased during re-compensation and decreased during de-compensation. This observation will now be evaluated in a multi-centre randomised trial.

Creation of a New Competence in Bio-Informatics and of a Technological Platform for Large-Scale Genic Analysis (DNA Chips)

Public Research Centre Santé

Contact(s): Evelyne Friederich, Laboratory of Molecular Biology, Genetic Analysis and Modelling,
Public Research Centre Santé

E-mail: evelyne.friederich@crp-sante.lu

Project Website: <http://www.microarray.lu> and <http://www.bioinformatics.lu>

Partner(s): Public Research Centre Henri Tudor (Centre de Ressources SANTEC),
National Health Laboratory

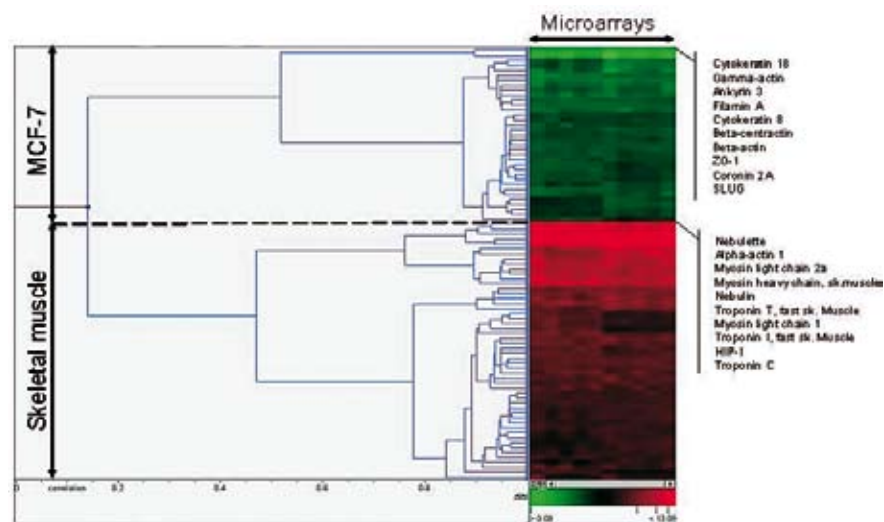
Starting Date – Closing Date: 1st February 2002 – 31st January 2007

FNR Contribution: € 1,400,000

Refereed Scientific Publications:

Muller J, Oma Y, Vallar L, Friederich E, Poch O, Winsor B. Sequence and Comparative Genomic Analysis of Actin-related Proteins. *Mol Biol Cell*. 2005 16(12): 5736–48.

Established in early 2002 in the context of the BIOSAN programme, the microarray consortium consists of three units: a microarray platform aiming at designing, making and using microarrays; a team developing new tools for the processing of microarray images; and a bioinformatic and statistic unit in charge of the management and the analysis of microarray data. The facility is committed to providing academic or industrial laboratories from Luxembourg and surrounding areas with support, quality tools and equipments. In 2005, our efforts concentrated on the optimisation of methodologies allowing gene expression profiling, the most commonly demanded application by our users who have widespread interests ranging from cancer, immunological disorders, cardiovascular and neuro-degenerative diseases. We standardised the microarray procedure, including the experimental protocols and the quality controls, and we automated some critical steps of the procedure using new equipments.



Hierarchical clustering of microarray data : The plot depicts the dendrogram of gene clusters obtained by hierarchical clustering with the average linkage and the city block metrics applied to gene expression data from 10 microarrays presenting two different samples under a study. Expression patterns highlight genes that are specific markers allowing the characterisation of the two samples used in the assays.

We performed tests to evaluate the performance of an in-house thematic microarray designed for the analysis of actin cytoskeleton-related gene expression (ACTIchip), and we showed that the biochip performs equally well as other commercial arrays in term of specificity, sensitivity and reproducibility. The platform also worked on the implementation of additional methodologies such as CGH arrays, SNPs analysis or protein-based arrays. In parallel, the bioinformatic team finalised a programme for the design of oligonucleotide microarray probes (CADO4MI), and implemented a comprehensive database server, the Bioarray Software Environment (BASE), to store and manage the data generated by microarray analysis. BASE manages biomaterial information, raw data and images, provides integrated normalisation, data viewing and analysis tools, and allows information tracking using LIMS features. These local resources were made freely accessible through a user-friendly website, together with other bioinformatics tools including SRS, EMBOSS, and Blast. Several training sessions were organised for users. As the databases that store DNA sequences and proteins are growing rapidly, we examined possible strategies to optimise their indexing and to save disk space and speed up the search. In addition, we investigated how to improve microarray image segmentation and evaluation. We also implemented tools to assess the accuracy and reproducibility of microarray results. We developed a standardised data analysis pipeline based on a suite of specialised software that allows the filtering of statistically relevant data and their further analysis and mining. The ultimate goal of this pipeline is to improve the quality of microarray analysis and to facilitate the comparison and the exchange of genomic data within and between laboratories.

FNR 01/04/11

Vaccines against Low Molecular Antigens: Novel Strategies and Application (TOBAVAC)

National Health Laboratory

Contact(s): Claude Muller, Institute of Immunology, National Health Laboratory

E-mail: claudemuller@ins.etat.lu

Project Website: <http://www.etat.lu/LNS>

Partner(s): Department of Sciences, University of Luxembourg, Department of Psychology,
University of Luxembourg

Starting Date – Closing Date: 1st June 2002 – 1st January 2006

FNR Contribution: € 773,509

Possible Prolongation: 30 months, maximum financial contribution by FNR € 772,994

Refereed Scientific Publications:

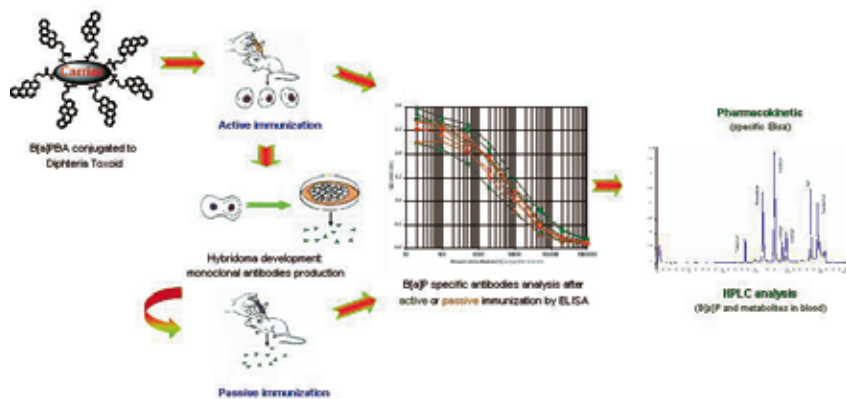
De Buck SS, Muller CP. Immunopropylactic approaches against chemical carcinogenesis. *Vaccine* 18; 23:2403–06, 2005.

De Buck SS, Augustijns P, Muller CP. Specific antibody modulates absorptive transport and metabolic activation of benzo[a]pyrene across Caco-2 monolayers. *J Pharmacol Exp Ther* 313:640–6, 2005.

De Buck SS, Bouche FB, Brandenburger A, Muller CP. Modulation of the metabolism and adverse effects of benzo[a]pyrene by a specific antibody: a novel host factor in environmental carcinogenesis? *Carcinogenesis* 26:835–44, 2005.

N Grova, H Schroeder, A Valley, JD Turner, CP Muller. Behaviour modulation and expression of N-methyl D-aspartate receptor genes in adult female mice after a chronic administration of Benzo[a]pyrene. Proceeding of the 25th International Symposium on Halogenated Environmental Organic Polluants and POPs, Toronto, Dioxin 2005, 67:418–420, 2005.

The general objective of this project was to explore the possibility of a prophylactic immune strategy, based on carcinogen-specific antibodies, to lower the risk of chemical carcinogenesis. Benzo[a]pyrene (B[a]P), an ubiquitous environmental micro-pollutant and the 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK), a potent pulmonary tobacco carcinogen, were used to investigate the strategy. The protective effect of specific antibodies was tested in *in vitro* and *in vivo* models based on very low, relevant concentrations of carcinogen. Our *in vitro* studies demonstrated that carcinogen-specific antibodies decrease the transport and metabolism of B[a]P and NNK in two different cell lines (Caco-2, Calu-3, models of gut and lung mucosa). Moreover, recent studies showed the ability of hapten-specific antibodies to reverse NNK-induced cell proliferation in small lung cell carcinoma (NCI-H82 cells). *In vivo* experiments included active and passive immunisation based on functionalised B[a]P and NNK derivatives developed by extensive and on-going chemical synthesis. These derivatives were conjugated to protein carriers (like diphtheria toxoid, tetanus toxin or ovalbumine) to generate conjugate vaccines. These were then used to develop monoclonal antibodies for passive immunization as well as for active immunisation. The activity of antibodies *in vivo* was confirmed both on the level of metabolism and pharmacokinetic of the carcinogen by following-up of the fate ^3H -B[a]P. These on-going studies showed that monoclonal or polyclonal antibodies modulate the bioavailability of B[a]P in blood and may interrupt the metabolic activation pathway both at the level of the pro-carcinogen B[a]P and its activated metabolites. These results were further confirmed by evaluating pharmacokinetics of monoclonal antibodies after chronic administration of B[a]P in mice.



VACCINES AGAINST LOW MOLECULAR ANTIGENS
TOBAVAC



PROVIE* Programme

* extension of the BIOSAN programme

Medical Aspects of Ageing

Duration: 2004–2008

Total Budget: €2,500,000

1st Call in 2003: 4 Projects Selected (€1,828,000)

2nd Call in 2006

The aim of this specific research area is to study the epidemiological, psychosocial and biological aspects of the neurodegenerative diseases of old age in Luxembourg and view them against the broader European canvas. In line with the EU research programme on 'medical and social challenges posed by an ageing population and the disabilities associated with old age' (Official Journal of 15 November 2000), the approach taken is a holistic one, i.e. multidisciplinary and multidimensional. Priority will be given to projects which are multidisciplinary and interactive, involving players from different specialist backgrounds.

Objectives:

- To improve the skills of the biomedical community in Luxembourg and the transfer of knowledge concerning pathologies linked to ageing of the brain;
- To correlate medical, epidemiological, psychosocial and biological aspects;
- To improve the prevention of cerebrovascular accidents (strokes);
- To acquire innovative detection methods for neurodegenerative diseases, depression, sleep disorders and chronic pain in the elderly;
- To devise new specific treatment strategies for the above pathologies;
- To improve the care of the patients and their families;
- To develop new therapies.

The aim, in pursuing these objectives, is to attain an internationally recognised level of medical and scientific competence and to ensure that work done under this programme meshes with other national and international projects.

PROVIE Projects

Project Code	Title	Contact	Coordinating Institution(s)	Starting Date	Closing Date	Budget Estimates (€)
FNR/03/04/02	Prospective Evaluation of Neuropsychological and Biological Characteristics of Mild Cognitive Impairment (MCI) and of Associated Sub-clinical Health Problems	M. Perquin	CRP Santé	01.07.2005	30.06.2006	350,000 (1st phase) 900,000 (2nd phase)
FNR/03/04/04	Interactions between Microglia and Beta-Amyloid	P. Heuschling	University of Luxembourg	01.11.2004	31.10.2005	188,000
FNR/03/04/06	Aspirin Non-Responders in Elderly High Vascular Risk Patients in Luxembourg	R. Metz	Centre Hospitalier de Luxembourg/ CRP Santé	01.12.2004	30.11.2005	75,000 (pre-study)
FNR/03/04/07	Cognitive Neuropsychology of Ageing in Schizophrenia	C. Pull	Centre Hospitalier de Luxembourg/ CRP Santé	01.10.2004	30.09.2007	315,000
Total:	Available amount for PROVIE, according to the Convention with the Government: € 2,500,000					1,828,000

Feasibility Study of the Prospective Evaluation of Neuropsychological and Biological Characteristics of Mild Cognitive Impairment (MCI) and of Associated Sub-clinical Health Problems

Public Research Centre Santé

Contact(s): Magali Perquin, Service of Clinical Epidemiology and Public Health of the Centre for Health Studies, Public Research Centre Santé

E-mail: magali.perquin@crp-sante.lu

Partner(s): University of Luxembourg

Starting Date – Closing Date: 1st July 2005 – 30th June 2006

FNR Contribution: € 350,000

Possible Prolongation: 24 months, maximum financial contribution by FNR: € 900,000

Cognitive disorders and Alzheimer's disease (AD) are increasingly considered a major public health problem. Because an overview on these concerns in Luxembourg is still non-existing, the present project aims to provide a comprehensive view of the elderly population in the country. The study is divided in three parts. (1) The feasibility study of the overall project consists in setting up useful tools for the neuropsychological testing in our country where at least three official languages are spoken, and also in installing all the processes for the cohort study. (2) A first step of the project will allow investigating the prevalence of subjects suffering from mild cognitive impairment (MCI) and from AD-type dementia. Subjects will be randomly selected from the general population, and the prevalence study of people living at home will be complemented by studying a random sample of institutionalised elderly persons. (3) A prospective cohort of people over 65 years will be consequently set up. "Environmental" conditions (lifestyle and socio-cultural parameters) and biological factors (including genetic traits) will be examined in association with MCI, and evolutions from MCI to AD are the main outcomes of interest. Special attention will be paid to multilingualism as an aspect of particular importance in Luxembourg and which may be impaired through the cognitive alterations associated with pathological ageing. Sub-clinical impairments will be explored including cardiac and respiratory functions, metabolic disorders and long-term medications that may impact on cognition. Gene polymorphism, blood protein patterns, and selected blood lipid components are among the examined biological factors. Data will be collected in a prospective way with an etiologic goal, which minimises bias likelihood. On the basis of the results collected from the prospective cohort, the main outcomes will be analysed, i.e. evolution from normal cognitive capacities to MCI and evolution from MCI to AD. Case-control designs will be used for cross-sectional or retrospective comparisons between outcomes and biological or clinical factors. The former design is statistically highly powerful and allows cost-effective use of research resources. Appropriate follow-up of subjects in the cohort will improve the knowledge of this preclinical stage that represents a challenge in public health in the sense that it would lead to identify MCI and AD predictors, allowing interventions that could protect or delay the occurrence of cognitive disorders in elderly people.

FNR 03/04/04

Microglial Activation and Differentiation: Balance between Proinflammatory Secretions and Beta-amyloid Clearance

University of Luxembourg

Contact(s): Paul Heuschling, FSTC, University of Luxembourg

E-mail: paul.heuschling@uni.lu

Partner(s): Public Research Centre Santé, National Health Laboratory

Starting Date – Closing Date: 1st November 2004 – 31st October 2005

FNR Contribution: € 188,000

The amyloid-beta (A β) cascade hypothesis is the dominant explanation for the pathogenesis of Alzheimer's disease (AD). Producing the well-known plaques, these A β peptides accumulate inside the brain tissue causing neuronal degeneration and local inflammatory stress. We need a more complete understanding of the signalling pathways leading to the inefficient clearance of A β by microglia, the brain-resident macrophage-like cell, as well as to the development of the concomitant pro-inflammatory and thus neurotoxic reaction by the same cells.

The aim of this project was to develop experimental strategies allowing us to influence the balance between pro-inflammatory reactions and A β clearance. Microgliaocytes belong to the monocyte/macrophage cell lineage. Recent findings have shown that, during activation, macrophages differentiate along a continuous spectrum of phenotypes. The extremes of this spectrum are pro-inflammatory cells (M1) on one side and anti-inflammatory cells (M2) on the other. Tentative signature expression profiles and behaviour for these phenotypes have been presented in the literature.

Based on these findings, we analysed the transcription profiles, the protein expressions and the phagocytic activity of A β -activated microglial cells. Gene-transcription profiles were established using RT-PCR, real-time quantitative PCR and whole genome microarrays. Morphological changes, production of free radicals and phagocytic activity were assessed. The preliminary results clearly indicated that A β -stimulated microglial cells differentiate towards a M1-polarised activated phenotype (pro-inflammatory phenotype): the cytokine and chemokine expression profiles are pro-inflammatory, free radical production is high and the phagocytic activity strongly reduced. This *in vitro* behaviour seems to parallel *in vivo* observations and explains some of the neurotoxic effects observed during AD. Our results also give some indications that the differentiation of the activated microglial cells can be influenced. Exposure of the cells to the cytokine M-CSF decreases the production of some of the pro-inflammatory cytokines as well as the free radicals. Treatment of microglial cells with soluble ligands of the Notch pathway has the same effect and also increases their phagocytic activity. Special attention was given to a set of compounds, protected by patents co-owned by the University of Luxembourg, the University Louis Pasteur and the CNRS. When present during activation, these molecules seem to modulate the differentiation process of microglial cells. Thus, the project aimed to define scientific and therapeutic strategies against the A β cascade.

Aspirin Non-Responders in the Elderly Population with High Vascular Risk

Centre Hospitalier de Luxembourg / Public Research Centre Santé

Contact(s): René Metz, Department of Neurology, Centre Hospitalier de Luxembourg

E-mail: metz.rene@chl.lu

Partner(s): Public Research Centre Santé

Starting Date – Closing Date: 1st December 2004 – 30th November 2005

FNR Contribution: € 75,000 (pre-study)

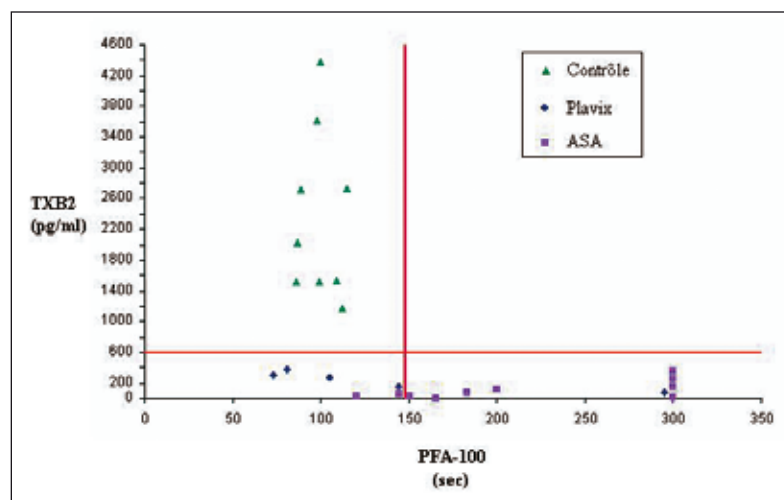
Possible Prolongation: 24 months

Aspirin (ASA) reduces the relative risk of major vascular events and vascular death by ~20% after ischemic stroke and acute coronary syndrome. However, the antiplatelet properties of ASA are not uniform between individuals and recurrent events in some patients may be caused by “ASA resistance” or ASA non-responsiveness. The elderly high vascular risk population has been poorly studied.

To measure platelet aggregation we use the PFA-100, a point-of-care platelet aggregometer that functions by aspirating a blood sample through a capillary tube at high shear rate, and through a small slit aperture. The time for a platelet plug to occlude the slit aperture, reported in seconds as closure time, is inversely related to platelet activity.

Rather than measuring platelet aggregation directly, another approach to quantify the activity of aspirin is to measure the levels of the products of COX-1 enzyme action. Reduced levels of these products would be expected as a result of ASA administration. ThromboxaneA2 (TXA2) is unsuitable for measurement since it is a highly unstable compound with a short half-life. TXA2 is rapidly hydrated to form the more stable TXB2 and converted to 11-hydro-TXB2 that can be detected in the urine and serves as an indirect measure of TXA2 activity in vivo.

The availability of these tests allowed us to identify ASA responsiveness in routine clinical practice in the elderly. The following figure shows the good correlation of the PFA-100 and the low TXB2 values. On the x-axis you see the PFA-100 closure times and on the y-axis the urinary concentration of TXB2.



Clopidogrel, another antiplatelet agent that, given alone or in addition to aspirin, is effective in reducing the composite end point of death from cardiovascular causes, nonfatal myocardial infarction or stroke in high risk patients. As for ASA, laboratory assays of platelet response to clopidogrel show a wide inter-individual variability with some patients also being classified as “non-responders” or “resistant to clopidogrel”. We studied in patients taking clopidogrel alone or in combination with ASA with the PFA-100, the TXB2 urinary excretion and the VASP analysis. VASP (Vasodilator Stimulated Phosphoprotein) is an intracellular protein which participates in the regulation of the dynamics of the platelet cytoskeleton and activation of GP IIb/IIIa. The phosphorylation/dephosphorylation properties of VASP have been utilised to evaluate the quality of the P2Y12 inhibition by clopidogrel by flow cytometry and appear to be a promising and reliable test of treatment efficacy using clopidogrel.

FNR 03/04/07

Cognitive Neuropsychology of Ageing in Schizophrenia

Centre Hospitalier de Luxembourg / Public Research Centre Santé

Contact(s): Anne-Marie Schuller, Public Research Centre Santé

Charles Pull, Centre Hospitalier de Luxembourg

E-mail: anne-marie.schuller@crp-sante.healthnet.lu, pull.charles@chl.lu

Starting Date – Closing Date: 1st October 2004 – 30th September 2007

FNR Contribution: €315,000

Ageing in schizophrenia has been a neglected topic in research. Changes in cognition and every day functioning occur with normal ageing in the population as a whole. This raises the question as to the status of cognitive and functional performances in individuals with a life long history of cognitive compromise.

Indeed, considering that patients with schizophrenia suffer from cognitive and functional deficits early in life, what would be the course over lifespan and what would be the level of functioning seen in patients after a lifetime of illness?

The aim of the present research is to study and specify the cognitive, functional and neuroanatomical impairments of ageing in schizophrenia. For this purpose, our research project is two folded: First, an extensive neuropsychological examination is measuring the cognitive performance including short and long term memory, executive functioning, language, attention, intelligence and global functioning. The second, neuro-imaging examination includes IRM and SPECT, and will furnish information about the metabolic and vascular state of the brain. The results will be compared to a control group of normally ageing persons, matched in age, gender and educational level to the patient group.

So far, several patients and control persons have participated in the study and passed the neuropsychological and neuroimaging assessment and the data collection is steadily progressing.

VIVRE Programme

Living Tomorrow in Luxembourg

Duration: 2002–2009

Total Budget: € 12,000,000

1st Call in 2002: 14 Projects Selected (€ 4,052,659)

2nd Call: Launched in October 2005. Deadline for Submission of Proposals: 15th March 2006

The VIVRE programme defines several thematic priorities within the social sciences and humanities in order better to understand the challenges that the Luxembourg nation and society will have to face:

- the evolution of the Luxembourg population, from a demographical, social, cultural and historical point of view,
- the development of human resources, the educational and training system,
- the era of information and communication and its consequences for society,
- the place of a small country like Luxembourg within the Greater Region, the European Union and a global world, with a specific focus on the perspectives of the Luxembourg financial market,
- the organisation of 'space', town and country planning.

On 16 December 2005, the Fund launched the 2nd call of the VIVRE Programme in the presence of 80 Luxembourg researchers and the media. The objectives of the 2nd call are among others the creation of new competences in the social sciences and humanities domain in Luxembourg and the development of international collaborations in order to guarantee the scientific quality of the projects. Additionally, the VIVRE programme aims to start or develop research on subjects that are of strategic importance for the country.

VIVRE Projects

Project Code	Title	Contact	Coordinating Institution(s)	Starting Date	Closing Date	Budget Estimates (€)
FNR/02/05/01	European Social Survey (ESS)	M. Borsenberger	CEPS/INSTEAD	01.01.2003	31.03.2005	440,000
FNR/02/05/04	History, Memory and Identities	M. Margue	University of Luxembourg	01.01.2003	30.04.2007	316,472
FNR/02/05/06	Linguistic Competences	F. Fehlen	University of Luxembourg	01.11.2003	31.12.2006	100,000
FNR/02/05/07	Impact of Psychological Factors on Socio-professional Integration	C. Houssemand	University of Luxembourg	01.01.2004	28.02.2007	310,000
FNR/02/05/09	The Luxembourg School System Tomorrow	R. Martin	University of Luxembourg	01.01.2004	28.02.2007	500,000
FNR/02/05/12	Multilingualism of children up to 9 years old	D. Portante	University of Luxembourg	01.05.2003	30.04.2006	260,000
FNR/02/05/14	Arts Therapies	L. Schiltz	CRP Santé	01.09.2004	31.08.2008	210,000
FNR/02/05/19	Living in the "Greater Region" of Luxembourg	F. Fehlen	University of Luxembourg	01.04.2003	31.08.2005	120,000
FNR/02/05/20	The Future of the Luxembourg Financial Market	A. Prüm	CRP Gabriel Lippmann	01.12.2003	30.09.2005	236,263
FNR/02/05/22	Key Areas for Biodiversity in Luxembourg	G. Colling	National Museum of Natural History	01.09.2003	31.08.2006	250,000
FNR/02/05/24	Cultural Heritage	F. Le Brun	National Museum of History and Art	01.04.2003	31.03.2009	390,000
FNR/02/05/25	CLIMAT: Climate Change and Change in Land Use in Luxembourg	L. Pfister	CRP Gabriel Lippmann	01.10.2003	30.06.2006	449,924
FNR/02/05/26	Socio-economic Databases Online (SEDO)	U. Warner	CEPS/INSTEAD	01.03.2003	31.08.2005	250,000
FNR/02/05/27	Bio-bibliographic Database of Luxembourg Authors	G. Goetzinger	National Centre for Literature	01.10.2003	31.10.2006	220,000
Total:	Available amount for VIVRE, according to the Convention with the Government: € 12,000,000					4,052,659

FNR 02/05/01

European Social Survey

CEPS/INSTEAD

Contact(s): Monique Borsenberger, CEPS/INSTEAD

E-mail: monique.borsenberger@ceps.lu

Project Website: www.ceps.lu/ess, www.europeansocialsurvey.org

Starting Date – Closing Date: 1st January 2003 – 31st March 2005

FNR Contribution: € 440,000

The European Social Survey (ESS) covers more than 20 nations. Its aim is to explain the interaction between Europe's changing institutions and the attitudes, beliefs and behaviour patterns of its diverse populations. It is funded via the European Commission's 5th and 6th Framework Programmes, the European Science Foundation and the FNR in Luxembourg.

In Luxembourg, the ESS was also conducted in the framework of the axe 6, point 6.2, of the FNR's VIVRE Programme titled La production de données et l'accès aux données et aux sources.

The two surveys in Luxembourg were realised by CEPS/INSTEAD with respect to the usual scientific criteria relevant in this type of survey. With an experience of more than twenty years in the fieldwork, it could mobilise an experimented staff in this field. The interviews were conducted by sworn interviewers who have a long experience in the field and have followed a specific training for the ESS.

More than 1,500 one-hour face-to-face interviews with persons aged 15 or more were realised for each survey. The first survey was realised between February and August 2004 and the answer rate was 43%. The second survey was realised between September 2004 and mid-January 2005 with an answer rate of 50%.

The questionnaire consisted of a 'core' module which remained relatively constant from wave to wave, plus two or three 'rotating' modules, repeated at intervals, each of which was devoted to a main topic or theme. The core module covered topics such as: Media, social trust, politics, well-being, socio-demographic profile. In 2003, the rotating modules covered citizenship, involvement and democracy, immigration. In 2004, they covered health and care seeking, economic morality, family work and wellbeing. Finally, a small supplementary questionnaire on human values was also administered. For each interview, the interviewers had to fill in a questionnaire about the conditions of the interview.

The original questionnaires were in English and were translated in Luxembourgish, German, French and Portuguese. Each interviewed person could choose between these five languages for the interview. In complement to these data, weekly reports had a look at the general context of the survey in terms of national and international events which happened during the survey time and could influence the answers. A report on the period between the two surveys, from August 2003 to August 2004, is also available.

All documents and results for the participating countries are online (<http://www.europeansocialsurvey.org>). The first results of the survey for Luxembourg are accessible on the Internet on the CEPS home page (<http://www.ceps.lu>).

Finally, on 2 December 2005, the European Social Survey received the Descartes Prize for Research & Science Communication in social sciences from the European Commission.

History, Memory and Identities

University of Luxembourg

Contact(s): Michel Margue, Department of History, University of Luxembourg

E-mail: michel.margue@uni.lu

Project Website: www.cu.lu/ldm

Starting Date – Closing Date: 1st January 2003 – 30th April 2007

FNR Contribution: €316,472

The objective of the present research project is to examine how the reactivation of history through memory contributes to the formation of collective identities. Particular emphasis is put on identity constructions commonly referred to as “national identity”. The project offers thus a re-reading of so-called “national” history, based on an analysis of memory construction.

As 2003 served to refine concepts and the general approach, 2005 was the second year of actual research. Three lines of work were pursued simultaneously: research work in itself; cooperation with external researchers on a national and international level; visualisation of research results.



Stamps constitute an important memory vector, ensuring a much more important visibility of a particular theme (i.e. memory of the victims of WW II) than monuments are able to.



This pamphlet disseminated clandestinely during the Second World War shows the close association of Grand-Duchess Charlotte and Virgin Mary.

The research team managed to finalise the bulk of studies on individual lieux de mémoire, as planned. Moreover, conclusions were tested regarding (1) the role of historiography; (2) idiosyncrasies of Luxembourg memory culture; (3) comparisons with the formation of collective memories in other countries and (4) methodological procedures.

The series of interdisciplinary workshops continued with a workshop on memory in cognitive psychology, historical psychoanalysis, literature and languages. The project has played an important role in the organisation of the First Symposium on Luxembourg Historiography at the University of Luxembourg. Contributions made at international colloquia and seminars enabled us to confront our own approach with that of other research units working in the same field (ESF – “Writing National History”; University of Gießen – SFB “Erinnerungskulturen”; University of Vienna – “Orte des Gedächtnisses”; Kulturhistorisches Institut Essen – “Tradierung des Geschichtsbewußtseins”; European Academy, Berlin – “Working Group and Network on Nations, Borders, Identities”). The project will be presenting a session at the Sixth ESSH Conference in Amsterdam in March 2006 and an international colloquium is set to take place in Luxembourg in November 2006.

In Luxembourg, the project is providing the concept for the Museum on the fortress, history and national identities, directed by the SSMN. A first draft has been handed in and has received a positive evaluation. Moreover, the collaboration of about thirty authors has been obtained for a first publication *Lieux de mémoire au Luxembourg* to be published end 2006. The research team also contributes to a publication on Luxembourg traditions (CNA). In addition, a public appeal led to the collection of a series of memory vectors from the private sphere.

In 2005, the research project ran smoothly along and has gained increasing respect among its peers. Within the Faculty it constitutes one of the driving forces of academic research.

Linguistic Competences

University of Luxembourg

Contact(s): Fernand Fehlen, Interdisciplinary Research Unit on Luxembourg, University of Luxembourg

E-mail: fernand.fehlen@uni.lu

Starting Date – Closing Date: 1st November 2003 – 31st December 2006

FNR Contribution: €100,000

The present research project consists in a socio-linguistic study describing the multilingual reality of Luxembourg and highlighting the evolutions of the last six years.

Some themes:

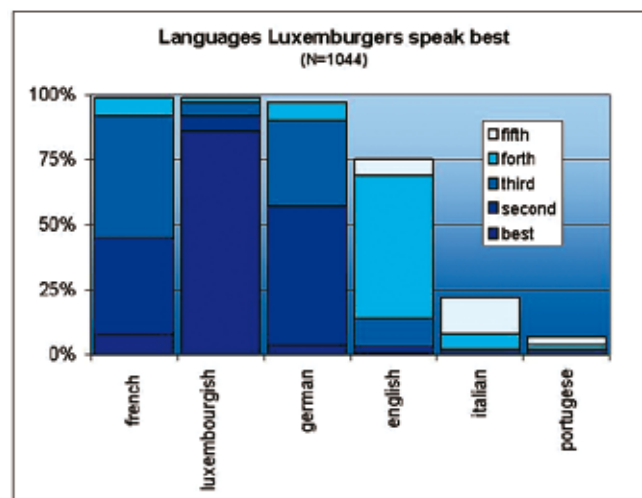
- What is the relative importance of the three usual languages of the country and of the other languages present in Luxembourg's society (mother tongue of immigrants, English, etc.)?
- Which language is used for which purpose (type of situation)?
- What is the function and status of the language used?
- What is the influence of the geographic variations of Luxembourgish?

Other questions concern language learning and the identity functions of languages.

A particular attention is given to the description of the context of linguistic diversity in which children under 10 evolve.

A survey of a sample of 1,800 persons, with an overrepresentation of parents with children between 3 and 9 was undertaken. This allowed the FNR project FNR/02/05/12 (Multilingualism in children up to 9 years old) to use the survey as a quantitative background for its qualitative findings.

Field work was done by ILReS at the end of 2004. In the course of 2005, first analyses, relying on cross tables, were presented at three conferences. They were also disseminated to other researchers, for instance to those working on the FNR projects Multilingualism of Children up to 9 Years Old and History, Memory and Identities. Final results should be published in the fall of 2006.



source: BaleineBis

FNR 02/05/07

Impact of Psychological Factors on Socio-professional Integration and their Interaction with Social and Economic Domains

University of Luxembourg

Contact(s): Claude Houssemand, Faculty of Language and Literature, Humanities, Arts and Education, University of Luxembourg

E-mail: claudе.houssemand@uni.lu

Project Website: http://wwwfr.uni.lu/research/flshase/psycho/dimension_psycho,
<http://www.emacs.lu/projects/chom>

Starting Date – Closing Date: 1st January 2004 – 28 February 2007

FNR Contribution: € 310,000

Refereed Scientific Publications:

Meyers, R., Houssemand, C. (in press). Comment évaluer les compétences clés dans le domaine professionnel?

Revue Européenne de Psychologie Appliquée.

The aim of the project is to study the impact of psychological factors on employment and re-employment, and to relate them to social and economic contexts. A cohort of newly unemployed persons is being followed from their initial registration with the public Employment Administration. A number of psychological, social and socio-economic dimensions are measured and analysed. The project has two different aims: (1) to find out what the main characteristics of unemployed people in Luxembourg are, that could predict the duration of unemployment (profiling), and (2) to study the impact of the duration of unemployment on the well-being and job-search behaviour of the unemployed. In 2004, the international literature on unemployment and employability was screened to find the main variables that could be used for investigating the two research objectives (see Working Paper n°1). In 2005, these main variables were put into questionnaire form (see Working Paper n°2), some questions were constructed, others (mainly psychological scale measures) were taken over, and if necessary translated, from published literature. The entire questionnaire was put into a user-friendly computer-based version that was first tested with a group of undergraduate students, then with a group of unemployed people at the Employment Agency of Luxembourg. After minor improvements, the computer-based questionnaire was then completed by a first group of 300 newly unemployed people at the Agencies of Luxembourg and Esch-Alzette. The data collecting will continue at the beginning of 2006 to increase the cohort number. A first analysis of the data has shown that people gave coherent answers and that the complete tool has good psychometric qualities in terms of internal consistency and construct validity (see Working Paper n°3). In 2006, all the collected data will be correlated with the main dependent variable i.e. the duration of unemployment of the cohort subjects.

The Place of School in Luxembourg Society of Tomorrow

University of Luxembourg

Contact(s): Romain Martin, EMACS Research Unit, Faculty of Language and Literature, Humanities, Arts and Education, University of Luxembourg

E-mail: romain.martin@uni.lu

Project Website: <http://www.ecolededemain.lu>

Starting Date – Closing Date: 1st January 2004 –28th February 2007

FNR Contribution: € 500,000

The main objective of the “School of Tomorrow research” is the elaboration of scenarios for the development of the Luxembourg school system. These prospective scenarios should be scientifically founded and provide an empirical basis that would allow to foresee the difficulties and obstacles of their realisation. The elaboration of structural scenarios of development adapted to the specific situation of the Luxembourg school is based on scientifically founded experiments that were carried out in other countries as well as on an accumulation of quantitative and qualitative data, collected from the key stakeholders of the Luxembourg school system. The research team pursues three particular objectives: (1) to better understand the current state of the education system by exploiting different types of existing information (international and national research reports on the one hand and databases on the other hand), (2) to undertake an in-depth study among the parents and pupils on the relation that they have with education and the school institution and, finally, (3) to write, starting from a comparative study of the school reforms carried out in the countries of reference, a document proposing a series of concrete measures likely to bring the Luxembourg education system towards more efficiency and equity and to present this document for discussion to the various stakeholders of the education system (this was realised in 2005 with a focus group methodology specifically adapted to the needs of the project). The research team is presently writing articles on the current functioning of the Luxembourg school system (objective 1), preparing the study on parents that will be conducted in March 2006 (objective 2) and analysing the corpus from the focus groups carried out in 2005 (objective 3).



Members of the project team in the setting used for the recording of focus group discussions

FNR 02/05/12

Multilingualism of Children up to 9 Years Old: Language Diversity, Learning Luxembourgish and Emergent Literacies

University of Luxembourg

Contact(s): Dominique Portante, LCMI Research Unit, Faculty of Language and Literature, Humanities, Arts and Education, University of Luxembourg

E-mail: dominique.portante@uni.lu

Project Website: <http://uni.lcmi.lu>

Starting Date – Closing Date: 1st May 2003 – 30th April 2006

FNR Contribution: € 260,000

Refereed Scientific Publications:

Portante, D. (2004). Developing initial multilingual literacy in a complex setting: Some principles suggested to build a cross-National Research Agenda. Reading Online, International Reading Association:
<http://www.readingonline.org/international/edinburgh>

The aim of the research project is to investigate how children's diverse linguistic and cultural capital is used as a resource for language and literacy learning in preschool and during the first 3 years in primary school. The project is anchored in socio-cultural theories and uses mainly qualitative methods of data gathering and analysis. The data consists of videotaped language and literacy activities in the classroom, as well as teacher and parent interviews about practices of language usage and learning in the classroom and in the family contexts. The project also participates in a national survey on children's language use, as part of the Baleine2 project. The first video observations took place in the first half of 2004 in classes of early years education (3-year olds), preschool (5-year olds) and in year 2 of primary school (7-year olds). The classes that participated were located in five different schools. During the academic year 2004–2005, focus children of each group were followed through to their next school class, where video observation was continued. In 2005 an important part of the research efforts was directed towards the development of the theoretical and interpretative framework for data analysis. Several presentations were given at international conferences. The database that is used for data storage and management was further developed. A second round of teacher interviews was conducted and the first data of the national survey, mainly frequency tables, was made available to the research team. The tentative findings presented in 2004 were confirmed in 2005: the linguistic and cultural diversity that was documented by the project data can work as a true resource for learning. It permits to enrich the language practices in the classroom in drawing on the complex backgrounds of all children. The diverse resources children bring to school expand the opportunities for participation and hence for the learning of all children. However, this resource remains often untapped. Furthermore, observations and analyses in 2005 brought out the tensions between learning objectives and school practices, between the resources that are legitimated by the school context and those that are being used by the children in informal and out-of-school contexts, as well as tensions that arise from the discontinuity between different settings of instruction (early years, preschool, primary school grades).

Application of Arts Therapies to some Crucial Problems of our Society

Public Research Centre Santé

Contact(s): Lony Schiltz, Department of Neurosciences, Public Research Centre Santé

Email: lony.schiltz@education.lu

Partner(s): Centre Hospitalier de Luxembourg, University of Luxembourg

Starting Date – Closing Date: 1st September 2004 – 31st August 2008

FNR Contribution: € 210,000

Refereed Scientific Publications:

Schiltz L. (2004). Motivation de performance, destinée scolaire et mécanismes d'ajustement. Quelques implications d'une étude longitudinale comparée. *Neuropsychiatrie de l'enfance et de l'adolescence*, 72, 2, 70–77.

Schiltz L. (2004). Le blocage cognitif, émotionnel et motivationnel des élèves surdoués en situation d'échec scolaire grave. Résultats d'études cliniques et expérimentales sur la résignation apprise. *La Revue française de Psychiatrie et de Psychologie médicale*.VII, 79, 39–44.

Schiltz L. (2005). La créativité entravée. Données cliniques et expérimentales sur les élèves surdoués en situation d'échec scolaire. *La Revue de Musicothérapie*, XXV, 1, 81–89.

Schiltz L. (2005). Dysfonctionnements cognitifs liés aux pathologies limites à l'adolescence. Etude comparée de quelques tests projectifs. *Neuropsychiatrie de l'Enfance et de l'Adolescence*. 53, 3; 107–113.

The aim of the project consists in studying the cognitive, emotional and motivational disturbances linked to different kinds of developmental or clinical problems (highly gifted underachievers, elderly people confronted to the crisis of third age or suffering from different degrees of dementia, adult psychiatric patients) and in evaluating the efficiency of arts therapies in these realms. The theoretical and methodological part of the study was finished in August 2005. In our first report we presented a survey of literature, integrating the data of developmental psychology clinical psychology, health psychology, psychiatry and neurobiology, and personal prior research results. With the help of these analyses we drew out the structural, cognitive and behavioural variables to be included in a pre-test / post-test design. At the same time the mathematical background of some non parametrical statistical procedures for small samples respectively non metrical data (especially the interaction structure analysis, the partial least squares methods and the dynamic factor analysis) was investigated and the suitability of these procedures for our project was tested. The second stage of the research project is focused on the application of arts therapies in the different institutions, schools and hospitals participating in the project. The pre-test session is currently being launched.

A first seminar on research methodology was held in June 2005 and a second one will take place on 11 March 2006.

Living in the “Greater Region” of Luxembourg

University of Luxembourg

Contact(s): Fernand Fehlen, Interdisciplinary Research Unit on Luxembourg, University of Luxembourg

E-mail: fernand.fehlen@uni.lu

Project Website: <http://www.cu.lu/stade/projets.html#GRANDEREGION>

Partner(s): Fondation Forum Europa

Starting Date – Closing Date: 1st April 2003 – 31st August 2005

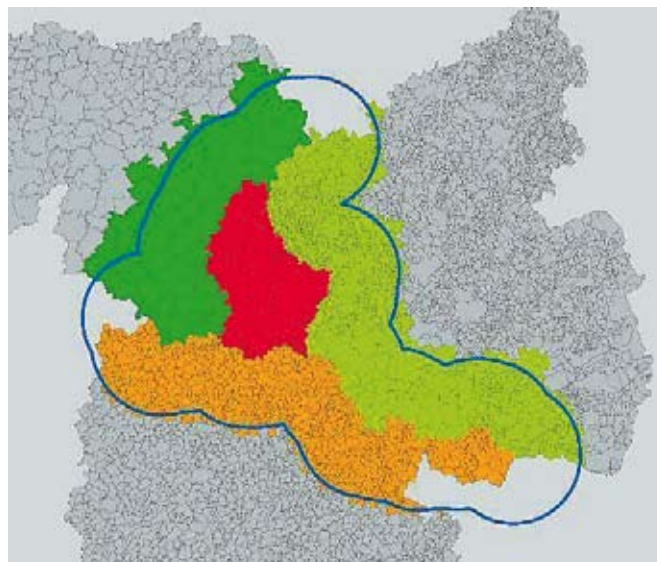
FNR Contribution: € 120,000

In the course of 2004, an opinion survey of some 2,500 inhabitants of the zones that constitute the territory of the Great Region (Luxembourg, the French-speaking Community and Walloon region of Belgium, the Lorraine region of France, and Germany’s Saarland and Rheinland-Pfalz) was carried out. If the concept of the Great Region somehow makes sense for people who are directly involved in its trans-border labour market, do other populations know what is at stake and in general can we find traces of a common identity for the Great region?

This quantitative analysis allowed for an evaluation of the quantity and quality of trans-border relations, but also shed light on the limits, prejudice and clichés in the minds of the citizens of the Great Region.

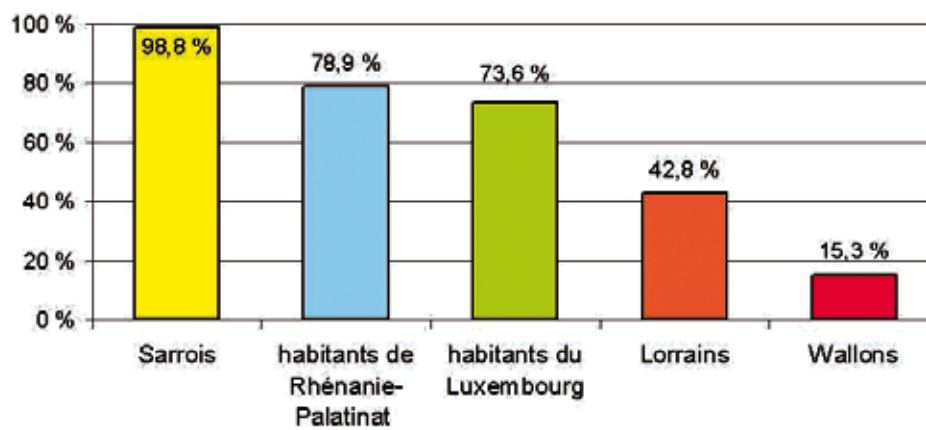
A second, qualitative, study was undertaken in 2005: 22 experts of trans-border cooperation and key actors (political personnel, civil servants, managers, trade unionists, researchers, representatives of the civil society) of the Great Region were asked to react to the results of the opinion survey.

The research report was written in 2005 and will be published in 2006.



The five survey regions at the inner borders of the “Grande-Région”

People having heard someone speaking about the "Grande Région" or "SarLorLux"?



FNR 02/05/20

The Future of the Luxembourg Financial Market

Public Research Centre Gabriel Lippmann

Contact(s): André Prüm, Faculty of Law, Economics and Finance, University of Luxembourg

E-mail: andre.prum@uni.lu

Project Website: under construction (formerly available from www.lippmann.lu)

Starting Date – Closing Date: 1st December 2003 – 30th September 2005

FNR Contribution: €236,263

Refereed Scientific Publications:

Trust & Fiducie, La Convention de la Haye et la Nouvelle Législation luxembourgeoise, sous la direction d'André Prüm et de Claude Witz, éd. Montchrestien, collection Grands Colloques, Paris, 2005, 274 pages

Jean-Jacques DAIGRE, De la directive de 1993 à celle de 2004, d'un modèle à un autre, Dossier sur la Directive européenne sur le marché des instruments financiers, Revue Banque, 2005, n° 102, p. 7

Estelle NAUDIN, Le silence du client à la réception des relevés de compte, Recueil Dalloz, 2005, p. 579

André PRÜM, La CJCE admet l'irresponsabilité des autorités de contrôle des banques vis-à-vis des déposants, Revue de Droit bancaire et Financier, 2005, n° 1

André PRÜM, De nouvelles opportunités pour les fusions transeuropéennes de banques, Revue de Droit bancaire et Financier, mai – juin 2005, p. 3

André PRÜM, De nouvelles orientations pour la politique européenne en matière de services financiers, Revue de Droit bancaire et Financier, septembre – octobre 2005, p. 3

André PRÜM, La dématérialisation indirecte des valeurs mobilières en droit Luxembourgeois, in 20 ans de dématérialisation des titres en France: bilan et perspectives nationales et internationales, sous la direction de Hubert de Vauplane, Revue Banque éditeur, 2005

André PRÜM, Thierry REVET and Claude WITZ, La ratification de la Convention de la Haye sur le trust par le Grand-Duché du Luxembourg in Trust & Fiducie, La convention de la Haye et la nouvelle législation du Grand-Duché, Montchrestien, collection Grands Colloques, 2005, sous la direction scientifique d'André Prüm et de Claude Witz

André PRÜM and Claude WITZ, La nouvelle fiducie luxembourgeoise in Trust & Fiducie, La convention de la Haye et la nouvelle législation du Grand-Duché, Montchrestien, collection Grands Colloques, 2005, sous la direction scientifique d'André Prüm et de Claude Witz

Michel TISON, Do not attack the watchdog! Banking supervisor's liability after Peter Paul, Common Market Law Review, 2005

Luc THEVENOZ, Du Dépôt collectif des valeurs mobilières aux titres intermédiés, un saut épistémologique, in Wirtschaftsrecht zu Beginn des 21. Jahrhunderts, Stämpfli, Bern 2005, p. 681

Luc THEVENOZ, New Legal Concepts regarding the Holding of Investment Securities for a Civil Law Jurisdiction, Uniform Law Review, 2005 – 1–2 p. 301

Claude WITZ and André PRÜM, L'essor de la fiducie hors de l'hexagone: les récentes réformes luxembourgeoise et libanaise, in Mélanges en l'honneur de Dominique Schmidt, Ed. Joly, 2005

The research project focused on the legal and economic environment of the Luxembourg financial sector. Its overall aim was to get a better understanding of this environment and the competitive advantages that have lead so far to the development of the banking and funds industries. Furthermore, the project answered to evaluate the perspectives of this industry taking into account the process of integration of financial markets at the European level as well as the internationalisation of the activities and the concentration of its actors.

After a consultation with the Luxembourg authorities and representatives of the banking and fund industry, several subjects were examined under this perspective such as the concept of negotiable instruments and possible solutions of scripturalisation, the listing of atypical instruments at the Stock Exchange, the development of alternative markets and trading platforms, the impacts of the future implementation of the Financial markets directive, the role and function of management companies in the fund industry, the diversity of investment vehicles.

The latitude for a competitive attitude from the Luxembourg legislator and supervising authorities was our core concern on these topics.

Key Areas for Biodiversity in Luxembourg

National Museum of Natural History

Contact(s): Guy Colling, Biology of Populations, National Museum of Natural History

E-mail: gcolling@mnhn.lu

Starting Date – Closing Date: 1st September 2003 – 31st August 2006

FNR Contribution: € 250,000

The general aims of the project are:

- the analysis of historical land use changes for documentation and modelling future developments (landscape fragmentation, built area, agricultural field regrouping), and
- the definition of key areas for biodiversity in Luxembourg.

In 2005 we continued our work on historical land use changes. We acquired scanned topographic maps (1954, 1964, 1979) and hardcopies of historical aerial photographs from the Administration de la topographie et du cadastre. After scanning the aerial photographs both were geo-referenced and assembled to the national grid system. The time-demanding work of digitising and backdating these documents is still in progress.

The data on the actual landscape fragmentation was completed by the analyses of historical fragmentation changes. We calculated for example an index for landscape fragmentation changes between 1954 and 2002 considering the main streets (Fig. 1). The figure shows an important (and still ongoing) increase of fragmentation, mainly in the southern Gutland (Fig. 2).

We also started backdating the development of urbanised areas (example in Fig. 3) and compared rural landscapes before and after land consolidation.

The analysis of existing data showed that it is difficult to delimit key areas for biodiversity because of the different geographical precisions of historical species occurrences and the different typologies of the land use maps.

Due to the different data qualities in the existing datasets, we decided to build an information system that allows attributing to the different data values for their contribution to the biodiversity. We started to build up relationships and statistic evaluations for the different types of information. The choice of the study species was done with the help of the existing red lists and the lists of protected species on the national and international level.

We also made a test with the species occurrence data recorded during the land use cartography of 1989. For three communes, we entered the list of observed species and built the relation to the cartographic elements. We started to build a database (MSAccess) to create different relationships between the maps and the field observations of species stored in the database Recorder 6 hosted at the Luxembourg National Museum of Natural History. The Access database will also store statistical values and descriptions of the habitats and species.

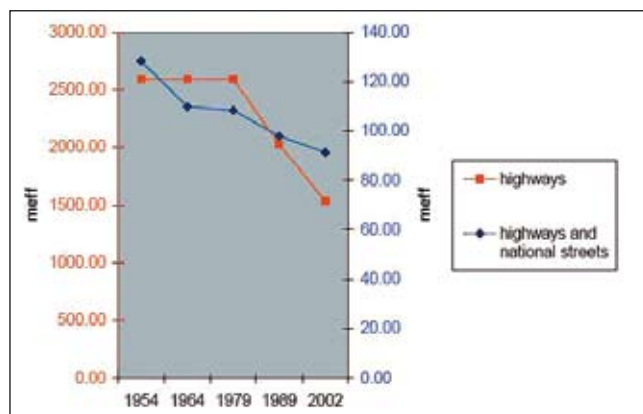


Figure 1: Historical changes in landscape fragmentation (measured with the index effective Maschenweite, Jaeger 2002)

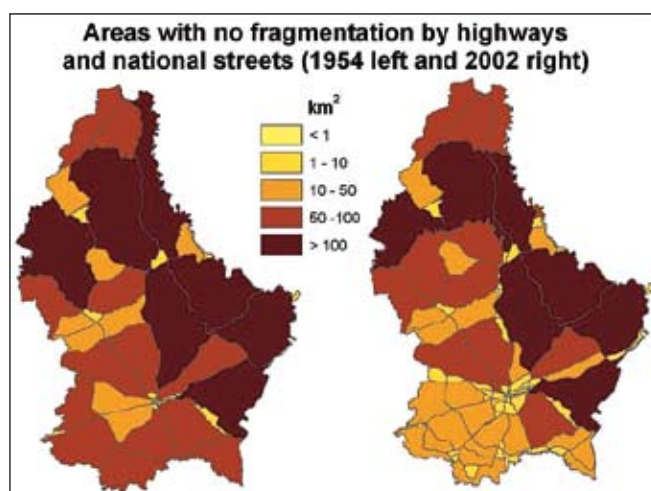


Figure 2: Comparison of landscape fragmentation by main streets (1954 left and 2002 right)

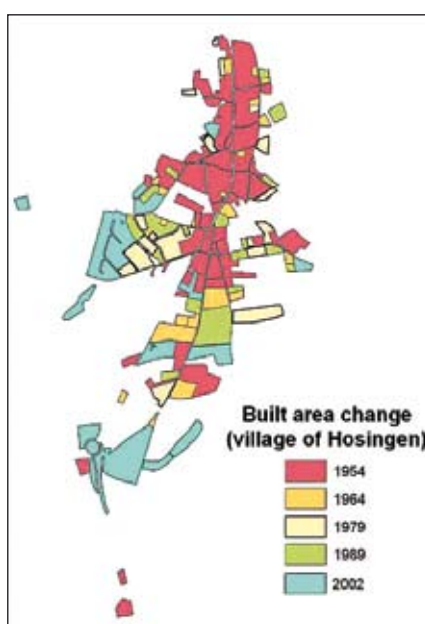


Figure 3: Evolution of the urbanized area in the village of Hosingen

Cultural Heritage

National Museum of History and Art

Contact(s): Foni Le Brun-Ricalens, Department of Prehistory, National Museum of History and Art

E-mail: fo니.le-brun@mnha.etat.lu

Project Website: http://www.ulg.ac.be/archgrec/EPC/CVEPC_Base.htm (under construction)

Starting Date – Closing Date: 1st April 2003 – 31st March 2009

FNR Contribution: € 390,000

The aim of the “Cultural Heritage” project is to develop a computer-aided decision-making tool for use by government ministries, public works contractors (local authorities and administrations), building contractors, planning offices and private individuals for the maintenance of a cultural heritage-oriented Geographic Information System. Existing and potential archaeological site locations may therefore be taken into consideration during the planning and research stages of construction work.

Following the first two stages, activities that were conducted in 2005 involved the completion of the main modules of the meta-database structure and the testing of the initial versions of the information system.

In the meantime, discussions with other leading institutes in the field of national heritage services were organised and highlighted the need to develop interoperable or compatible solutions for the management of national ‘heritage’ resources.

The tests of the current database version as well as the conclusions of the discussions highlighted the need to improve the interoperability of the system with other national data sources, not only from the geo-administrative point of view (national administrations), but also in terms of interconnection between the ‘research’ databases and data sources of Heritage-oriented research centres (MNHN, CRP Gabriel Lippmann, AEF).

At the same time, the current version of the map server developed by the MNHA was made operational. During the most recent project phase, two of the project’s major objectives were further pursued: firstly, the development of the database and secondly the development of the web-mapping interface.

The web mapping application’s map data processing and display code was greatly improved. There is now a logical and optical distinction between the web mapping system’s thematic layers and the layers’ captions. The interface used to interact with the map was also improved in order to be more flexible in meeting user needs.

An analysis of the development of the database structure and of data suitable for the EPC system revealed that the use of a highly developed and standardised database structure was necessary. The task of creating such a structure would be enormous and it became evident that the development of such a structure would not be possible within the scope of the project. The database “recorder” used by our cooperation partner MNHN (National Museum of Natural History) was introduced into the project as a possible solution to achieve our objectives. It is a highly scalable and flexible database system which is very effective in meeting our needs and requires only minor modification in some areas which have already been discussed with the designer of the database.

CLIMAT: Climate Change and Change in Land Use in Luxembourg

Public Research Centre Gabriel Lippmann

Contact(s): Laurent Pfister, Department Environment and Agro-biotechnologies (EVA),

Public Research Centre Gabriel Lippmann

E-mail: pfister@lippmann.lu

Partner(s): Department of Geography, University of Luxembourg

Starting Date – Closing Date: 1st October 2003 – 30th June 2006

FNR Contribution: € 449,924

Refereed Scientific Publications:

DROGUE G., HOFFMANN L., MATGEN P., PFISTER L. & LEVIANDIER T.

Trajectoire climatique et réponse hydrologique à l'horizon 2050: l'exemple de deux cours d'eau luxembourgeois.

In C. Ries (éd.), Contribution à la climatologie du Luxembourg. Analyses historiques, scénarios futurs.

Ferrantia 43:101–138, 2005.

DROGUE G., HOFFMANN L. & PFISTER L. Les archives climatiques quantitatives de Luxembourg-ville:

analyse primaire des longues séries chronologiques (1838–2003). In C. Ries (éd.), Contribution à la climatologie

du Luxembourg. Analyses historiques, scénarios futurs.

Ferrantia 43: 21–84, 2005.

DROGUE G., HOFFMANN L., PFISTER L. & PAUL P. Les températures extrêmes de l'année 2003

dans le Nord-Est français et ses bordures luxembourgeoise et

allemande. Revue de Géographie de l'Est 45: 79–98, 2005.

DROGUE G., MESTRE O., IFFLY J.F., HOFFMANN L. & PFISTER L.

Recent warming in a small region with semi-oceanic climate, 1949–1998: what is the ground truth?

Theoretical and Applied Climatology 81: 1–10, 2005.

PFISTER L., DROGUE G., POIRIER C. & HOFFMANN L. Spatial variability of trends in hydrological extremes

induced by orographically enhanced rainfall events due to westerly atmospheric circulations.

Water Science and Technology 51: 15–22, 2005.

PFISTER L., DROGUE G., POIRIER C. & HOFFMANN L.

Evolution du climat et répercussions sur le fonctionnement des hydrosystèmes

au Grand-Duché de Luxembourg au cours des 150 dernières années.

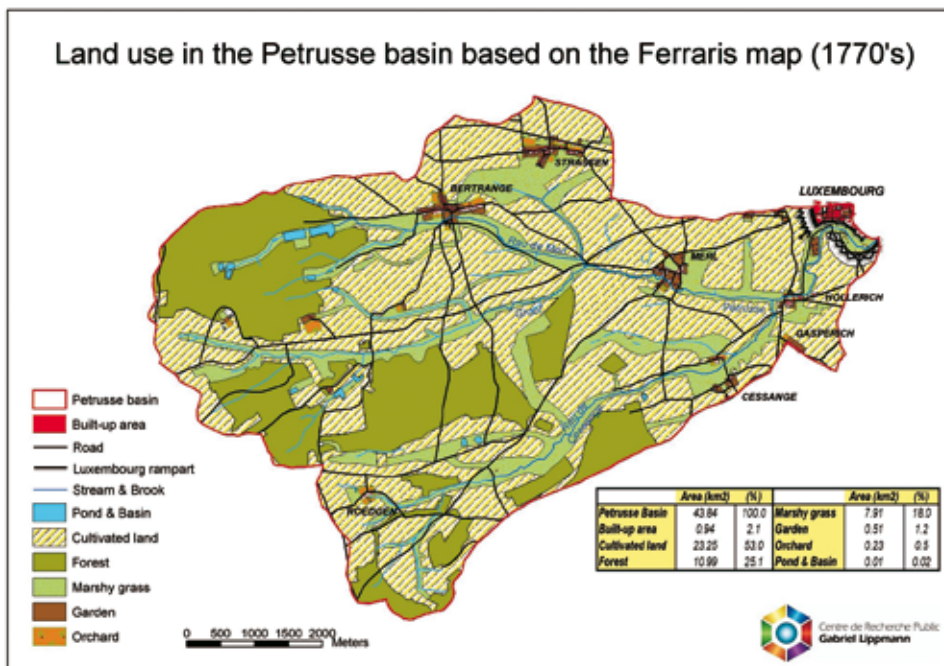
In C. Ries (éd.), Contribution à la climatologie du Luxembourg. Analyses historiques, scénarios futurs.

Ferrantia 43: 85–100, 2005.

Detecting the influence of land use change and climate change on the runoff behaviour of the River Alzette demands for a good investigation on the relevance of both changes. For both factors of impact, historical data, some going back for over a century, as well as future scenarios are investigated. To evaluate this data in comparison with the runoff behaviour of the area, distributed hydrological models are built, which simulate the influence of both factors on the runoff processes at small scales (approximately 200 m × 200 m, depending on the size of the investigated basin). The model output at basin scale is verified through comparison with runoff data of some well-measured basins, to create a reliable representation of the real runoff processes. Several basins as well as flood plains are chosen, which reflect the variability of land use change in the area of interest, to be

able to compare the individual impacts of both land use and climate changes. Then, these models are going to be applied on the past and on future scenarios, with the aim to evaluate to what significance level the land use and climate changes influence the runoff behaviour. Extra focus is set on the flood plain between Luxembourg and Mersch, to evaluate the possible consequences of the changing environment on the risk of flooding.

Until now, the major set-ups of the models for the chosen basins are finished and the verification procedure on present data series has started. A verified hydraulic model is available within the mentioned flood plain for simulating past and future water levels, using the predicted discharge of the hydrological model. The historical land use data is substracted from ancient maps and future climate scenarios are downscaled to this particular area. Due to the long calculation time of the model, the model optimisation procedure will take several months.



Socio-Economic Databases Online (SEDO)

CEPS/INSTEAD

Contact(s): Uwe Warner, CEPS/INSTEAD

E-mail: sedo@ceps.lu

Project Website: <http://sedo.ceps.lu>

Partner(s): Public Research Centre Gabriel Lippmann

Starting Date – Closing Date: 1st March 2003 – 31st August 2005

FNR Contribution: € 250,000

Refereed Scientific Publications:

T. Tamisier, F. Feltz. Socio-Economic Database Online, DataScience Journal, vol. 4, 2005, ISSN 1683-1470.

SEDO combines rapid access to statistical indicators and to tables. A higher degree of freedom to users is achieved by the independence of SEDO from any statistical software. The data source of SEDO is the Luxembourg socio-economic household panel study (Panel Socio-Economique Liewen zu Lëtzebuerg) that was carried out by CEPS/INSTEAD among 3,000 households during 1995 and 2001. This database covers the income situation and the economic well-being of households and their members in Luxembourg.

In 2005, SEDO implemented three different ways of access to the database: (1) A free access for everybody to statistical tables and graphs by various years and themes of the study. (2) An access on demand using a login user and password that allows registered users to explore the entire database of SEDO without having installed statistical software on their own computers. (3) And finally, an access to registered users trained in statistical analysis to download the SEDO database to maintain individual and sophisticated statistical procedures and research on the Luxembourg socio-economic household panel study.

SEDO [Socio-Economic Database Online]

Une plateforme flexible
Une plateforme performante

■ une zone grand public ■

Des tableaux statistiques

■ une zone privée ■

Projet d'avoir accès à Internet en 2002 (après le 1er avril 2002)

SEDO	Fréquence	Percent	Cumulées	Cumulées		
	Fréquence	Percent	Fréquence	Percent		
Ind	9726,7	54,94	9726,7	54,94	N	2001
Res	8202,16	45,06	18228,86	100,00		

Fréquence Missing = 10586,3791

Connexion à Internet par modem analogique

Connexion à Internet par RNIS ou ISDN

La liberté d'exploitation des données socio-économiques

SEDO makes available an internet-based discussion forum that allows all users to exchange their experience and to communicate with the principal investigators of PSELL and the research community on socio-economic issues.

From the technical point of view, the final version of an advanced prototype for the SEDO Navigator was completed in the first half of 2005. The prototype provides a customised architecture that ensures the independence and stability of the three basic components of the system: the longitudinal databases, the calculation module, and the result browser. This embodiment has been put into practice by successfully combining different computing and statistical techniques. The presentation of these technical works conducted for the SEDO Project was accepted for publication in the DataScience Journal, a periodical of the International Codata Organisation.

Additional developments were accomplished for the content and functional enrichment of the architecture, such as a toolbox to add online comments or help, an intuitive search-engine for the public at large, and an automatic detection of the actual sampling size of the results.

The technological transfer of the know-how from the CRP Gabriel Lippmann to the developers at the CEPS/INSTEAD towards the effective product installation has then started end of June 2005.

Since the fall of 2005, SEDO has been functioning and can be accessed at <http://sedo.ceps.lu>.

Biobibliographic Database of Luxembourg Authors

National Centre for Literature

Contact(s): Germaine Goetzinger, National Centre for Literature

E-mail: germaine.goetzinger@cnl.etat.lu

Project Website: <http://www.cnl.public.lu>

Partner(s): University of Luxembourg

Starting Date – Closing Date: 1st October 2003 – 31st October 2006

FNR Contribution: € 220,000

Refereed Scientific Publications:

GOETZINGER, Germaine: Spiegelsplitter unter dem Kastanienbaum. Aufbruch und Selbstvergewisserung im Werk Roger Manderscheids. In: Forum für Politik, Gesellschaft und Kultur 247/248 (2005), S. 62–64.

GOETZINGER, Germaine: Winnie Pooh's Signale von einem fremden Planeten. Laudatio auf Claudine Muno, Preisträgerin der IKB. In: *récré* 21 (2005), S. 142–148.

MANNES, Gast: 'Dada, incendiaire et assassin' ou Comment passer de l' 'Action' par la 'Clarté' au 'Zénit' Pol Michels, un parcours intellectuel européen du temps des avant-gardes historiques (1916–1922). Dans: *Pensée de l'expérience, travail de l'expérimentation au sein des surréalistes et des avant-gardes en Europe. Textes réunis par Jacqueline Chénieux-Gendron et Myriam Bloedé.* Louvain: Paris: Peeters 2005, p. 211–236.

MARSON, Pierre: Von der Sauer bis an den Nil, vom Pfaffenthal in die Türkei. Bilder des islamischen Orients in der luxemburgischen Literatur des 19. und frühen 20. Jahrhunderts.

In: *Les Cahiers luxembourgeois* 52 (2005), S. 41–64.

WILHELM, Frank: Tullio Forgiarini, créateur du polar francophone grand-ducal.

Dans: *Francophonie vivante* 2 (2005), p. 67–80.

WILHELM, Frank: Guy Rewenig ou la Muse Indignation. Éloge d'un écrivain en colère.

Dans: *Prix Batty Weber Guy Rewenig. Prix national de littérature 2005, Luxembourg, MCESR, 2005, p. [3–25]*

As no complete, reliable and up-to-date information sources were available, our project had to start its analysis of the literary expression in Luxembourg with the creation of a bio-bibliographical database of Luxembourg's authors. We had to establish both a list of authors, for whom a thorough research had to be done, and a grid for a standardised and therefore comparable collection of the biographical, archival, bibliographical and iconographic data resulting from this research. Furthermore, characteristic aspects of Luxembourg's culture and literary life had to be taken into account: several languages existing side by side, literary creation in a small society confronted with major neighbouring cultures, biographical similarities or disparities in typical itinerary, a slowly growing professionalism among writers. This database has to be seen as the starting point/working basis for a dictionary of Luxembourg authors, to be published as a book and on-line resource, and for a literary history of the Grand-Duchy. Reflecting on literature is one element of the indispensable and growing social awareness in an ever more diversified and multi-cultural surrounding.

The list of authors to be checked grew from some 800 names initially to more than 2,900: two thirds will not be retained in the dictionary, as they do not qualify as literary writers, they had only published in newspapers, had no obvious link with Luxembourg or were born before 1815. Of the remaining 827, 74.73% are accepted, and the information collection phase is nearly finished. The next step will be to streamline the data for publication.

While processing the information, interesting and unexpected parallels and cross-references appeared, creating new knowledge on famous and well-known, but also on unknown or forgotten writers from two centuries. To handle the often unprocessed raw material, indexes and repertories had to be created, while contacts with communal administrations allowed the confirmation of biographical data, which did not always appear correctly in other books. Our research among authors, their family or their heirs brought new material to the archives of the CNL on Hary Reiter, Milly Thill (complete works), Margret Steckel, Emely Arnoldy, Alphonse Arend, Nic Pletschette, Jean-Paul Jacobs or Claudine Muno

TRASU Programme

Surface Treatment

Duration: 2003–2009

Total Budget: € 6,000,000

1st Call in 2003: 1 Project

Research into the field of surface treatment is becoming more and more important for many industries in Luxembourg so that new materials can be developed and existing products improved. The research relates to the development of new types of treatment in order to improve the properties sought, such as adhesion, wear, hardness and better environmental protection. The research programme also includes characterisation of the surfaces before and after treatment in order to gain a better understanding of the mechanisms at atomic and molecular level, for example.

Because the field of surface treatment is extremely broad and the methods used very varied, each research project will have to involve the participation of a Luxembourg industrial partner.

Generally speaking, the actors are aware of the future scope of activities in the field and have a clear interest in it.

This is being reflected by:

- the creation of improved or new products,
- the appearance of new, so-called advanced products,
- improved qualities, and
- research into processes that create less pollution.

Following the first call for project proposals in 2003, two projects were submitted and later assessed by international experts. Many Luxembourg companies and national as well as international academic partners joined in. The Fund decided to merge these two projects into one, in order to better develop new competences.

The **'Development of Innovative Surfaces by Means of Optimised Plasma Techniques and Technology Transfer to Industries'** – project started in May 2005.

The project is managed under the responsibility of the CRP Gabriel Lippmann and the CRP Henri Tudor. The CRP Gabriel Lippmann focuses on fundamental research, whereas the CRP Henri Tudor concentrates more on applied research.

Development of Innovative Surfaces by Means of Optimised Plasma Techniques and Technology Transfer to Industries

Public Research Centre Gabriel Lippmann

Public Research Centre Henri Tudor

Contact(s):

Henri-Noël Migeon, Laboratory for the Analysis of Materials (LAM), Public Research Centre Gabriel Lippmann

David Ruch, Laboratory of Industrial Technologies (LTI), Public Research Centre Henri Tudor

E-mail: migeon@lippmann.lu, duday@lippmann.lu, jos.schaefer@tudor.lu, david.ruch@tudor.lu

Industrial Partners:

Ateliers Nic Georges, Luxembourg

Balzers, Luxembourg

Ceratizit, Luxembourg

Ceodeux-Puretec, Luxembourg

Circuit Foil, Luxembourg

Ewald Giebel, Luxembourg

Galvalange, Luxembourg

Goodyear Technical Centre, Luxembourg

Novellis (Pechiney Eurofoil Lux)

TrefilArbed, Luxembourg

Academic Partners:

Fraunhofer Institute for Surface engineering and Thin films, Braunschweig, Germany

VITO, Flemish Institute of Technological Research, Mol, Belgium

University of Luxembourg

Laboratoire de Science et Génie des Surfaces (LSGS-Ecole des Mines de Nancy), Nancy, France

Laboratoire de Physique des Milieux Ionisés (LPMIA – Université de Nancy), Nancy, France

Laboratoire de Chimie du Solide Minéral (LCSM – Université de Nancy), Nancy, France

Laboratoire de Génie des Procédés Plasma et Traitements de Surface (LGPPTS-ENSC), Paris, France

Laboratoire Interdisciplinaire de Spectroscopie d'Électrons (LISE – Université de Namur), Namur, Belgium

Unité de Physico-Chimie et de Physique des Matériaux (PCPM – Université de Louvain la Neuve),

Louvain la Neuve, Belgium

Universität de Saarbrücken, Germany

Starting Date – Closing Date: 1st May 2005 – 31st October 2006

FNR Contribution: €2,250,000 (€1,500,000 for the Public Research Centre Gabriel Lippmann and €750,000 for the Public Research Centre Henri Tudor)

Possible Prolongation: 24 months; maximum financial contribution by FNR €3,750,000 (€2,500,000 for the Public Research Centre Gabriel Lippmann and €1,250,000 for the Public Research Centre Henri Tudor)

The 11 Luxembourg industries involved in this project need innovative surfaces for corrosion and wear protection, modification of surface energy and chemistry to improve or decrease adhesion, produced mostly by means of plasma treatments. Different surface treatment equipments and characterisation methods are used to obtain innovative surfaces.

In WP1 (WP=Work-Package) (topic 3), microwave plasma assisted chemical vapour deposition (MPACVD) was used to deposit carbonitride films. The high power used allowed a fast deposition of high quality films. After the determination of parameters to obtain a stable plasma, the increase of nucleation density at the first steps of film growth was the objective of our experiments.

In WP2, the surface functionalisation of epoxy resins by NH_2 and the deposition of Si-based films with HMDS precursors on copper film for adhesion promotion were carried out in a dielectric barrier discharge (DBD) with a post-discharge configuration.

In WP4, the determination of Novelis lubricants degradation kinetics by a microwave torch at atmospheric pressure was studied. The N_2 plasma allowed an increase of one order of magnitude of the degradation rate and the optimisation of the process will rapidly improve the lubricants degradation rate.

In WP5, a treatment of rubber by DBD with a post-discharge configuration by N_2 -HMDSO mixtures for adhesion modification was carried out at LAM. The effect of the N_2 /HMDSO ratio and of the sample surface-plasma distance on the deposited film and sample surface chemistry was studied.

In WP15, WP16 and WP17, siloxane based and conducting polymer layers were deposited on galvanised steel for corrosion protection with a DBD reactor. Such a discharge is an innovative and versatile environment-friendly process as opposed to wet processes currently in use.

The first results with hexamethyldisiloxane are promising since they show a significant increase of the corrosion protection.

Siloxane plasma treatments are under development to reach the performance of chromated layers currently used in industry (Galvalange and Ewald Giebel) Improvement of coating quality and deposition rate shall be achieved by optimisation of plasma chemistry.

Conducting polymer coatings provide an additional anticorrosion protection. For instance, an innovative synthesis by DBD of polyaniline conductive form coatings is currently under development. A first FNR expert panel meeting will take place on 6 July 2006 to discuss about the project.

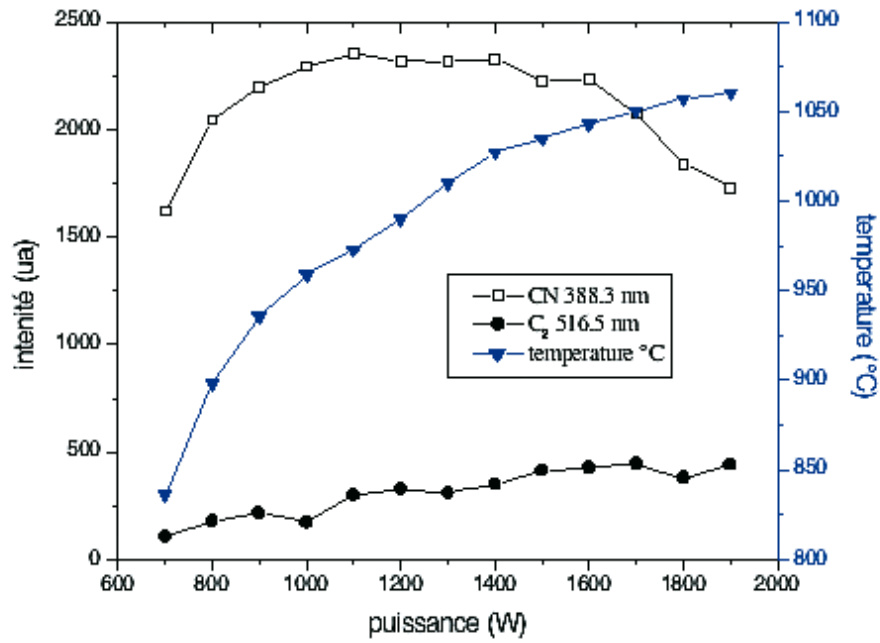


Figure 1: WP1 (topic 3) : Evolution of the quantity of CN and C₂ species and of the temperature close to the substrate at a pressure of 50 mbar and with a N₂ flow of 48 sccm and a CH₄ flow of 2 sccm in function of the plasma source power

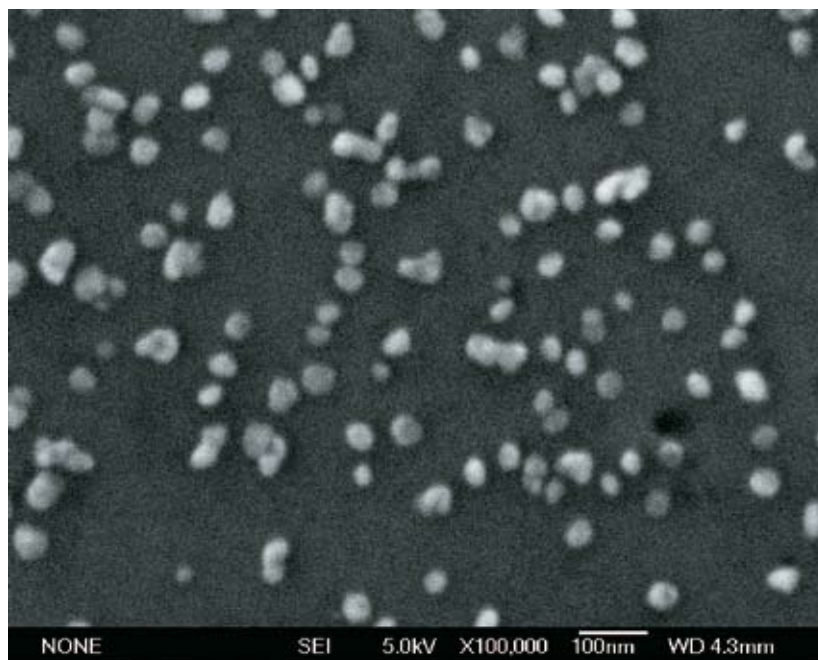


Figure 2: WP1 (topic 3) : Carbonitride grains on silicon substrate elaborated at a pressure of 30 mbar, a power of 600W, with a N₂ flow of 100sccm and a CH₄ flow of 1sccm after 2 h.
The nucleation density has to be improved.

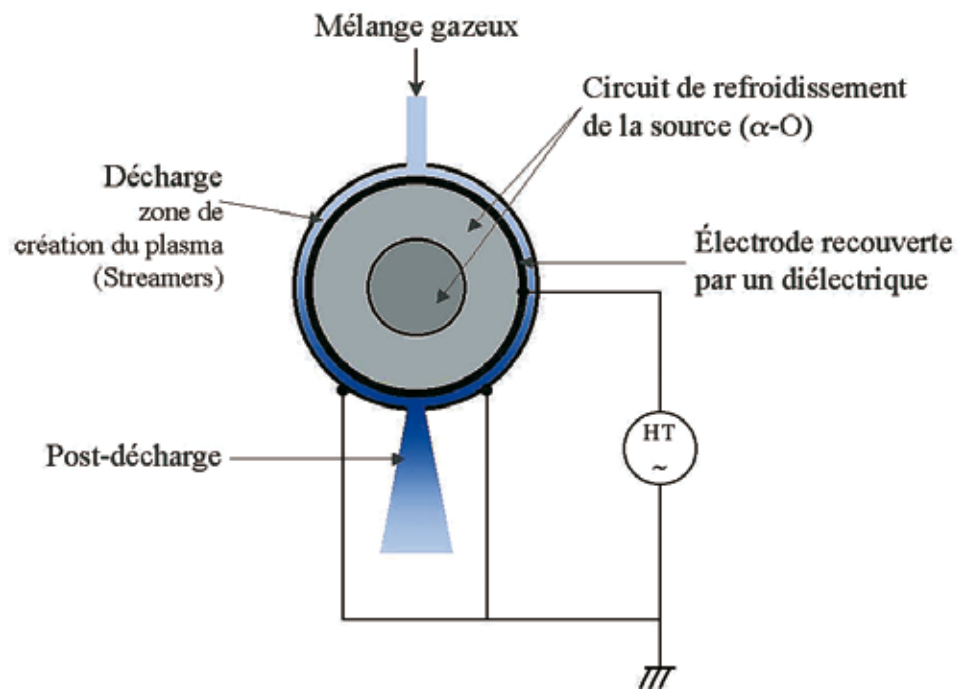


Figure 3: Scheme of the dielectric barrier discharge (DBD) system acquired by CRP-GL

SECAL Programme

Food Safety

Duration: 2003–2010

Total Budget: € 6,000,000

1st Call in 2003: 6 Projects Selected (€ 5,881,533)

Food safety has become a major public health issue, both with regard to the context of an increased life expectancy and the economic impact. In order to assess and control the risks connected to food safety, the improvement of scientific knowledge – concerning the analysis of contaminants throughout the “food chain”, human exposure to the various contaminants and their impact on human health – is now necessary.

The aim of this programme is to develop a body of scientific expertise and resources in Luxembourg in matters of food safety, serving all the actors involved, such that the base of scientific knowledge can be widened and new methods of surveillance and risk avoidance can be developed. Priority will be given to the following areas of research, ranging from risk assessment to the study of prevention strategies:

- traceability of foods (including genetically modified organisms – GMOs);
- chemical and microbiological quality of foods (including drinking water);
- impact on human health and consumer protection.

SECAL Projects

Project Code	Title	Contact	Coordinating Institution(s)	Starting Date	Closing Date	Budget Estimates (€)
FNR/03/07/01	Mobile Expert & Networking System for Systematic Analysis of Nutrition-based Allergies – MENSANA	N. Rösch	CRP Henri Tudor	01.10.2004	30.06.2006	370,000 (1st phase) 400,000 (2nd phase)
FNR/03/07/02	The Development of a Drinking Water Contamination Risk Assessment and Management Strategy in Luxembourg – An Interdisciplinary Approach (CHEMRISK)	P. Schosseler	CRP Henri Tudor	01.05.2005	30.04.2008	1,200,000
FNR/03/07/03	Novel Quantitative Protein- and DNA-based Methods for Tracing of Food Components	A. Steinmetz	CRP Santé	01.11.2004	31.10.2007	1,199,980
FNR/03/07/05	Development of New Genoproteomic Diagnostic Tools for the Toxicological Assessment of Endocrine Disruptors in Food (ENDIF)	L. Hoffmann	CRP Gabriel Lippmann	01.02.2006	31.01.2009	983,437
FNR/03/07/07	Knowledge and Know-How Acquisition for an Efficient Risk Assessment of Waterborne Pathogens in the Drinking Water of Luxembourg (KAWA)	L. Hoffmann	CRP Gabriel Lippmann	01.07.2005	30.06.2008	848,716
FNR/03/07/08	Molecular Epidemiology of Zoonotic Bacteria in the Food Chain in Luxembourg (EPIFOOD)	J. Mossong	National Health Laboratory	01.07.2005	30.06.2008	849,400
Total:	Available amount for SECAL, according to the Convention with the Government: € 6,000,000					5,881,533

Mobile Expert & Networking System for Systematic Analysis of Nutrition-Based Allergies (MENSSANA)

Public Research Centre Henri Tudor

Contact(s): Norbert Rösch, Department SANTEC, Public Research Centre Henri Tudor

E-mail: norbert.rosch@tudor.lu

Project Website: <http://santec.tudor.lu/projects/menssana>

Partner(s): Centre Hospitalier de Luxembourg

Starting Date – Closing Date: 1st October 2004 – 30th June 2006

FNR Contribution: € 370,000

Possible Prolongation: 27 months; maximum financial contribution by FNR € 430,000

According to the World Health Organisation, food allergies have become one of the most important problems of public health. Today the management of food allergies consists in educating the patient to avoid ingesting the responsible allergen and to initiate therapy in case of an unintended ingestion. Patients are required to keep food diaries to identify individual allergens in the daily food (e.g. instant meals). Unfortunately, while purchasing their food, people are left alone with ingredient descriptions that are difficult to read and understand. This makes it also very hard to document and control the ingested foods. Furthermore, studies have shown that significant amounts of the data in paper diaries is fudged or fabricated. In “parking lot diaries”, just prior to an appointment with a nurse or a doctor, a patient fills in the past week or two of experiences.

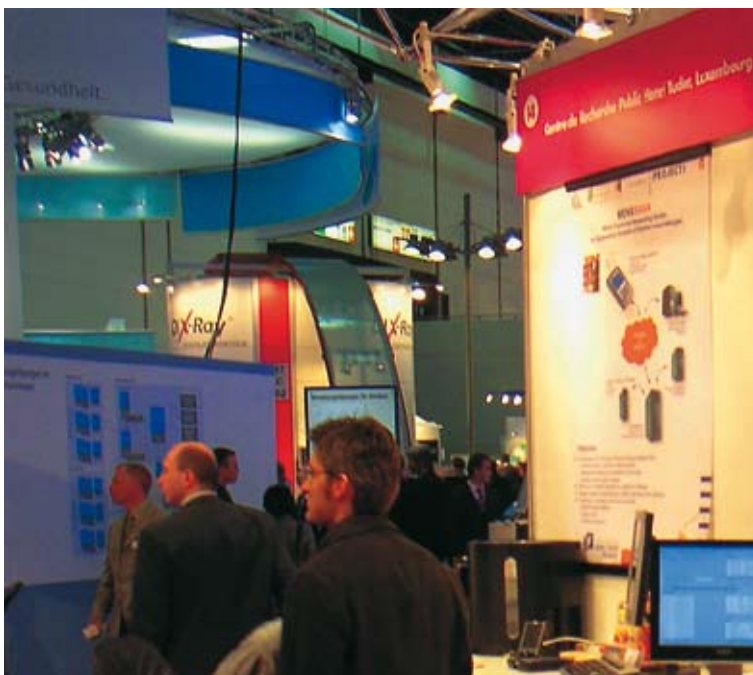
To overcome the mentioned obstacles, a major goal of the project is to develop a Personal Allergy Assistant (PAA), based on modern mobile computing and database technology. The PAA could help to easily distinguish permitted food products from prohibited food products as well as to generate coherent patient diaries. This makes it possible to build-up a scientific database for the systematic identification of allergies.

In 2005 the project team has begun to construct first prototypes of a knowledge database and to develop two different PAA prototypes. The knowledge base has now ingredient lists of about 4,000 ecological food products, but methods are required to increase the number of known products tremendously. The first PAA prototype is based on Palm OS using a Symbol SPT 1550 with integrated laser barcode scanner. The second PAA prototype runs on Windows Mobile and uses HP IPAQ RX 3700 hardware. Both prototypes will be improved and tested in parallel. On the scientific division of the MEDICA 2005, the World’s largest medical fair and congress, we presented our intermediate results with positive feedback from health professionals and patients.

A Steering Committee was founded to manage the project’s functional, technical and strategic aspects. Besides leading managers of the MENSSANA team, internationally renowned experts in the field of allergy research and computer science are members of this steering committee. This opportunity was used to create a working group “Information Technology and Allergy” to improve the interdisciplinary information exchange between allergologists, researchers and experts in information technologists. Furthermore we have been accepted as a collaborating centre of the Global Allergy and Asthma European Network (GA2LEN).



Personal Allergy Assistant (PAA) identifies a food product with its integrated laser barcode scanner



MENSANA stand on the MEDICA 2005 conference and exhibition

The Development of a Drinking Water Contamination Risk Assessment and Management Strategy in Luxembourg – An Interdisciplinary Approach (CHEMRISK)

Public Research Centre Henri Tudor

Contact(s): Paul Schosseler, Tom Gallé, Resource Centre for Environmental Technologies (CRTE),

Public Research Centre Henri Tudor

E-mail: paul.schosseler@tudor.lu, tom.galle@tudor.lu

Project Website: www.crte.lu (water section)

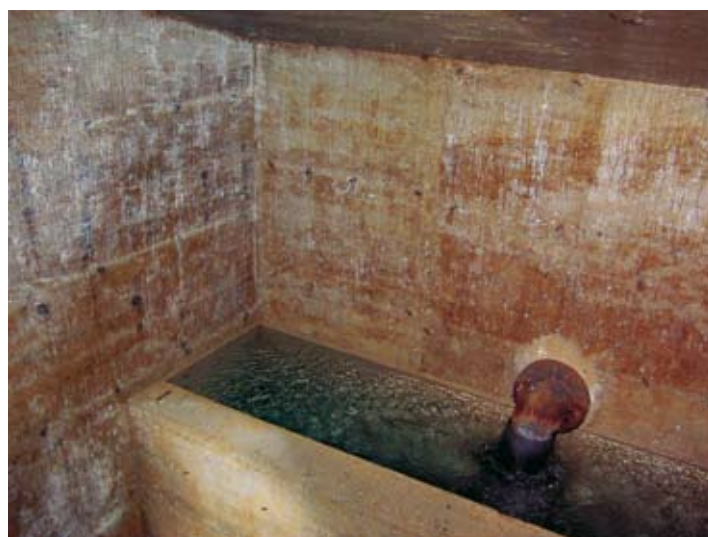
Partner(s): Department of Water Management, Laboratory of Radiation Physics,

University of Luxembourg, National Health Laboratory

Starting Date – Closing Date: 1st May 2005 – 30th April 2008

FNR Contribution: € 1,200,000

The Chemrisk project combines classical vulnerability studies with immission data to achieve a risk analysis for the main drinking resources in Luxembourg. Geo-statistical methods and spatiotemporal modelling will be applied to evaluate different land-use scenarios. The main scope in the first months of the project lay on data mining for the GIS data basis. Apart from digital maps on land use, geology, soils and elevation models, localised data on chemical parameters from springs and wells was gathered. A water balance integrating precipitation data, spring and river discharges is about to be established for different catchments of interest. A special focus will be laid on the Luxemburg Sandstone, the main drinking water supplying aquifer in central Luxembourg. The latter is known to be highly fissured and prone to preferential flow and flashy reactions to rain events. In order to learn about the chemical dynamics of springs throughout different recharge situations, ten springs will be equipped with online measurement equipment for discharge, temperature and conductivity. These locations will be sampled at a high pace in times of recharge and analysed for inorganic parameters as well as pesticides and antibiotics. A thorough review on use and environmental behaviour of pesticides and antibiotics has been conducted and will lead to the choice of a measurement protocol for different land use situations. Analytical instruments were selected and will be installed in early 2006. A scientific collaboration on method development has been agreed on with the supplier of the analytical instruments.



A captured drinking water source in the Luxemburg Sandstone

Novel Protein- and DNA-based Methods for Tracing of Food Components

Public Research Centre Santé

Contact(s): André Steinmetz, Laboratory of Immunogenetics, Allergology and Plant Molecular Biology,
Public Research Centre Santé,

E-mail: andre.steinmetz@crp-sante.lu

Partner(s): National Health Laboratory

Starting Date – Closing Date: 1st November 2004 – 31st October 2007

FNR Contribution: € 1,199,980

The aims of the project are to experimentally generate protein and nucleic acid data that will be used in a second step to develop molecular tools (detection kits) allowing an unambiguous identification of plant and animal species and hence the tracing of food components in processed food. The protein approach is based on the development and use of monoclonal antibodies specifically directed against small heat-resistant proteins (allergens), while the nucleic acid approach makes use of PCR amplifications targeting species-specific genomic DNA sequences. The allergens studied are parvalbumins from various fish, poultry and mammalian species, as well as Lipid Transfer Proteins (LTPs) from maize, wheat, rice, barley, sesame, walnut, peanut and soybean. Parvalbumins are encoded by a small gene family and are expressed in muscle and neural tissues. The plant LTP family comprises about 80 members in Arabidopsis and is possibly even more complex in higher plants with larger genomes. LTPs are highly variable in their amino acid sequence and are therefore good protein markers for species identification. However, their structural heterogeneity makes LTP genes difficult-to-work-with candidates when it comes to defining unique sequences. We have therefore selected a low copy number and structurally conserved gene family for this approach. We have so far identified LTPs in seed extracts from peanut, walnut, wheat and barley following electrophoretic separation and N-terminal sequencing. Genomic target sequences from several maize and rice varieties have been determined and compared, and species-specific primer pairs have been designed and successfully tested. Also, the genes for different isoforms of type beta parvalbumin and the corresponding cDNAs from Atlantic cod, salmon, carp and mackerel have been cloned. These allergenic proteins have been over-expressed in *E. coli* and chromatographically purified. To facilitate the selection of proteins as well as of genes, additional data has been collected from tuna, redfish, herring and different Salmonidae. Primer testing and immunisation of mice for generation of monoclonal antibodies are in progress. Pilot micro-array experiments were successfully performed using purified albumins from different animal species and monoclonal antibodies of well-defined specificity. Our results indicate that the protein arrays exhibit solid performance in terms of specificity, sensitivity and reproducibility that makes them valid platforms for future studies in this project. Finally, Real-Time PCR targeting the NOS-terminator of *Agrobacterium tumefaciens* has been developed and tested successfully on all EU-authorized GMO events.

FNR 03/07/05

Development of New Genoproteomic Diagnostic Tools for the Toxicological Assessment of the Presence of Endocrine Disruptors in Food (ENDIF)

Public Research Centre Gabriel Lippmann

Contact(s): Lucien Hoffmann, Department Environment and Agro-biotechnologies (EVA),

Public Research Centre Gabriel Lippmann

E-mail: hoffmann@lippmann.lu

Partner(s): National Health Laboratory

Starting Date – Closing Date: 1st February 2006 – 31st January 2009

FNR Contribution: €983,437

There is increasing evidence that endocrine disruptors (e.g. pesticides, PCBs, dioxin, additives used by the plastic industry, phytoestrogens), which are present in food, have an effect on human health (e.g. reproductive abnormalities, cancer, sex ratio o babies). The objectives of this project are 1) to evaluate the exposure of the population of Luxembourg to endocrine disruptors and 2) to use evolving gene expression (bio-chips) and proteomics technology in order to develop new molecular biomarkers to assay human exposure to selected endocrine disruptors present in food.

FNR 03/07/07

Knowledge and Know-How Acquisition for an Efficient Risk Assessment of Waterborne Pathogens in the Drinking Water of Luxembourg (KAWA)

Public Research Centre Gabriel Lippmann

Contact(s): Henry-Michel Cauchie, Department Environment and Agro-biotechnologies (EVA),

Public Research Centre Gabriel Lippmann

E-mail: cauchie@lippmann.lu

Partner(s): Ministry of the Interior, Department of Water Management

Starting Date – Closing Date: 1st July 2005 – 30th June 2008

FNR Contribution: €848,716

The KAWA project aims to acquire new knowledge and develop innovative know-how to perform an adequate risk assessment on the major non-bacterial pathogens in the drinking water of Luxembourg. Viruses, parasitic protozoa and toxic cyanobacteria were chosen as target pathogens on the basis of their frequent occurrence, their pathogenicity at low doses and the gap of knowledge concerning them compared to bacteria. To perform the risk assessment, a correct estimation of occurrence, viability, virulence and infection potential needs to be made. Concerning viruses and parasitic protozoa, the project focused first on the behaviour of target pathogens in bio-films whose contribution to pathogen survival in pipes have been largely overlooked until now. Research activities during 2005 concentrated on methodologies to estimate the occurrence of pathogens in bio-films. Rapidly colonising wastewater bio-films were chosen for these methodological studies. Adapted protocols were set up for the recovery of viruses and protozoa. Besides using wastewater bio-films, it is scheduled to grow bio-film in a laboratory pilot unit. This unit has been installed in the confined microbiology laboratory of CREBS and will be operational in early 2006. Concerning cyanobacteria, a monitoring of the major surface water resources of Luxembourg (Haute-Sûre reservoirs) was performed. Large blooms of cyanobacteria including toxin-producing species were recorded in the main reservoir as well as in the pre-dam reservoirs. Algal biomass was collected and frozen for subsequent toxin analyses by chromatography. During the blooming period, samples were also taken in the facilities of the SEBES, the major water producer in Luxembourg, for toxin analyses. These samples will be assayed in 2006. Molecular biology protocols are currently developed to detect viruses, protozoa and cyanobacteria using PCR and RT-PCR.

Molecular Epidemiology of Zoonotic Bacteria in the Food Chain in Luxembourg (EPIFOOD)

National Health Laboratory

Contact(s): Joël Mossong, François Schneider, Microbiology, National Health Laboratory

E-mail: joel.mossong@lns.etat.lu, francois.schneider@lns.etat.lu

Partner(s): Public Research Centre Santé

Starting Date – Closing Date: 1st July 2005 – 30th June 2008

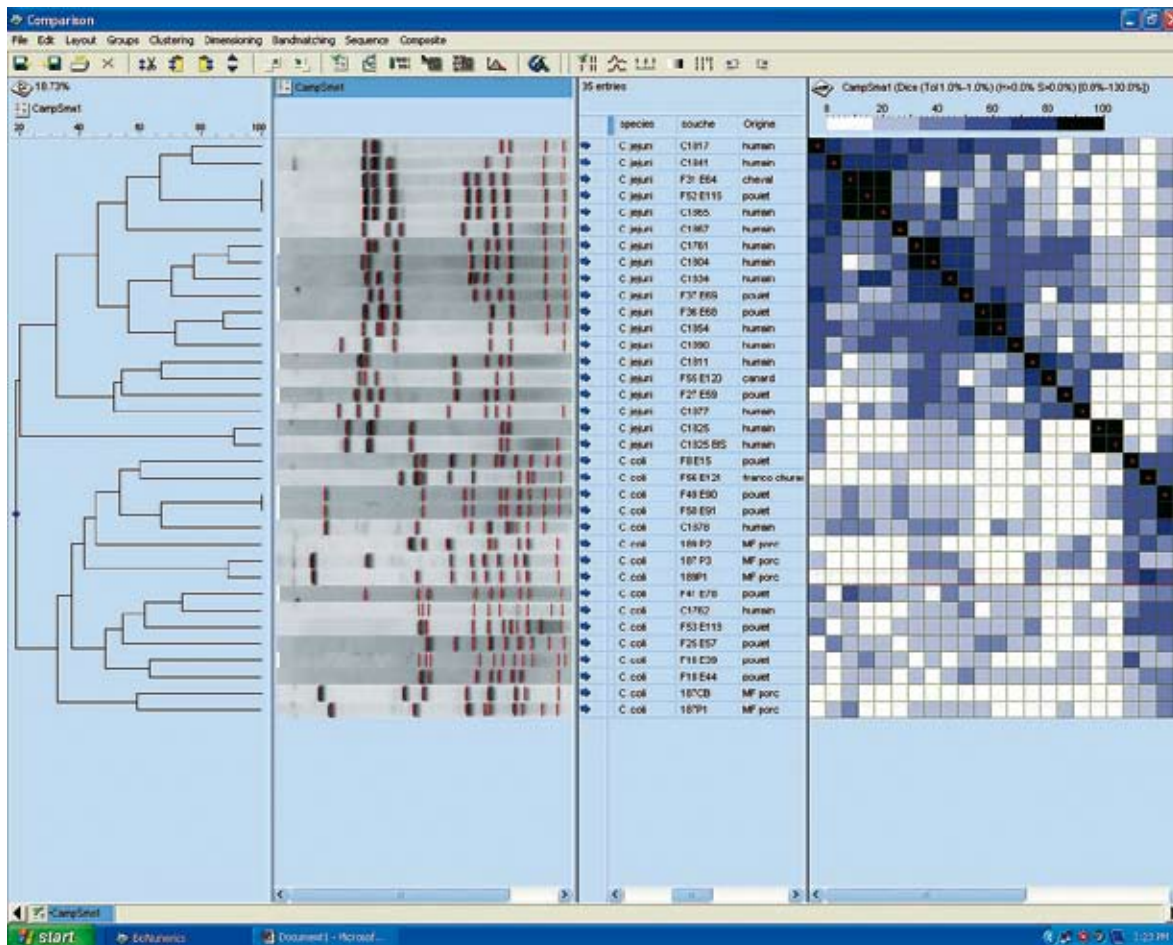
FNR Contribution: € 849,400

Food-borne bacteria are not only a major public health burden; they can also have major consequences for the agriculture and food sector. Our project aims to assess the contamination of the most important human food-borne pathogens – Salmonella, Campylobacter, verotoxigenic Escherichia coli and Listeria monocytogenes – on different levels of the food chain in Luxembourg (feeding stuffs, animal carcasses, animal faeces, and food products), and to compare these bacteria with human clinical isolates using state-of-the-art molecular identification and typing techniques. An epidemiological study will be conducted to assess risk factors associated with bacterial food-borne infections in Luxembourg.

Our project started on 1st July 2005 and the first 3 months of the project were mainly spent with administrative and management matters: recruitment and initial training of personnel, applying for appropriate authorisations, purchasing equipment, software and materials, setting up databases and refining the sampling strategy.

In autumn 2005, sample collection began in supermarkets, butcher shops, abattoirs and chicken farms. A considerable amount of effort was spent adapting and optimising bacterial isolation methodologies in view of documenting the underlying diversity. Preliminary results seem to suggest that different culture media might have an influence on clone selection. Several genotyping methods were set up and developed which will be used in the project, e.g. pulsed-field gel electrophoresis on Campylobacter and Listeria.

In the coming year, the project team expects to continue sample collection and to extend it to animal feed. New sequence-based genotyping methods will also be developed to supplement pulsed-field gel electrophoresis. This is particularly important for Campylobacter where online multi-locus sequence typing databases exist and can be accessed for comparison purposes. It is also expected to start piloting a new infectious disease questionnaire for risk factor analysis and tracing of human Salmonella and Campylobacter food-borne infections.



INTER Programme

Promotion of International Cooperation

Duration: 2006 – 2011

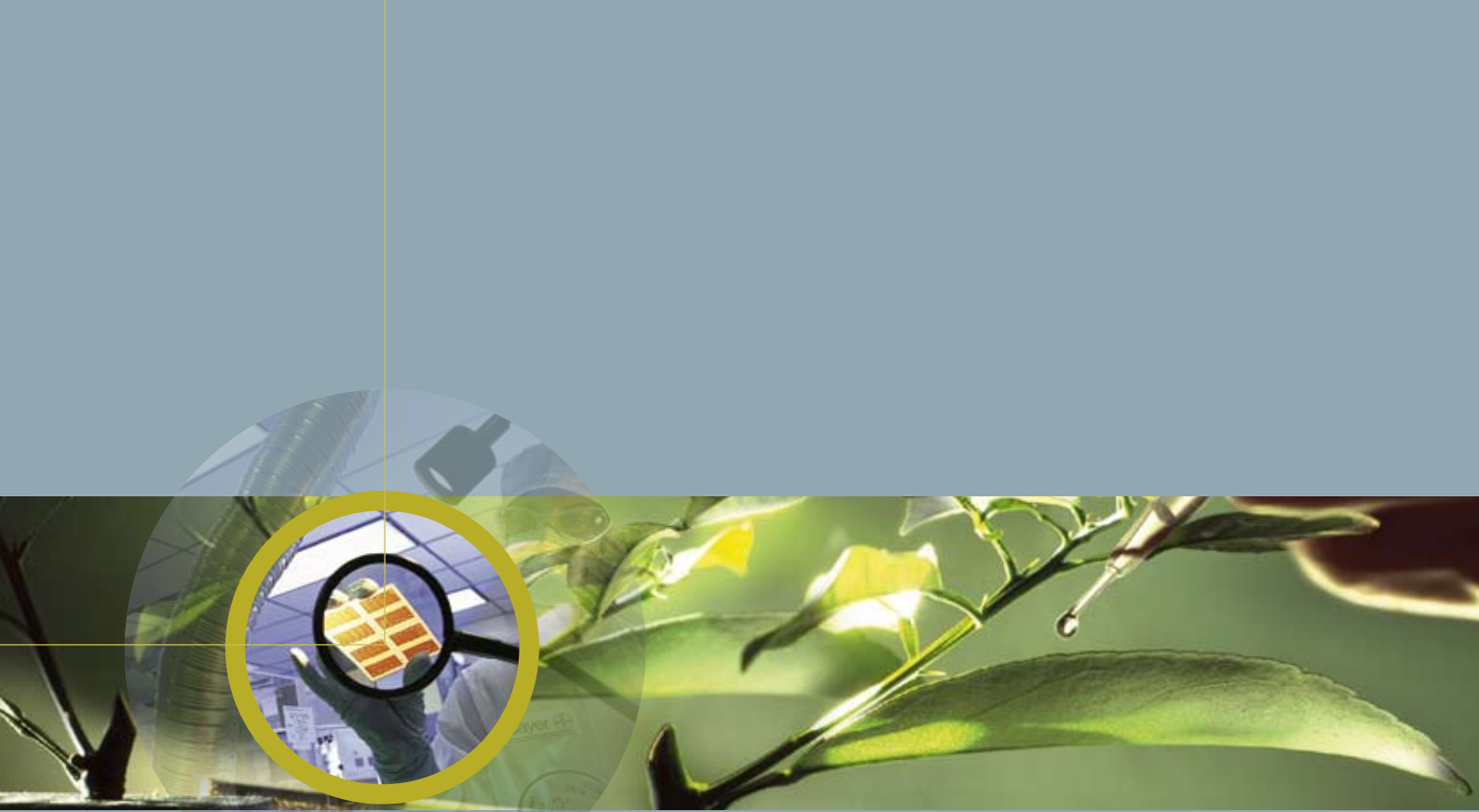
Total budget: € 6,000,000

In December 2005, the Government Council approved a new research programme for the Fund entitled “Promotion of international cooperation (INTER)”. The INTER programme was the result of recommendations made by the steering committees and the panel of experts held on 10 December 2004, and of the wish by researchers in Luxembourg to cooperate more closely with international researchers. Players involved in public research and international experts recognise the need for international cooperation, particularly with a view to giving research in Luxembourg a higher profile in other countries and to achieving a critical mass within research that cannot be sought if the research context is limited to Luxembourg.

As a result, the aims of the INTER programme are as follows:

- to promote international scientific cooperation;
- to create synergies between research centres within and outside Luxembourg;
- to achieve a critical mass in certain fields;
- to take a better approach to the resolution of certain transnational issues;
- to make research in Luxembourg more visible and more competitive.

In order to do this, the INTER programme will not involve participation in individual projects at international level, but solely participation in international programmes that will be developed jointly with other research funds or councils outside Luxembourg, or in programmes already in place at international level in which the Fund may decide to participate.



Accompanying Measures

In order to supplement research financing as such, the National Research Fund also applies the following accompanying measures (mesures d'accompagnement – MA) in order to support the general framework of scientific research in Luxembourg.

In 2005, the Fund selected a total of 145 activities from the 170 proposals submitted. It should be noted that activities selected in 2005 may take place in 2005 or be extended over subsequent years. Activities selected in preceding years are no longer mentioned in this report.

MA1: Various measures to promote scientific culture, international scientific cooperation or national coordination in the research field

MA1 measures are chiefly intended to stimulate scientific interest among young people through experimentation, but also to interest a wider audience in the sciences by showing them the importance of scientific research. These measures also aim to support innovative and original activities promoting research or supporting cooperation between different players in the R&D sector, whether at national level or, in specific cases, international level.

MA2: Active participation of novice researchers in scientific conferences

Through MA2, the Fund supports scientific presentations at international conferences by young researchers undertaking doctoral studies for up to four years after defending their theses by financing their travel expenses and registration fees. This measure is intended to encourage researchers to present the results of their research abroad and thereby to establish scientific contacts that may be important in their future careers.

MA3: Organisation of scientific conferences in Luxembourg

MA3 is intended to co-finance national or international scientific conferences organised in Luxembourg by public research bodies or associations. The conferences must be organised by a scientific committee. In the same category, the Fund also finances public events arranged by interested parties from Luxembourg or abroad to present the state of the art in a particular scientific field to a specialist or non-specialist audience.

MA4: a) Publication of doctoral theses

MA4 is subdivided into two parts. The first part (MA4a) covers the financing or co-financing of the printing or publication of a doctoral thesis. The maximum amount of the grant from the Fund is 3,000€.

MA4: b) Publication of scientific works

In parallel with the financing of doctoral theses, under MA4b the Fund also co-finances the publication of scientific works up to a maximum of 3,000€.

MA5: Preparation of European research projects

MA5 makes it possible to refund the costs of preparing European research projects incurred by Luxembourg public bodies which coordinate this kind of project.

MA6: Mobility of researchers

MA6 aims to encourage international collaboration by attracting foreign researchers to institutions in Luxembourg or enabling Luxembourg researchers to spend periods at research bodies abroad. Applications must relate to a research project to be executed jointly.

MA7: Training in research project management

MA7 encourages participation in a seminar or a conference in connection with research project management (for example seminars organised by EARMA – www.earma.org – or similar seminars organised at national or international level) or with the management of intellectual property in the R&D sector.

For measures MA1, MA3 and MA6, the deadlines for the receipt of proposals are set annually at 1 April and 1 October. For measures MA2, MA4, MA5 and MA7, the deadline is set in relation to the launch date of the activity.

SF: Science Festival

Every two years (2003, 2005,...) the Fund supports the Science Festival, organised by the National Museum of Natural History (www.science-festival.lu). The Science Festival hosts a variety of activities (workshops, talks, exhibitions, shows, etc.) aimed at all age groups.

Overview of activities in 2005

Code	Title of measure	Number of proposals submitted	Number of proposals accepted	Total FNR* contributions in 2005 (€)
MA1	Various measures for promoting R&D	21	12	164,320.00
MA2	Active participation of novice researchers in conferences	51	49	53,525.67
MA3	Organisation of scientific conferences in Luxembourg	49	43	375,271.12
MA4	Scientific publications	29	24	51,172.84
MA5	Preparation of EU projects	1	1	10,000.00
MA6	Mobility of researchers	16	14	149,722.00
MA7	Training in research project management	3	2	2,516.20
SF	Science Festival			420,000.00
Totals		170	145	1,226,527.80

* preliminary estimates

Accepted Proposals in 2005

MA1: Various measures to promote scientific culture, international scientific cooperation or national coordination in the research field

FNR / 05 / MA1 / 02

Musée National d'Histoire Naturelle	2006	€ 25,000.00
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Galileo Science Mobil 2006
ALINE FISCHER

FNR / 05 / MA1 / 03

Musée National d'Histoire Naturelle	2006	€ 25,000.00
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Science Club 2006
PATRICK DELHALT

FNR / 05 / MA1 / 04

CRP Gabriel Lippmann	7–25 November 2005	€ 20,000.00
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e-Science Quizz (3e édition)
FERNAND REINIG

FNR / 05 / MA1 / 05

Lycée Classique de Diekirch	October–December 2005	€ 6,020.00
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Conférences et expositions pour les 175 ans du Lycée Classique de Diekirch
FRANCIS MASSEN

FNR / 05 / MA1 / 06

CRP Henri Tudor	1 July 2005–30 June 2006	€ 7,500.00
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Plateforme COME–COmputational Mechanics
GASTON RAUCHS

FNR / 05 / MA1 / 07

CRP Henri Tudor	1 July 2005–30 June 2006	€ 7,500.00
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Plateforme Vieillissement et durabilité des matériaux
CLAUDE BECKER

FNR / 05 / MA1 / 08

Luxinnovation	1 July 2005–31 December 2006	€ 35,000.00
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Plateformes COME, Vieillissement des matériaux, Automobile et aéro-espace
GILLES SCHLESSER

FNR / 05 / MA1 / 12
Fondation Hëllef fir d'Natur 1 January 2005–31 December 2006 € 13,500.00

Natur erleben ohne Grenzen! Geologie und Landschaft im Dreiländereck
FRANTZ CHARLES MULLER

FNR / 05 / MA1 / 13
Musée National d'Histoire Naturelle 22–23 April 2006 € 20,000.00

Trophées de Robotique 2006 au Luxembourg–Euroboot Junior
PATRICK DELHALT

FNR / 05 / MA1 14
European Association for Astronomy Education April or May 2006 € 1,800.00

Catch a Star 4
FERNAND WAGNER

FNR / 05 / MA1 / 15
Association Luxembourgeoise des Physiciens a.s.b.l. 15 September 2006 € 1,500.00

Remise d'un prix de physique aux meilleurs bacheliers
JEAN-PAUL ZANTER

FNR / 05 / MA1 / 16
Université du Luxembourg Spring 2006 € 1,500.00

Concours de dessin sur le thème «Mir gi Fuerscher»
Massimo Malvetti

MA2: Active participation of novice researchers in scientific conferences

FNR / 05 / MA2 / 01
The 63rd Midwest Political Science Association–MPSA
National Conference, Chicago 7–10 April 2005 € 1,068.92

Representation and Committee Assignments in the European Parliament
PIERRE HAUSEMER, London School of Economics

FNR / 05 / MA2 / 02
XVII International Botanical Congress, Vienne 17–23 July 2005 € 569.14

Evolution of mechanical innovations and self repair in climbing plants
TOM MASSELER, Université de Fribourg

FNR / 05 / MA2 / 03

Steering Committee Meeting on Research Related to
Measles and Rubella Vaccines and Vaccination, New Dehli 19–21 April 2005 € 1,102.47

Participation active à un comité d'évaluation
JACQUES KREMER, Laboratoire National de Santé

FNR / 05 / MA2 / 04

ARVO 2005 (association for research in vision
and ophthalmology), Fort Lauderdale 1–5 May 2005 € 1,267.37

Experimental corneal imaging and intrastromal tissue ablation with femtosecond laser
scanning microscopy
CORINNE HUSS, Fraunhofer Institut für Biomedizinische Technik

FNR / 05 / MA2 / 05

ARVO 2005 (association for research in vision and
ophthalmology), Fort Lauderdale 1–5 May 2005 € 893.23

A Custom CMOS-based Hartmann-Shack Wavefront Sensor
OLIVIER LA SCHIAZZA, Ruprecht-Karls-Universität Heidelberg

FNR / 05 / MA2 / 06

4th International Water Association Activated Sludge
Population Dynamics Specialist Conference,
Surfer's Paradise, Australie 17–20 July 2005 € 1,457.71

Towards exposure of elusive metabolic mixed-culture processes: the application
of metaproteomic analyses to activated sludge
PAUL WILMES, University of East Anglia

FNR / 05 / MA2 / 07

Industrial Engineering and System Management–IESM '05',
Marrakech 16–19 May 2005 € 943.23

How is work of anaesthesiologists organised?
ILHAM BEN ABBES, CRP Henri Tudor

FNR / 05 / MA2 / 08

IFORS 2005–International Federation of Operational
Research Societies, Honolulu 11–15 July 2005 € 1,417.00

Multicriteria Clustering: a Hierarchical Approach
CLAUDE LAMBORAY, Université Libre de Bruxelles

FNR / 05 / MA2 / 09

ENII (European Network of Immunology Institutes)

Conference 2005, Ile des Embiez, France

18–22 May 2005

€ 1,057.30

Anti-tumor immune responses in breast cancer

LYNN WENANDY, Danish Cancer Society

FNR / 05 / MA2 / 10

Transducers '05, Seoul

5–9 June 2005

€ 1,768.88

Localized and CMOS compatible Growth of Carbon Nanotubes on a 3 × 3 μm² Microheater Spot

ALAIN JUNGEN, Eidgenössische Technische Hochschule Zürich

FNR / 05 / MA2 / 11

XIII Congress of Virology, San Francisco

23–28 July 2005

€ 1,631.59

Étude fonctionnelle de la signalisation intracellulaire médiée par l'intégrine αIIbβ3
au cours de l'interaction avec le fibrinogène immobilisé

MIKE PÜTZ, Imperial College London

FNR / 05 / MA2 / 12

1st International Operational Modal Analysis Conference,

Copenhagen

26–27 April 2005

€ 726.00

Error bounds for modal parameters estimated from correlation-driven stochastic realisations

LAURENT GIAMPELLEGRINI, University College London

FNR / 05 / MA2 / 13

32nd Annual Meeting of the Controlled Release Society,

Miami Beach

18–22 June 2005

€ 1,108.71

Oral Peptide Delivery: Identification and First Characterisation of the «Sulphydryl Barrier»

THIERRY SCHMITZ, Universität Innsbruck

FNR / 05 / MA2 / 14

19th American Peptide Society Symposium, San Diego

18–23 June 2005

€ 1,373.71

Thiohydantoins—A technique to label peptides and proteins

CAROLE BÜCKLER, University of Edinburgh

FNR / 05 / MA2 / 15XVIII International Symposium on Bioelectrochemistry
and Bioenergetics, Coimbra

19–24 June 2005

€ 842.05

Electrochemical detection of the immobilization and hybridization of unlabeled nucleic acid
oligonucleotides on gold electrodes

MARC STEICHEN, Université Libre de Bruxelles

FNR / 05 / MA2 / 16

The 2005 Metabolic Drug / Discovery and Development Meeting, San Francisco

29 June –1 July 2005

€ 1,418.95

Targeting of the glycolytic keyregulator pyruvate kinase subtype M2 by peptide aptamers
GILLES SPODEN, Universität Innsbruck

FNR / 05 / MA2 / 17

Journées d'Informatique Musical 2005, Paris

2–4 June 2005

€ 696.70

Learning musical pitch structures with hierarchical hidden markov models
MICHÈLE WEILAND, University of Edinburgh

FNR / 05 / MA2 / 18

13th IUPAC International Symposium on Organometallic Chemistry Directed towards Organic Synthesis, Genève

17–21 July 2005

€ 762.00

Synthetic and Mechanistic Aspects of Enyne Metathesis
ROBERT MARGUE, University of Bristol

FNR / 05 / MA2 / 19

IFORS 2005–International Federation of Operational Research Societies, Honolulu

11–15 July 2005

€ 1,000.00

On a fuzzy extension of the Choquet integral for ranking in Multiple Criteria Decision Aiding
PATRICK MEYER, Université du Luxembourg

FNR / 05 / MA2 / 20

IEEE–Conference on Automation Science and Engineering, Edmonton

1–2 August 2005

€ 1,338.36

Solving a stochastic inventory–location problem using Lagrangian relaxation approach
GUY-AIMÉ TANONKOU, Institut National de Recherche en Informatique et en Automatique

FNR / 05 / MA2 / 22

9th International Symposium on Physical Measurements and Signature in Remote Sensing, Pékin

17–19 October 2005

€ 1,111.35

Land-cover change and vegetation dynamics across Africa and Europe
PEDRAM RHOWANI, Université Catholique de Louvain–La-Neuve

FNR / 05 / MA2 / 23

XXVIIth Congress of the International Union of Game Biologists, Hannover

28 August–3 September 2005

€ 759.00

Hunting of wild boar *Sus scrofa* in Luxembourg
SANDRA CELLINA, University of Sussex

FNR / 05 / MA2 / 24

3rd International Conference on Computer Science
and its Applications–ICCSA 2005, San Diego

27–30 June 2005

€ 1,305.00

BEN SCHROEDER, Anima: associative memories for categorical data streams
Université du Luxembourg

FNR / 05 / MA2 / 25

The 16th Evergreen International Phage Biology
Meeting, Olympia, Washington

7–12 August 2005

€ 976.30

GIL01 and relatives, a new generation of tectiviruses infecting *Bacillus thuringiensis*
NADINE FORNELUS, Université Catholique de Louvain–La-Neuve

FNR / 05 / MA2 / 26

Progress in Motor Control V, Pennsylvanie

17–20 August 2005

€ 1,104.07

A dynamic recurrent neural network for multiple muscle EMG mapping to elevation
angles of a lower limb prosthesis during locomotion
FRANÇOISE LEURS, Université Libre de Bruxelles

FNR / 05 / MA2 / 27

The International Society on Thrombosis & Haemostasis
XXth Congress, Sydney

6–12 August 2005

€ 1,723.10

A new functional role of the fibrinogen RGD motif as the molecular switch that
selectively triggers integrin $\alpha\text{IIb}\beta\text{3}$ -dependent RhoA activation during cell spreading
ALEXANDRE SALSMANN, Université du Luxembourg

FNR / 05 / MA2 / 28

10th International Conference on Urban
Drainage–ICUD, Copenhagen

21–26 August 2005

€ 1,187.13

Integrated urban catchment modelling for a sewer–treatment–river system
ANNE-MARIE SOLVI, CRP Henri Tudor

FNR / 05 / MA2 / 29

4th European Graduate School on Literacy,
Egmond aan Zee, Pays Bas

20–25 August 2005

€ 565.35

Learning to read and spell in Luxembourg: acquisition of transparent and opaque
orthographic systems in Primary School
SONJA UGEN, Université Libre de Bruxelles

FNR / 05 / MA2 / 30

XXVIIth Congress of the International Union of
Game Biologists, Hannover 28 August–3 September 2005 € 1,001.60

Ecological networks of national importance: the faunistic corridors of the red deer
(*Cervus elaphus* L.) in Luxembourg
ADIL BAGHLI, Musée National d'Histoire Naturelle

FNR / 05 / MA2 / 32

Open Systems: Rethinking Art c. 1970
(Tate Modern, London) 16–19 September 2005 € 989.89

Sculpture inside-out
SOPHIE RICHARD, Norwich School of Art and Design

FNR / 05 / MA2 / 33

Meeting of the Society of Hair Testing, Strasbourg 28–30 September 2005 € 498.42

Enantioselective quantification of amphetamines and congeners in hair by gas
chromatography–mass spectrometry
LILIANE MARTINS FERREIRA, Laboratoire National de Santé

FNR / 05 / MA2 / 34

Knowledge-Based & Intelligent Information
& Engineering Systems–KES 2005, Melbourne 14–16 September 2005 € 1,968.60

Dafo, a multi-agent framework for decomposable functions optimization
GRÉGOIRE DANOY, Université du Luxembourg

FNR / 05 / MA2 / 35

2005 IEEE International Ultrasonics Symposium,
Rotterdam 18–21 September 2005 € 831.82

C-axis inclined ZnO films deposited by reactive sputtering using an additional blind
for shear BAW devices
MATHIAS LINK, Université Henry Poincaré Nancy I

FNR / 05 / MA2 / 36

43rd Annual Meeting of the Academy
of Aphasia, Amsterdam 23–25 October 2005 € 802.19

Treating verbal short-term memory deficits by restoring longer lasting temporary activation
of phonological representations: A case study.
STEVE MAJERUS, Université de Liège

FNR / 05 / MA2 / 38

The 20th International Conference of the World
Association for the Advancement of Veterinary
Parasitology, Christchurch, Nouvelle Zélande

16–20 October 2005

€ 1,270.31

The relationship between ectoparasite infestation in sheep and farm management
practices in Great Britain

BETTY BILDORFF, University of Bristol

FNR / 05 / MA2 / 39

International Conference on Animal Circoviruses
and Associated Diseases, Belfast

11–13 September 2005

€ 1,097.04

Molecular Epidemiology of Chicken Anemia Virus in Nigeria

MARIETTE DUCATEZ, Laboratoire National de Santé

FNR / 05 / MA2 / 40

22. Kongress der Deutschsprachigen
Arbeitsgemeinschaft für Arthroskopie
(AGA), Francfort

30 September – 1 October 2005

€ 668.90

The reproducibility of radiological anterior and posterior horn determination
in lateral meniscus transplantation planning

PHILIPPE WILMES, Universität des Saarlandes

FNR / 05 / MA2 / 41

6th International Conference of the Estonian
Association of Comparative Literature,
Tartu, Estonie

28–30 September 2005

€ 623.00

The emergence of the 'foreign' author and the bewilderment of the reader / critic

JEANNE GLESENER, Université de Provence

FNR / 05 / MA2 / 42

International Symposium on Extremophiles
and their Applications, Tokyo

29 November – 2 December 2005

€ 1,240.18

Analysis of Ser-His-Glu triad in alpha-amylases

JEAN-CLAUDE MARX, Université de Liège

FNR / 05 / MA2 / 43

IPSI 2005 Bled Lake, Slovénie

8–11 December 2005

€ 953.68

A new queueing strategy for the Adversarial Queueing Theory

MICHAEL HILKER, Université du Luxembourg

FNR / 05 / MA2 / 45

12th Congress of the International Headache
Society, Kyoto

9–12 October 2005

€ 180.35

Burden of migraine and headache in the Grand Duchy of Luxembourg—First results
COLETTE ANDRÉE, CRP-Santé

FNR / 05 / MA2 / 46

AGU (American Geophysical Union)
Fall Meeting 2005, San Francisco

5–9 December 2005

€ 1,094.44

The Lower Toarcian Carbon–Isotope Perturbation: Geochemical And Biological Evolution
During A Methane Release Event
MICHAEL HERMOSO, Université Pierre & Marie Curie

FNR / 05 / MA2 / 47

EUROCON 2005—The International Conference
on Computer as a Tool, Belgrade

21–24 November 2005

€ 870.20

A case study on successful IS project management; the quadruple constraint as the root
for project systems
EMILIO TUÑÓN NIETO, NAMSA

FNR / 05 / MA2 / 48

12th Asia–Pacific Software Engineering
Conference—APSEC'05, Taipei

15–17 December 2005

€ 1,496.55

A Formal Semantics of Timed Activity Diagrams and its PROMELA Translation
AMEL MAMMAR, Université du Luxembourg

FNR / 05 / MA2 / 49

International Conference on Intelligent Agents,
Web Technologies and Internet
Commerce—IAWTIC 2005, Melbourne

28–30 November 2005

€ 1,062.08

A Prototype for an Agent–Based Electronic Contracting using an Organizational Model
BENJAMIN GÂTEAU, CRP Henri Tudor

FNR / 05 / MA2 / 50

18th Annual Australian Finance and Banking
Conference, Sydney

14–16 December 2005

€ 1,189.95

The effect of exchange rate variability on U.S. shareholders' wealth
ALINE MULLER, Radboud University Nijmegen Nijmegen School of Management

FNR / 05 / MA2 / 51

Gordon Research Conference on Marine
Natural Products, Ventura, Californie 26 February–3 March 2006 € 1,150.00

Marine natural products as a potent source of NF-kappa B inhibitors
FLORENCE FOLMER, University of Aberdeen

MA3: Organisation of scientific conferences in Luxembourg**FNR / 05 / MA3 / 01**

X. Workshop Aggression:
Emotionen und aggressives Verhalten 3–5 November 2005 € 4,500.00

GEORGES STEFFGEN, Université du Luxembourg

FNR / 05 / MA3 / 02

Allen Gewalten zum Trotz sich erhalten–ADHS
im Lebenslauf 13–15 October 2005 € 9,432.00

GABRIEL DEIBENER, Lëtzebuenger Aktiounskrees Psychomotorik

FNR / 05 / MA3 / 03

25e Journée Nationale de Biologie Clinique 23–24 September 2005 € 4,630.00

ROBERT FASSOTTE, Société Luxembourgeoise de Biologie Clinique

FNR / 05 / MA3 / 05

1^{ère} conférence européenne des experts
en trichoptérologie 2–4 September 2005 € 7,800.00

MARC MEYER, Musée National d'Histoire Naturelle

FNR / 05 / MA3 / 06

1st International Recorder Conference 2–3 December 2005 € 9,108.00

GUY COLLING, Musée National d'Histoire Naturelle

FNR / 05 / MA3 / 07

Littérature et architecture 30 September–1 October 2005 € 1,502.12

FERDINAND STOLL, Société Luxembourgeoise de Littérature Générale et Comparée

FNR / 05 / MA3 / 08

Zweiter internationaler und interdisziplinärer
Workshop zur Frauen- und Genderforschung an der
Universität Luxemburg. Thema: DifférenceS-
DifférenceN-DifférenceS

2–3 December 2005

€ 6,716.00

CHRISTEL BALTES-LÖHR, Université du Luxembourg

FNR / 05 / MA3 / 09

Ambulante Pflege in Bewegung:
Pflege, Wohnen, Lebensqualität

19 October 2005

€ 3,237.00

PAUL WAGENER, Stéftung Hëllef Doheem

FNR / 05 / MA3 / 12

Sustainable Bioenergy

Spring 2006

€ 4,890.00

JÜRGEN SACHAU, Université du Luxembourg

FNR / 05 / MA3 / 13

22nd Annual Meeting OAO / GTOR / AOR
(réunion internationale du groupe de
travail des oncologues du Rhin Supérieur)

13–14 January 2006

€ 6,000.00

GUY BERCHEM, Société Luxembourgeoise d'Oncologie

FNR / 05 / MA3 / 15

Tuesday Seminars in Molecular Medecine 20 September–13 December 2005

€ 2,400.00

MARC DIEDERICH, Laboratoire de Biologie Moléculaire et Cellulaire du Cancer

FNR / 05 / MA3 / 16

Les Jeudis des Sciences (9^e semestre)

September 2005–January 2006

€ 1,800.00

MASSIMO MALVETTI, Université du Luxembourg

FNR / 05 / MA3 / 17

Astronomie à l'Européenne

5 July 2005

€ 790.00

MASSIMO MALVETTI, Université du Luxembourg

FNR / 05 / MA3 / 18

LUCEA 2005: Impacts of European Union Expansion
on Land Use Change and Environment Effects
in Agricultural Areas

5–7 September 2005

€ 9,174.00

LUCIEN HOFFMANN, CRP Gabriel Lippmann

FNR / 05 / MA3 / 19 Urbane Wasserwirtschaft	23 September 2005	€ 3,210.00
FERNAND REINIG, CRP Gabriel Lippmann		
FNR / 05 / MA3 / 23 Conférence francophone en gestion et ingénierie des systèmes hospitaliers – GISEH 2006	14–16 September 2006	€ 18,023.00
MAGALIE BRIQUET, CRP Henri Tudor		
FNR / 05 / MA3 / 24 The 18th Conference on Advanced Information Systems Engineering–CAISE '06	5–9 June 2006	€ 25,000.00
ERIC DUBOIS, CRP Henri Tudor		
FNR / 05 / MA3 / 25 Entrepreneuriat, Démographie d'entreprises: facteurs de succès	15 November 2005	€ 1,980.00
JEAN-CHARLES BERNACCONI, CRP Henri Tudor		
FNR / 05 / MA3 / 26 Quel accompagnement organisationnel pour la performance des projets d'innovation par les TIC?	November 2005	2,309.00
JEAN-CHARLES BERNACCONI, CRP Henri Tudor		
FNR / 05 / MA3 / 27 Psychobiologie des Schmerzes	12–14 September 2005	€ 9,162.00
FERNAND ANTON, Université du Luxembourg		
FNR / 05 / MA3 / 28 Journées des jeunes chercheurs/euses en littérature et linguistique françaises	19–21 January 2006	€ 5,232.00
FRANK WILHELM, Université du Luxembourg		
FNR / 05 / MA3 / 29 AIM 2006–11th International Conference of the Association Information and Management	7–9 June 2006	€ 25,000.00
FERNAND REINIG, CRP Gabriel Lippmann		

FNR / 05 / MA3 / 30

19^e Colloque International de l'ADMEE-Europe:
L'Evaluation au 21^e siècle

11–13 September 2006

€ 25,000.00

RÉGINALD BURTON, Université du Luxembourg

FNR / 05 / MA3 / 31

Eleventh Biennial Conference of the European
Network of Experimental
and Representative Basins (ERB)

19–23 September 2006

€ 25,000.00

LAURENT PFISTER, CRP Gabriel Lippmann

FNR / 05 / MA3 / 32

International Conference on Proteomics: Bridging the Gap Between Gene
Expression and Biological Function

11–14 October 2006

€ 25,000.00

LUCIEN HOFFMANN, CRP Gabriel Lippmann

FNR / 05 / MA3 / 33

6th International SPICE Conference—Software
Process Improvement and Capability dEtermination

3–5 May 2006

€ 11,670.00

BÉATRIX BARAFORT, CRP Henri Tudor

FNR / 05 / MA3 / 34

LinuxDays 2006

25–27 January 2006

€ 8,622.00

PIERRE PLUMER, CRP Henri Tudor

FNR / 05 / MA3 / 35

1st International Workshop on Engineering
Fault-Tolerant Systems—EFTS 2006

Spring 2006

€ 6,200.00

NICOLAS GUELF, Université du Luxembourg

FNR / 05 / MA3 / 36

Image J User and Developer Conference

18–19 May 2006

€ 9,468.00

PIERRE PLUMER, CRP Henri Tudor

FNR / 05 / MA3 / 37

Le Droit Pénal Européen des Affaires—Bilan
et Perspectives

15–17 June 2006

€ 6,600.00

STEFAN BRAUM, Université du Luxembourg

FNR / 05 / MA3 / 38

De la Mer du Nord à la Méditerranée: Franca Media,
une région au coeur de l'Europe (c. 840–c. 1050) 10 February 2006 € 6,243.00

MICHEL PAULY, Université du Luxembourg

FNR / 05 / MA3 / 39

Les processus de ratification de la Constitution
européenne. Débats, enjeux, perspectives 28–29 April 2006 € 8,000.00

LUKAS K. SOSOE, Université du Luxembourg

FNR / 05 / MA3 / 40

Traces de mémoire, mémoires des traces. Parcours
et souvenirs de la présence italienne au Luxembourg
et dans la Grande Région 12–13 May 2006 € 12,120.00

JOSEPH BOGGIANI, Convivium a.s.b.l.

FNR / 05 / MA3 / 41

Nei Tendenzen an der Recherche iwert
d'Lëtzebuerger Literatur 17 February 2006 € 2,270.00

CLAUDE CONTER, Centre National de Littérature

FNR / 05 / MA3 / 42

Les archives des migrations: état des lieux 25–26 May 2006 € 8,044.00

ANTOINETTE REUTER, Centre de Documentation sur les Migrations Humaines

FNR / 05 / MA3 / 43

L'interdisciplinarité des professions enseignantes,
éducatives et sociales–défis et perspectives
pour l'école de demain 7–8 April 2006 € 5,790.00

CHAREL SCHMIT, Association National des Communautés Educatives a.s.b.l.

FNR / 05 / MA3 / 44

Workshop: Vergangene und gegenwärtige Konstruktionen des Alters als Szenarien
des gegenwärtigen demographischen Wandels Cycle de conférences: Soziale Konstruktion
des Alters–Demographischer Wandel aus kulturwissenschaftlicher Perspektive
Workshop: 9–10 February 2006
Conferences: 22 February– 22 March 2006 € 6,660.00

DIETER FERRING, Université du Luxembourg

FNR / 05 / MA3 / 45		
Trust, Security and Reliability	January–June 2006	€ 4,242.00
THOMAS ENGEL, Université du Luxembourg		
FNR / 05 / MA3 / 46		
What are the Growth Factors for Biotechnology?	21 February 2006	€ 3,489.00
ROBERT KANZ, CRP-Santé		
FNR / 05 / MA3 / 47		
Public conference on Biotechnology	May 2006	€ 1,900.00
ROBERT KANZ, CRP-Santé		
FNR / 05 / MA3 / 49		
Les Maladies Mitochondriales	16–17 June 2006	€ 6,342.00
CHRISTIAN NUTTIN, Centre Hospitalier de Luxembourg		
FNR / 05 / MA3 / 50		
Interkulturalität, Intersektionalität	8–9 June 2006	€ 3,110.00
ULLA PETERS, Université du Luxembourg		
FNR / 05 / MA3 / 51		
La dimension sociale de l'aménagement du territoire Die soziale Dimension der Landesplanung	26–27 May 2006	€ 4,830.00
LUCIEN KERGER, Université du Luxembourg		
FNR / 05 / MA3 / 52		
Les Chercheurs Luxembourgeois à l'Etranger 2006	February–June 2006	€ 4,350.00
PIERRE SECK, Université du Luxembourg		
FNR / 05 / MA3 / 53		
Les Jeudis des Sciences (10 ^e semestre)	February–August 2006	€ 1,800.00
MASSIMO MALVETTI, Université du Luxembourg		

FNR / 05 / MA3 / 54

Cycle de 4 conférences dans le cadre du
10^e anniversaire du CDMH et du 10^e anniversaire
de la coopération avec la
Miami University Oxford/Ohio

20 February – 31 May 2006

€ 4,305.00

ANTOINETTE REUTER, Centre de Documentation sur les Migrations Humaines

FNR / 05 / MA3 / 56

Monthly Technology Transfer Meetings

2006

€ 4,176.00

ROBERT KANZ, CRP-Santé

MA4a: Publication of doctoral theses**FNR / 05 / MA4a / 01**

Phraseologie des Luxemburgischen. Empirische Untersuchungen
zu strukturellen, semantisch-pragmatischen und bildlichen Aspekten

€ 3,000.00

NATALIA FILATKINA, Universität Trier

FNR / 05 / MA4a / 02

Veritatis adjutor. Témoins et témoignage dans la procédure romano-canonique
et la pratique française des XII^e et XIV^e siècles

€ 3,000.00

YVES MAUSEN, Université de Montpellier 1

FNR / 05 / MA4a / 04

Foreign Exchange Risk Exposure

€ 2,621.87

ALINE MULLER, Université de Liège

FNR / 05 / MA4a / 05

Kanzlerkandidaten im Fernsehen. Eine Analyse der Berichterstattung
der Hauptabendnachrichten in der heißen Phase der Bundestagswahlkämpfe
1994 und 1998

€ 1,259.5

REIMAR ZEH, Friederich-Alexander Universität Erlangen-Nürnberg

FNR / 05 / MA4a / 06

Die Anfänge eines eigenen Nationalbewusstseins?
Eine politische Geschichte Luxemburgs von 1815 bis 1865

€ 2,045.95

PETER HACKER, Universität Bayreuth

FNR / 05 / MA4a / 07
An immunoprophylactic approach against environmental carcinogens € 551.31

STEFAN DE BUCK, Laboratoire National de Santé

FNR / 05 / MA4a / 08
Rôle de la mobilisation calcique dans la régulation de la réponse oxydative dans un modèle de neutrophiles humains € 720.00

SABRINA BRÉCHARD, Université du Luxembourg

FNR / 05 / MA4a / 09
Cellules NL et lymphocytes T régulateurs: interactions bidirectionnelles, effet(s) des neurotrophines et de la sérotonine € 560.00

JACQUES ZIMMER, CRP-Santé

FNR / 05 / MA4a / 10
Lernprozesse am Computer—theoretische und empirische Annäherungen € 1,723.99

PATRICK SUNNEN, Université du Luxembourg

FNR / 05 / MA4a / 11
Étude fonctionnelle de la signalisation intracellulaire médiée par l'intégrine IIbB3 au cours de l'interaction avec le fibrinogène immobilisé € 1,000.00

ALEXANDRE SALSMANN, Université du Luxembourg

MA4b: Publication of scientific works

FNR / 05 / MA4b / 01
GénEthique et dignité de l'espèce humaine € 1,937.50

LUKAS K. SOSOE, Université du Luxembourg

FNR / 05 / MA4b / 02
Contribution à la climatologie du Luxembourg € 2,455.22

CHRISTIAN RIES, Musée National d'Histoire Naturelle

FNR / 05 / MA4b / 03
EU Administrative Governance € 2,800.00

HERWIG HOFMANN, Université du Luxembourg

FNR / 05 / MA4b / 04 Die kleine Luxemburger Schweiz. Geheimnisvolle Felsenlandschaft im Wandel der Zeit	€ 3,000.00
CHRISTIAN RIES, Université du Luxembourg	
FNR / 05 / MA4b / 05 Actes du 6e congrès de la société d'études kantiennes de langue française	€ 2,000.00
ROBERT THEIS, Université du Luxembourg	
FNR / 05 / MA4b / 06 Kant et la France	€ 2,250.00
ROBERT THEIS, Université du Luxembourg	
FNR / 05 / MA4b / 08 Littérature et architecture	€ 3,000.00
FERDINAND STOLL, Société Luxembourgeoise de Littérature Générale et Comparée	
FNR / 05 / MA4b / 09 Actes des Journées des jeunes chercheurs / euses en littérature et linguistique françaises	€ 3,000.00
FRANK WILHELM, Université du Luxembourg	
FNR / 05 / MA4b / 10 Actes de la 1st International Recorder Conference	€ 1,000.00
GUY COLLING, Musée National d'Histoire Naturelle	
FNR / 05 / MA4b / 11 Article scientifique dans le journal «Clinical Neurophysiology»	€ 533.45
ANNE-MARIE SCHULLER, Université Catholique de Louvain-La-Neuve	
FNR / 05 / MA4b / 12 Facteurs d'influence et Evolution de la Bioéthique	€ 2,731.00
SUSANNE MICHEL, Centre de Recherche Public Santé	

FNR / 05 / MA4b / 13
Actes du X. Workshop Agression € 3,000.00

GEORGES STEFFGEN, Université du Luxembourg

FNR / 05 / MA4b / 14
Perspektiven einer linguistischen Luxemburgistik € 3,000.00

CLAUDINE MOULIN, Universität Trier

FNR / 05 / MA4b / 18
Atlas climatique du Grand-Duché de Luxembourg € 3,000.00

CHRISTIAN RIES, Musée National d'Histoire Naturelle

MA5: Preparation of European research projects

No financial contribution in 2005

MA6: Mobility of researchers

FNR / 05 / MA6 / 01
Recherche lépidoptérologique dans les collections du MNHNL et coopération
en matière de définition de régions naturelles (biogéographique) € 3,500.00

MARC MEYER, Musée National d'Histoire Naturelle 4 September–1 October 2005
Séjour du prof. Laszlo Rákosy de l'Université de Cluj (Roumanie) au Musée National
d'Histoire Naturelle

FNR / 05 / MA6 / 02
Les attitudes et comportements politiques des Portugais en Europe:
comparaison France-Belgique-Luxembourg € 3,362.00

FERNAND FEHLEN, Université du Luxembourg 1 September–31 October 2005
Séjour de Mme Malika Ghemmaz de l'Université de Lille à l'Université du Luxembourg

FNR / 05 / MA6 / 03
Application of radioactive tracers € 3,800.00

ANTOINE KIES, Université du Luxembourg, 14 July–14 August 2005
Séjour du Dr Gennadi Milinevski du Ukrainian Antarctic Centre de Kiev
à l'Université du Luxembourg

FNR / 05 / MA6 / 04

Strontium in environmental samples € 8,800.00

ANTOINE KIES, Université du Luxembourg 20 September–20 December 2005
Séjour du Dr Dessislava Dimitrova du Institute for Nuclear Research and Nuclear Energy
de Sofia à l'Université du Luxembourg

FNR / 05 / MA6 / 05

Algorithmes évolutifs appliqués à la sécurité (problème de détection d'intrusion)
et à l'ordonnancement € 3,750.00

PASCAL BOUVRY, Université du Luxembourg 1 September–21 September 2005
Séjour du prof. Franciszek Seredynski de l'Académie des Sciences de Pologne /
l'Institut d'informatique Pologne-Japon de Varsovie à l'Université du Luxembourg.

FNR / 05 / MA6 / 06

Contrôle actif-passif de vibrations et modélisation
de matériaux intelligents et structures adaptatives € 19,000.00

SALIM BELOUETTAR, CRP Henri Tudor, 1 July–31 December 2005
Séjour du prof. Azrar de l'Université de Tanger, Maroc au CRP Henri Tudor

FNR / 05 / MA6 / 08

Meshless methods: an efficient tool to improve
the flexibility of finite element method € 7,500.00

SALIM BELOUETTAR, CRP Henri Tudor, 23 May–23 July 2005
Séjour du prof. Ratish Kumar du Indian Institute of Technology de Kanpur au CRP Henri Tudor

FNR / 05 / MA6 / 09

Advanced Numerical Modelling in Solid Mechanics using Meshless Methods € 37,600.00

GASTON RAUCHS, CRP Henri Tudor, 1 April 2006–31 March 2007
Séjour du prof. Ratish Kumar du Indian Institute of Technology, Kanpur au CRP Henri Tudor

FNR / 05 / MA6 / 11

Modelling and Simulations of the Mechanical Behaviour of Polymers:
Effects of Strain Rate, Temperature, Pressure and Strain Induced Crystallization € 6,200.00

SALIM BELOUETTAR, CRP Henri Tudor, 1 March–30 April 2006
Séjour du prof. Said Ahzi de l'Université Louis Pasteur de Strasbourg au CRP Henri Tudor

FNR / 05 / MAG / 12**Computational Shear Actuation: Modelling and Evaluation**

€ 15,150.00

SALIM BELOUETTAR, CRP Henri Tudor, 1 April–31 August 2006

Séjour du prof. Ayech Benjeddou de l'Institut Supérieur de Mécanique de Paris
au CRP Henri Tudor**FNR / 05 / MAG / 13****210PB and 210Po in sediments and environmental samples**

€ 7,760.00

ANTOINE KIES, Université du Luxembourg, 1 March–31 May 2006

Séjour du prof. Marin Ivanov Ayrarov du Laboratoire de Radiochimie de Bulgarie
à l'Université du Luxembourg**FNR / 05 / MAG / 14****Gouvernance démocratique de la religion**

€ 27,000.00

ROBERT THEIS, Université du Luxembourg 1 January–30 September 2006

Séjour de M. Vincent Sohet de l'Université Catholique de Louvain à l'Université
du Luxembourg**FNR / 05 / MAG / 15****An Architecture-driven Methodology for Developing Fault-Tolerant Systems**

€ 3,300.00

NICOLAS GUELF, Université du Luxembourg, April 2006

Séjour du prof. Henry Muccini de l'Université de L'Aquila à l'Université du Luxembourg

FNR / 05 / MAG / 16**Regulation of the actin cytoskeleton organization and dynamics**

€ 3,000.00

ANDRÉ STEINMETZ, CRP-Santé, 1 month in 2006

Séjour de M. Clément Thomas du CRP-Santé à l'Université de Ghent

FNR / 05 / MAG / 17**Developing of models, algorithms and programming tools
for analysis of actin-based motility**

€ 13,200.00

EVELYNE FRIEDERICH, CRP-Santé, 1 March–30 June 2006

Séjour de M. Petr Nazarov de la Belarusian State University, Minsk au CRP-Santé.

MA7: Training in research project management

FNR / 05 / MA7 / 01

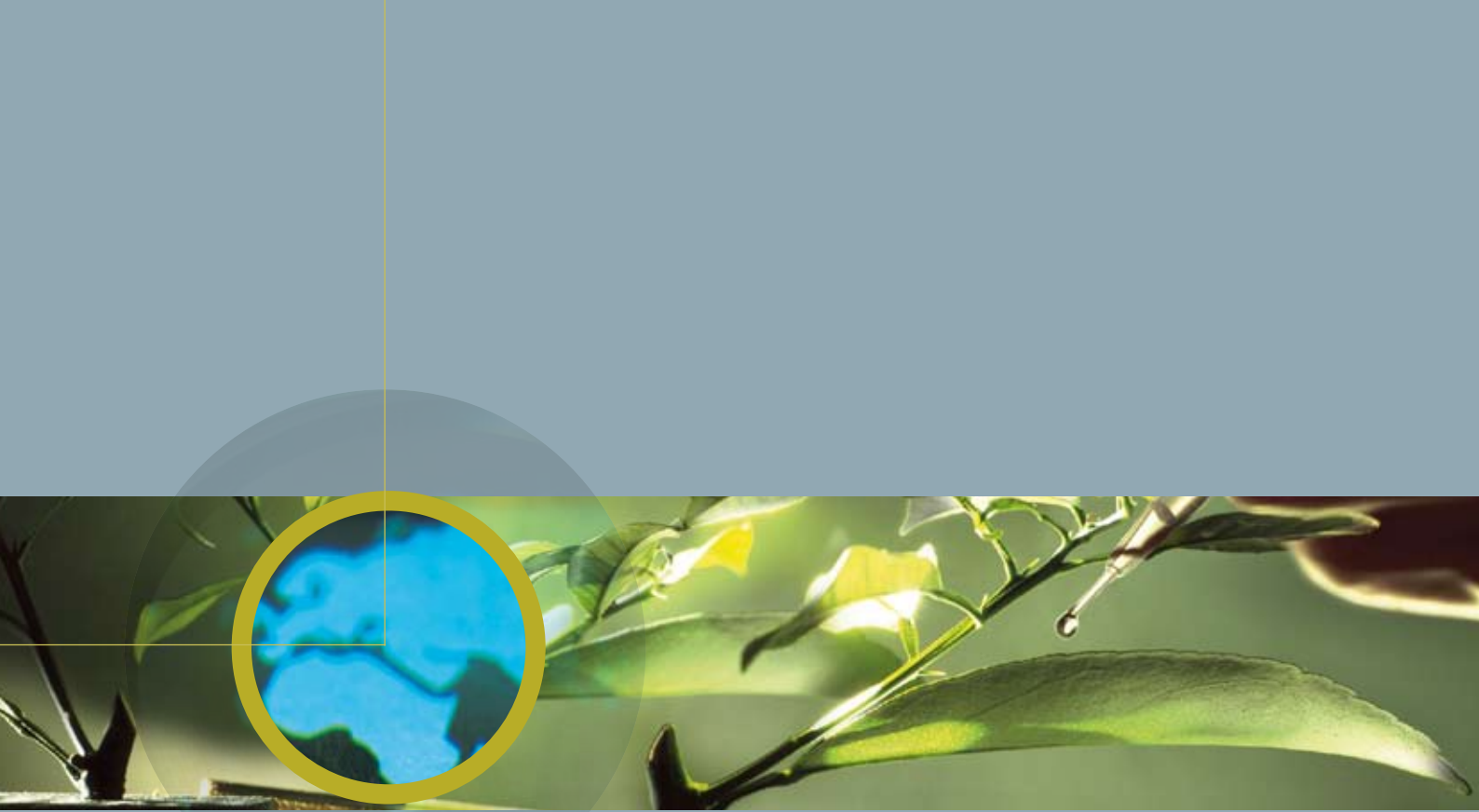
EARMA Training 2005 on Advanced International Project Management, Brussels € 1,258.10

MICHAEL SCHMITT, CRP Henri Tudor, 29–30 September 2005

FNR / 05 / MA7 / 02

EARMA Training 2005 on Advanced International Project Management, Brussels € 1,258.10

LAURENT VERGNOL, CRP Henri Tudor, 29–30 September 2005



International Cooperation in 2005

ESF – European Science Foundation

Participation in ESF Activities

Since 1 January 2002, the Fund has been a member of the European Science Foundation (ESF). The reason for joining the ESF was to facilitate and promote contacts and cooperation by Luxembourg researchers with their colleagues abroad.

National Representatives

In order to achieve this, following a call to the Luxembourg scientific community, the Fund nominated the following national representatives to sit on the ESF committees in 2002:

- Standing Committee for Physical and Engineering Sciences (PESC):
2002–2004: Serge Gillé, CRP Henri Tudor
2005–2007: Henri-Noël Migeon, CRP Gabriel Lippmann
- European Medical Research Councils (EMRC):
2002–2004: Nelly Kieffer, University of Luxembourg
2005–2007: Charles Pull, Luxembourg Hospital Centre
- Life, Environmental and Earth Sciences (LESC):
2002–2004: Lucien Hoffmann, CRP Gabriel Lippmann
2005–2007: Olivier Francis, European Centre of Geodynamics and Seismology
- Standing Committee for the Humanities (SCH):
2002–2005: Michel Polfer
2006: New call for representative
- Standing Committee for the Social Sciences (SCSS):
2002–2004: Antoine Haag
2005–2007: Georges Steffgen, University of Luxembourg
- Governing Council:
Raymond Bausch, National Research Fund

Participation by Luxembourg experts in the ESF networks thus makes it possible to strengthen scientific collaboration with other countries. Travel expenses arising from their participation are borne by the Fund.



The members of the Governing Council of the ESF meet in Luxembourg.

Activities

There have been fruitful exchanges with the ESF since 2002 as a result of the Luxembourg participation in the following ESF activities:

- **Integrated Approaches for Functional Genomics**

2003–2005: Evelyne Friederich, CRP Santé

Given the growing quantity of data on genome sequences emanating from the Human Genome Project and other projects at work in this field, the challenge to research is, in particular, to uncover genetic functions from information on DNA sequences. This new discipline is known by the name 'functional genomics'. As the technologies used in this field are very diverse, the present programme aims to integrate and form a network of European laboratories, which is essential if resources are to be used in an optimum way.

- **Frontiers in Functional Genomics: Technologies, Systems Biology and Applications**

2006–2010: Evelyne Friederich, CRP Santé

This new ESF programme addresses advances in functional genomics technologies, the integration of data through systems biology approaches, applications in biomedicine and the environment, and implications for society at large. Through various activity instruments, the programme will pursue the goal of promoting connections between:

- scientists involved in cutting edge developments in new functional genomics technologies, in order to strengthen European science,
- new technologies by encouraging innovative multidisciplinary and integrative approaches,
- academic groups and industry in order to optimise the economic impact of European research,
- a large panel of international organisations, European 6th Framework Projects and Networks, which include functional genomics in their remit,
- the scientific community involved in functional genomics research and the general public.

- **European Polar Board**

Participation by Luxembourg since 2003: Antoine Kies, University of Luxembourg

Established in 1995, the European Polar Board is the ESF's committee of experts in the field of research in the polar regions. It is an interdisciplinary programme bringing together highly diverse disciplines, including the earth sciences and environmental sciences.

- **Quantitative Methods in the Social Sciences**

2003–2007: Gaston Schaber, CEPS/INSTEAD

This programme aims to strengthen competence in Europe in the analysis of complex databases which are necessary to provide information to those responsible at political level and, in particular, to encourage the development of European networks of young researchers.

- **European Social Survey**

2003–2005: Uwe Warner and Monique Borsenberger, CEPS/INSTEAD

This is a biannual survey coordinated by the ESF and conducted in 23 countries, providing free access to the data of each of these countries for social science researchers. The first and second waves of the survey in 2003 and 2004/05, respectively, were financed under the Fund's multi-annual programme 'Living tomorrow in Luxembourg'.

- **Representations of the Past: National Histories in Europe (NHIST)**

2004–2007: Michel Margue, University of Luxembourg

This programme involves cooperation by more than 60 leading scholars from more than 20 European countries. Its agenda will be implemented by four teams which will investigate:

1. the institutions, networks and communities which produced national histories and were themselves influenced by the idea of national history,
2. the construction, erosion and reconstruction of national histories in their relationship with competing perceptions structured by the social divides in a society (such as class, race/ethnicity, religion and gender),
3. national histories and their relationship with regional, European and world histories, and
4. national histories in their spatial relationships and mutual interdependency with other national histories.

- **EUROQUAL: Qualitative Research in the Social Sciences in Europe**

2006–2010: Helmut Willems, University of Luxembourg

ESF supports a four-year programme on qualitative methods in the social sciences in Europe in order to: a) advance knowledge of the methods of analysing increasingly complex social science data; b) increase the human capacity to analyse such data; and c) advance comparative qualitative social science. A series of integrated workshops and seminars will provide training for junior social scientists in the latest methods of analysis of social scientific data and also provide the opportunity for senior researchers working through Europe at the cutting edge of analysis and methodological innovation to share their research.

The workshops will include:

- collection and analysis of visual data;
- collection and analysis of narrative and discourse data;
- development and use of archives of oral history and other qualitative data types;
- integration of spatial analysis into ethnographic and archival research;
- use of innovative information technologies for analysing, sharing and disseminating qualitative research;
- use of qualitative data for developing and evaluating evidence-based social policy and practice;
- use of multi-method research designs to integrate qualitative and quantitative methodologies.

- **EUROCORES**

The EUROCORES programme (EUROpean Science Foundation Collaborative RESearch programme) provides support for research projects involving a number of international partners. Projects are subject to an international evaluation administered by the ESF, while financing is provided by the participating organisations at national level. The National Research Fund plans to increase its participation in future EUROCORES programmes initiated by the ESF via its multi-annual programme 'Promotion of International Cooperation (INTER)'. To this end, a call was issued in order to gauge the interest of Luxembourg's research community in participating in one of the following five EUROCORES programmes proposed by the ESF:

- RNA Quality: Quality Control of Gene Expression – RNA surveillance
- EuroQUAM: Cold Quantum Matter
- Inventing Europe: Inventing Europe. Technology and the Making of Europe, 1850 to the Present
- CORISK: Coping with Risk: Vulnerability, Risk Assessment and Decision Making in an Uncertain Europe
- TECT: The evolution of cooperation and trading: from microbes to man

Following this call, the University of Luxembourg submitted a declaration of interest in participating in the EUROCORES CORISK programme. A decision on whether to participate in this EUROCORES programme will be taken early in 2006.

Detailed information on all the programmes, activities and other opportunities for cooperation within the framework of the ESF is available at www.esf.org.

ERCIM – European Research Consortium in Informatics and Mathematics

Participation in ERCIM Activities

ERCIM is a consortium bringing together the research institutes of 18 European countries in the field of information technology and applied mathematics.

ERCIM aims to:

- strengthen the European Community in the fields of information and communication science and technology and applied mathematics;
- identify emerging research fields in Europe;
- assist its partners in their relations with the European Community and other international bodies;
- foster the execution of international projects;
- promote synergies between complementary programmes; and
- bring together resources and expertise in order to strengthen Europe's position in research and innovation transfer.

The main decision-making bodies of ERCIM are the Board of Directors and the Executive Committee, which coordinate the consortium's activities and act as intermediaries between the national research communities and ERCIM.

Luxembourg Representatives in ERCIM Committees and Working Groups

Luxembourg representatives in the committees and working groups of ERCIM are as follows:

- Board of Directors:
2002–2005: Eric Dubois, CRP Henri Tudor
- Executive Committee:
2002–2005: Nicolas Guelfi, University of Luxembourg
- Editorial Board:
2002–2005: Patrik Hitzelberger, CRP Gabriel Lippmann
- Working Group on Electronic Commerce:
2002–2005: Benoît Otjacques, CRP Gabriel Lippmann
2002–2005: Djamel Khadraoui, CRP Henri Tudor
- Working Group on Environmental Modelling:
2002–2005: Henri-Michel Cauchie, CRP Gabriel Lippmann
2002–2005: Paul Schosseler, CRP Henri Tudor
- Task Force of European Liaison Officers:
2002–2005: Béatrix Barafort, CRP Henri Tudor
- Working Group on Applications of Numerical Mathematics in Science:
2002–2005: Salim Belouettar, CRP Henri Tudor

- Working Group on e-Learning:
2002–2005: Luc Vandennebeele, CRP Henri Tudor
2002–2005: Denis Zampunieris, University of Luxembourg
- Working Group on Informatics and Mathematics Applied to Interventional Medicine:
2004–2005: Pierre Plumer, CRP Henri Tudor (SANTEC)
- Working Group on Dependable Software – Intensive Systems:
2004–2005: Reza Razavi, University of Luxembourg
2002–2005: Steffen Rothkugel, University of Luxembourg
- Working Group on Soft Computing:
2002–2005: Pierre Emile Mousel, University of Luxembourg
2004–2005: Pascal Bouvry, University of Luxembourg
- Working Group on Semantic Web:
2004–2005: Thibaud Latour, CRP Henri Tudor
- Working Group on Rapid Integration of Software Engineering Techniques:
2004–2007: Nicolas Guelfi, University of Luxembourg
- Working Group on Data and Information Mining:
2005–2008: Christoph Schommer, University of Luxembourg
- Task Force on ERCIM Fellowships/Bursaries:
2002–2006: Ulrike Kohl, National Research Fund

A new call for representatives will be issued in 2006.

ERCIM Fellowships

ERCIM fellowships are intended to attract young researchers of post-doctoral level from anywhere in the world to work on a research problem at two research centres in the ERCIM network. Applicants wishing to benefit from these fellowships send their applications at the indicated deadlines (2 per year) to ERCIM using a form which can be downloaded from www.ercim.org. ERCIM then draws up a list of all applications submitted, together with applicants' CVs and project proposals, which is then forwarded to ERCIM's partner institutions, including the National Research Fund.

Twice a year the Fund issues calls for the award of a fellowship in order to host a researcher for a period of nine months in an institute in Luxembourg and, for a further period of nine months, in another ERCIM institute abroad.

In 2005, the following candidate was selected for a fellowship financed by the Fund:

- Rod McCall (of British nationality), for a nine-month period (from 1.10.2005 to 30.06.2006) at the CRP Gabriel Lippmann (contact: Benoît Otjacques) and an additional nine-month period at the Fraunhofer Gesellschaft in Germany (contact: Erich Vorwerk);

Further information can be found on ERCIM's website: <http://www.ercim.org/activity/fellows/fellowship.html> or, alternatively, on the National Research Fund website: www.fnr.lu.

COST – European Cooperation in the Field of Scientific and Technical Research

Luxembourg Participation in COST

COST is a European cooperation measure in the field of scientific and technical research, established in 1971 at the initiative of France. COST coordinates the research activities of 34 countries in the geographical area of Europe in a very wide range of fields.

Projects presented at the initiative of researchers involve between five and 25 countries (15 on average). Financing is restricted to coordination expenses (meetings between teams, publication expenses, short travel assignments of young researchers, etc.); the cost of the research itself is borne by each country under national programmes.

At the request of the Ministry of Culture, Higher Education and Research (MCESR), the Fund issued a call to the scientific community in Luxembourg in 2002 for the nomination of Luxembourg representatives to sit on the technical committees of COST. Since then, the Fund has reimbursed the expenses incurred by representatives to attend COST meetings, where those expenses were not already borne by COST.

National COST coordination is provided by the Ministry of Culture, Higher Education and Research.

National representatives:

- National coordination:
Josiane Entringer, Ministry of Culture, Higher Education and Research
- Technical Committee on Social Sciences and Humanities:
Lony Schiltz, University of Luxembourg
- Technical Committee on Agriculture, Food Sciences and Biotechnology:
Jean François Hausman, CRP Gabriel Lippmann
- Technical Committee on the Environment:
Lucien Hoffmann, CRP Gabriel Lippmann
André Weidenhaupt, CRP Henri Tudor
- Technical Committee on Medicine and Health:
Claude Muller, National Health Laboratory
- Technical Committee on Meteorology:
Laurent Pfister, CRP Gabriel Lippmann

A new call for representatives will be issued in 2006, following the restructuring of COST.

Detailed information on COST activities and Luxembourg participation in the various COST actions can be found on <http://www.cost.esf.org/>.

ERA-NET – EUROPEAN RESEARCH AREA NETWORKS

Participation in ERA-NET

In 2005, the National Research Fund continued to cooperate in three ERA-NET networks financed by the European Union's Sixth Framework Programme in order to strengthen the European Research Area by bringing together organisers of research programmes in various European countries.

The networks in which the Fund participates are:

- ERA-NET MATERA – Coordinated Action from 1 February 2005 to 31 January 2009;
- ERA-NET ERA-AGE – Coordinated Action (from 1 March 2004 to 28 February 2009);
- ERA-NET Neuron – Coordinated Action, currently undergoing evaluation.

ERA-NET MATERA

Sixteen organisations from 14 countries financing public and private research have been meeting since 1 February 2005, in connection with the ERA-NET MATERA Coordinated Action (financed by the Sixth Framework Programme), to prepare joint calls in the field of materials science and engineering. The National Research Fund is Luxembourg's contract partner.

Other organisations and countries participating are as follows:

- Tekes (Finland, coordinator);
- AKA (Finland);
- IWT (Flanders, Belgium);
- DGTRE (Wallonia, Belgium);
- MIWFT (Germany, North Rhine-Westphalia);
- RANNIS (Iceland);
- EI (Ireland), MIUR (Italy);
- LCS (Lithuania);
- RCN (Norway);
- WUT (Poland);



First MATERA meeting in Helsinki on 15 February 2005

- MHEST (Slovenia);
- KTI/CTI (Switzerland);
- Invest NI (Great Britain, Northern Ireland); and
- MOST (Israel).

It is planned that halfway through 2006, a pilot call will be issued to encourage researchers to increase their cooperation at international level. The pilot call is a MATERA Partner-funded initiative in which the individual Partner agencies fund those research project partners from their own nation/region in accordance with their own Programme participation rules. The National Research Fund will be responsible for financing Luxembourg's part in the projects. MATERA publishes regular newsletters and advertises its activities on www.matera.fi.

ERA-NET ERA-AGE

Since all the countries participating in this network are aware of the major changes taking place as a result of the ageing of populations in industrialised societies, the chief aim of the ERA-AGE network is

- to review at European level research activities in this highly interdisciplinary field, and
- to promote cooperation between the partners in the network through the development of future joint programmes.

The ERA-AGE network is coordinated by Professor Alan Walker of the University of Sheffield and includes 14 European partners.

The partners involved in the network are as follows:

- University of Sheffield (UK);
- Austrian Academy of Sciences (Austria);
- Finnish Academy of Sciences (Finland);
- CNAV/Direction des recherches sur le vieillissement (France) ;
- National Research Fund (Luxembourg);
- Netherlands Organisation for Health Research and Development (Netherlands);
- Research Council of Norway (Norway);
- Executive Agency for Higher Education and Research Funding (Romania);
- Swedish Council for Working Life and Social Research (Sweden);
- Projektträger Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany);
- Medical Research Administration/Ministry of Health (Israel); and
- Istituto Superiore di Sanità (Italy).

In 2004 and 2005 the network focused on creating a database of multi-annual programmes and other significant activities in the field of research on ageing, highlighting examples of good practice. In 2006 it is planned to develop joint research programmes for which partners will find future financing from their own resources or by cooperating with interested national partners.

Furthermore, each network partner undertakes to organise national forums between institutions financing activities in the field of research on ageing, in order to exchange information at national and international level with a view to improving coordination of activities. The first national forum in Luxembourg was organised by the Fund on 4 October 2005 in cooperation with the University of Luxembourg. ERA-AGE publishes regular newsletters and advertises its activities on www.era-age.group.shef.ac.uk.

First National Forum on Ageing Research, 4 October 2005 in Luxembourg

In the context of its participation in ERA-AGE, the National Research Fund organised the 'First National Forum on Ageing Research' on 4 October 2005 in cooperation with the University of Luxembourg. In the course of the afternoon session, Professor Alan Walker of the University of Sheffield, coordinator of the ERA-AGE network, presented ERA-AGE's activities. This first forum was attended by over 100 participants from a variety of backgrounds, including representatives of the National Research Fund and the University of Luxembourg, the Ministries of Research, Family Affairs, Health and Social Security, researchers from various institutions, union representatives, and representatives of hospitals and associations working with older people. The morning sessions were devoted to presentation of major research projects in the field of ageing in Luxembourg; in the afternoon sessions, participants were divided into five working groups with the aim of determining what needs exist in the field of ageing research:

- Prevention and active ageing
- Independence and dependence in old age
- Diagnosis and treatment of age-related illnesses
- Intergenerational relations
- Social security and employment models.

A report containing the recommendations of the various working groups will be published early in 2006, and it is intended to organise a 2nd forum at the end of 2006 or early in 2007.

ERA-NET Neuron

The purpose of ERA-NET Neuron is to set up a network linking national and regional European research projects in the field of diseases connected with the neurosciences. Neurological disorders affect over a billion persons throughout the world. The priority fields of the research programmes supported by the establishments involved in this project are neurological degeneration and neural repair.

The proposal to the European Commission, in which the National Research Fund was involved, was submitted in the Sixth Framework Programme's call of 2 November 2005 and had over ten partners:

- Deutsches Zentrum für Luft- und Raumfahrt e.V., PT-DLR, Germany;
- National Research Fund, FNR, Luxembourg;
- Ministry of Scientific Research and Information Technology, MSRIT, Poland;
- Israel Ministry of Health, CSO-MOH, Israel;
- Austrian Science Fund, FWF, Austria;
- Institut national de la santé et de la recherche médicale, INSERM, France;
- Academy of Science, AKA, Finland;
- Swedish Research Council, SRC, Sweden;
- Medical Research Council, MRC, United Kingdom;
- Ministry of Education and Research, MER, Romania;
- Centre National de la Recherche Scientifique, CNRS, France; and
- Ministry of Health, Italy.

Despite a positive evaluation of ERA-NET, negotiations on financing by the Commission have not yet been finalised.

Other International Cooperation

Cooperation with the United States' National Science Foundation

The Fund has been a partner in a cooperation network in the field of materials research coordinated by the National Science Foundation (NSF, www.nsf.org) since 2003. In October 2004 the Fund took part in the call for joint project proposals in the field of materials between the NSF and European countries. Neither of the two project proposals involving the participation of Luxembourg was taken up. The Fund took part in a new call in October 2005; one project was submitted to the FNR and is currently being evaluated. The results of the evaluation will be published in the first half of 2006 (www.nsf.org).

European Union Research Organisations' Heads of Research Councils (EUROHORCs)

EUROHORCs was set up in 1992 as an informal association of national research councils and comparable public non-university research organisations in the Member States of the European Union. EUROHORCs is an independent forum and network bringing together the presidents or chairmen of such organisations in order to discuss subjects of common interest and in order to strengthen the influence of national and European Community research organisations on research policy in Europe and on the development of the European Research Area. Mr Jean-Frank Wagner, President of the Scientific Council, represented the National Research Fund at the half-yearly meetings of EUROHORCs on international cooperation (www.eurohorcs.org).

Annual Meeting of the Advisory Councils for Research and Technology

On 15 and 16 June 2005, the National Research Fund participated in Cambridge in the annual meeting of Presidents and Secretaries General of the Advisory Councils for Research and Technology of the countries of the European Union. The theme of the meeting was 'Linking Business with Science and Technology: the Science Base-Industry Interface'. Delegates from Austria, Belgium, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Lithuania, Luxembourg, the Netherlands, Poland, Portugal, the Slovak Republic and the United Kingdom first presented the activities of their councils and then went on to discuss measures to be taken in order to reinforce the link between research and the industry.

European Network on Research Careers (ENRC)

On 6 April 2005, the National Research Fund took part in the fourth meeting of the European Network on Research Careers (ENRC). The ENRC is coordinated by Dr Beate Scholz of the Deutsche Forschungsgemeinschaft, and once or twice a year it brings together representatives of foundations or ministries from some 20 European countries to exchange information on programmes or policies promoting scientific careers (e.g. doctoral or post-doctoral grants). The subject of this fourth meeting was 'The Future of PhD training in Europe in the light of the Bologna Process'. Representatives were also able to exchange information with Mr Georges Bingen of the European Commission on the status of signature by Member States of the European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers.



ICSU's General Assembly in China.

International Council of Scientific Unions (ICSU)

On 9 September 2005, the National Research Fund took part in the meeting of the European members of the ICSU in Madrid, to discuss and coordinate European activities within the ICSU. On 16–23 October 2005, the Fund also took part in the ICSU's General Assembly in Shanghai and Suzhou, in which the ICSU's strategy for the next five years and research priorities at world level were discussed. The Fund's membership in the ICSU will facilitate international cooperation with non-European countries (see www.icsu.org).

INTER Programme – Promotion of International Cooperation

In order to reinforce and facilitate the cooperation between Luxembourg researchers and international scientists, the Fund has developed a new multi-annual research programme for the promotion of international cooperation (INTER). INTER's main utility is the added flexibility by which the FNR can support Luxembourg research in the priority domains of the FNR, and permit access to the various funding initiatives that present themselves in the European context and worldwide (for further details, see Chapter II of the present report).



*Her Excellency Mrs Pranchère with eminent Japanese scientists
and Mr Wagner and Mr Bausch from Luxembourg*

Visits to Japan, Bulgaria and Hungary

In September 2005, with the help of the Luxembourg embassy in Japan, Mr Jean-Frank Wagner, President of the National Research Fund's Scientific Council, and Mr Raymond Bausch, Secretary General, paid an exploratory visit to Japan to promote cooperation between researchers in Luxembourg and Japan. During their visit, Mr Wagner and Mr Bausch met representatives of the Japan Society for the Promotion of Science, the Tokyo University of Science, the National Institute of Advanced Industrial Science and Technology, the Japan Science and Technology Corporation, the Institute of Physical and Chemical Research, the Institute of Medical Science of the University of Tokyo, and the National Institute of Science and Technology Policy.

These initial contacts in Japan were reinforced by the 'Science and Technology in Society Forum' in Kyoto on 11–13 September 2005, in which Mr Bausch took part, together with another 500 eminent scientists from all over the world.

Following an invitation by the Bulgarian National Science Fund, Mr Wagner attended the conference 'National Science Foundation's Views and Futures' in Sofia from 29 to 30 September 2005 where he presented the Fund's activities. From 10 to 12 November 2005, Mr Wagner also attended the World Science Forum on 'Knowledge, Ethics and Responsibility' in Budapest.



Other Activities in 2005

Call for Proposals for New Multi-Annual Research Programmes and Preparation of the Forecasting Exercise FNR Foresight

Since the Fund's first multi-annual research programmes will be concluded in 2008, a call for proposals was launched at the beginning of 2005 with a view to obtaining proposals either for new programmes or for an extension of some of the current programmes. A total of 45 programme proposals were submitted, distributed across a variety of subject areas.

In order for the Fund to be able to incorporate the analysis of these priorities into a global strategy, while also taking account of the recommendations of a panel of international experts who met on 10 December 2004, the Fund has decided to undertake a forecasting exercise (FNR Foresight) in 2006 (see Chapter IV: 'Activities planned for 2006').

Calls for Project Proposals under the NANO, EAU and SECOM Programmes

In 2005, the Fund issued second calls for project proposals under the NANO and EAU programmes, with a budget of 700,000€ and 195,370€ respectively. A third call was issued under the SECOM programme, with a budget of 792,227€. Specific information on the selected projects is published on the Fund's website www.fnr.lu.

Establishment of a Management System

In order to optimise the work of the Secretariat, in 2004 and 2005 the Fund established a management platform for its administrative activities. The system has been operational since 1st September 2005.

Presentation of Research Results

The National Research Fund's Annual Report for 2004 was presented on 9 May 2005. Some research results achieved under the multi-annual programmes in progress were presented in the Fund's offices at the Chamber of Commerce in Kirchberg by the officials responsible for research projects under the programmes SECOM, NANO, EAU, BIOSAN and VIVRE, in the presence of around 180 researchers and guests from political, economic and social circles.



Presentation of the Fund's Annual Report 2004

Exhibition in Brussels: 'A Spotlight on Research in Luxembourg'

As part of the Luxembourg Presidency of the European Union (1 January 2005 – 30 June 2005), the Ministry of Research and the National Research Fund were keen to take advantage of the Grand Duchy's time in the spotlight to present Luxembourg's research centres and research activities. In cooperation with the Ministry of Culture, Higher Education and Research, the Ministry of Economy and Foreign Trade and Luxinnovation, the National Research Fund organised an exhibition on research in Luxembourg. The exhibition was opened in Brussels on 17 March 2005 in the presence of the Commissioner Janez Potočnik, the Minister of Research François Biltgen, the Minister of Economy and Foreign Trade Jeannot Krecké and 100 other international guests. With the aid of some thirty panels and twenty showcases, the exhibition presented

- the main players in public-sector research,
- firms active in the field of research,
- innovative research projects and products developed in Luxembourg,
- programmes, instruments and networks supporting research and innovation in Luxembourg, and
- Luxembourg as a land of enterprise and technology.



Opening of the exhibition in Brussels on 17 March 2005



'Researchers in Europe 2005' Initiative and 'Firwat nët Fuerscher?' Campaign

The aim of the European initiative 'Researchers in Europe 2005' was to present the many facets of the research profession to the public at large and in this way to raise young people's awareness vis-à-vis scientific careers.

The European campaign was launched at the National Museum of Natural History on 8 June 2005, in the presence of H.R.H. Grand-Duke Henri and Janez Potočnik, European Commissioner for Science & Research, and many other personalities.

As part of the European initiative, Luxembourg carried out the project 'Firwat nët Fuerscher?', with the participation of the following partners: the National Museum of Natural History (coordinator), the Ministry of National Education/SCRIPT, the Luxembourg Association of Young Scientists, the University of Luxembourg (Department of Women's Issues and Equal Opportunities and the Faculty of Science, Technology and Communications), Luxinnovation GIE, the Ministry of Culture, Higher Education and Research, the National Research Fund, the Association Recherches Scientifiques Luxembourg a.s.b.l., the National Health Laboratory (Department of Immunology), the CRP Santé, the CRP Henri Tudor and the CRP Gabriel Lippmann.



Launching of the European Campaign 'Researchers in Europe 2005' in Luxembourg

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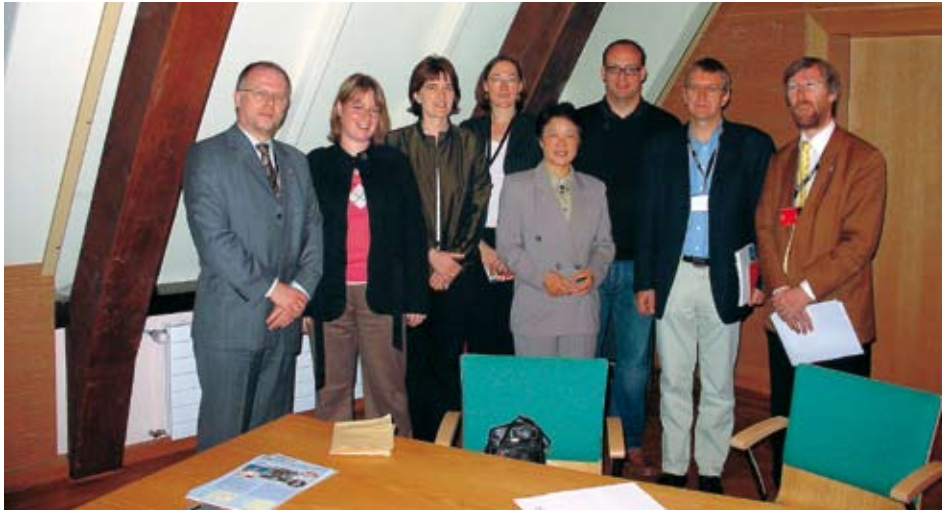
Portuguese researchers visit the Lycée Technique in Esch

The following activities took place as part of Luxembourg's 'Firwat nët Fuerscher?' campaign:

- Qualitative survey among young people to gain a better understanding of their subject choices and vocational aspirations; the results of this survey were presented by Mrs Simone Zunker, University of Luxembourg, in an evening event at the National Museum of Natural History on 7 November 2005.
- Production of a guide for young researchers (profession: researcher) aimed at 16-to-25-year-olds; this guide was distributed during the Science Festival and other campaign activities in Luxembourg's schools.
- 22–30 October 2005: specific activities as part of the Science Festival (e.g. the activity 'Forsche forschende Frauen', aimed at establishing individual partnerships between female secondary school students preparing for the baccalaureate and female researchers in firms or research centres).
- Supplement on research in Luxembourg in the weekly newspaper D'Land on 30 September 2005.
- Special edition of Pannewippchen, the Museum's bi-monthly magazine for children aged 6–12, in September 2005.
- From 7 to 11 November 2005: 'Researchers in schools' activity, in which some 20 researchers in Luxembourg took part; it was so successful with schools that the organisers plan to repeat it in 2006; the researchers' profiles can be consulted at www.fuerscher.lu.
- From 22 to 23 November 2005: Descobrir a ciência: series of talks by six Portuguese researchers in the Lycée Classique Diekirch, the Lycée Technique in Bonnevoie, the Fieldgen Private School, the Lycée Technique in Esch and the Lycée Ste Sophie.
- Development of the www.fuerscher.lu website, designed to remain active after the campaign.

Science Festival 2005

The 5th Science Festival was held on 22–30 October 2005 at the Abbaye de Neumünster Cultural Centre and at the National Museum of Natural History. Over 25,000 visitors attended the over 100 activities on offer, such as workshops, talks, exhibitions, shows and science buses. The National Research Fund supported the Festival, which it organised jointly with the National Museum of Natural History.



Dr Chiaki Mukai with members of the Fund and Mr Decker from the Ministry of Research



The Science Festival's special guest: ASIMO

The programme of the 2005 Festival included, among other things, two international initiatives, namely the International Year of Physics (Einstein Year) and '2005 – year of exchanges between the peoples of the EU and Japan'. A notable guest invited by the Fund was ASIMO, Honda's humanoid robot, which performed over the first weekend. In addition, several eminent Japanese researchers, such as the female Japanese astronaut Dr Chiaki Mukai, gave scientific talks in cooperation with the Japanese Embassy in Luxembourg.

The Science Festival also gave ESA (European Space Agency) an opportunity to showcase its many activities in the field of space. Luxembourg-based firms in the automotive sector also provided part of the programme by presenting their research and demonstrating the importance of industrial innovations to everyday life.

Like previous festivals, the Science Festival 2005 hosted a large number of scientific workshops led by participants from France, Germany, Belgium and the UK. The Festival once again highlighted the growing interest in science and technology among the population of Luxembourg. The next Science Festival – under a slightly different form – is planned for 2007, in the context of ‘Luxembourg – European Capital of Culture’, with support from the National Research Fund.



Workshop ‘La mémoire des grains de sable’

Second Call for Project Proposals under the VIVRE Programme

On 16 December 2005, the Fund launched the 2nd call of the VIVRE Programme in the presence of around 80 Luxembourg researchers and the media. The objectives of the 2nd call are among others the creation of new competences in the social sciences and humanities domain in Luxembourg and the development of international collaborations in order to guarantee the scientific quality of the projects. Additionally, the VIVRE programme aims to start or develop research on subjects that are of strategic importance for the country. The deadline for submission of applications is 15 March 2006.

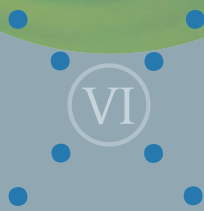
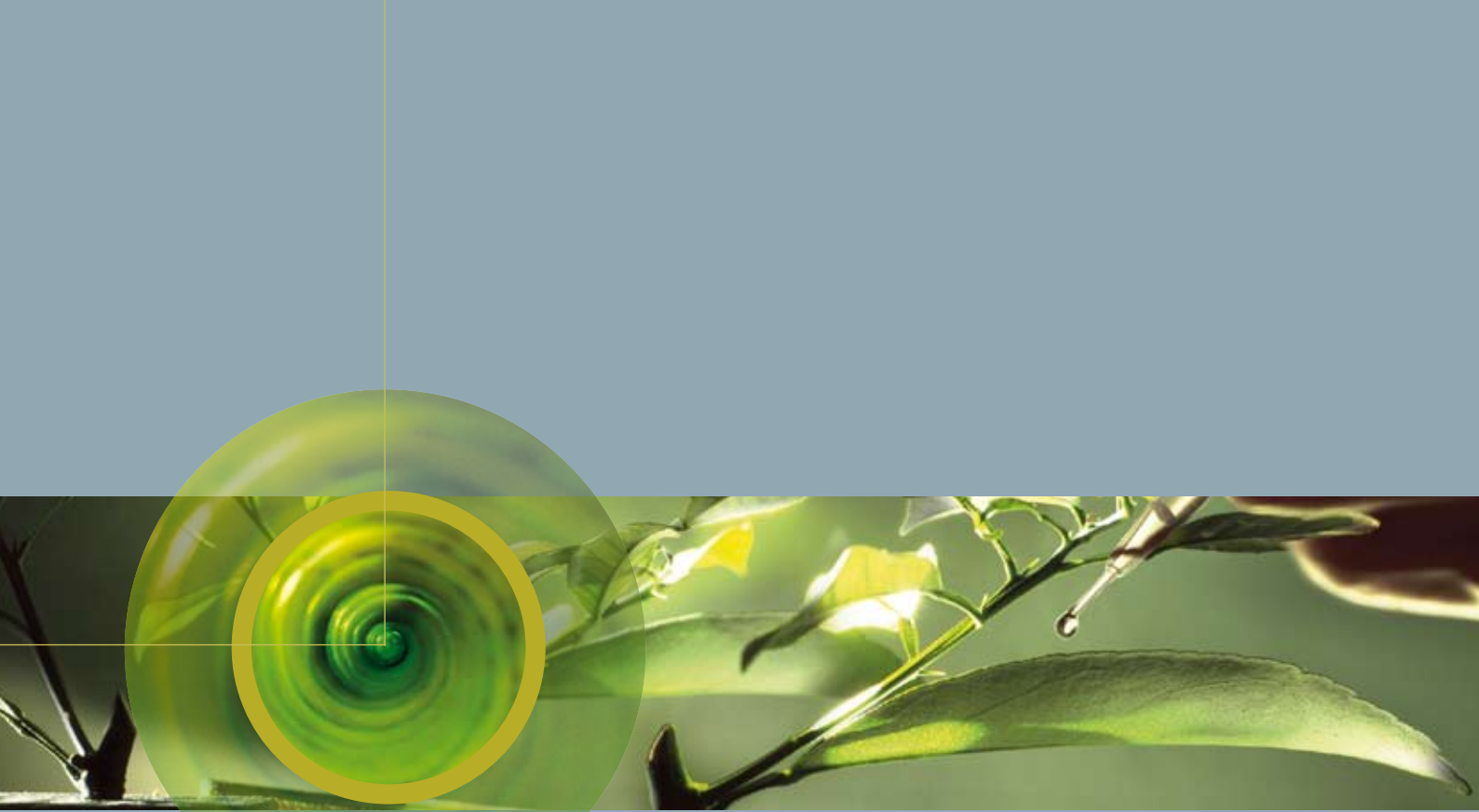
Preparation of Reports on Research on RTL Télé Lëtzebuerg

In November 2005, the National Research Fund signed a contract with RTL Télé Lëtzebuerg with a view to producing a series of brief reports, each lasting about one minute, on research activities in Luxembourg (see Chapter IV: ‘Activities planned for 2006’).

Foire de l’Étudiant and Salon du recrutement meet@uni.lu

Informing the general public, and above all young people, on research activities in Luxembourg and encouraging students of all ages to take up a career in research is clearly a priority for the National Research Fund. To that effect the Fund joined up with other players from the public research sector – the Ministry of Research, Luxinnovation, the CRP Gabriel Lippmann, the CRP Henri Tudor, the CRP Santé, the initiative ‘Firwat net Fuerscher?’, the Science Club, and the initiative ‘Jeunes Scientifiques’ – to present research in Luxembourg to high school students in the framework of the ‘Foire de l’étudiant’ on 17 and 18 November 2005.

The Fund was also present at the first ever ‘Salon du recrutement meet@uni.lu’, organised by the University of Luxembourg on 20 December 2005, where it presented research activities in Luxembourg to university students from the Grand-Duchy and abroad.



Activities Planned for 2006

Forecasting Exercise FNR Foresight

After its preparation in 2005, the forecasting exercise FNR Foresight will be officially launched on 20 January 2006. Generally speaking, the FNR Foresight will aim to consolidate the views of the main parties involved in public and private research in Luxembourg, and to identify for the public sector the research fields and priority aims of medium- and/or long-term interest to society in Luxembourg. Based on this, the National Research Fund's new multi-annual research programmes starting in 2007 will be drawn up.

What distinguishes a foresight exercise from an analysis of the future or a 'traditional' planning activity is its participative element, i.e. its emphasis on networking and on consulting all the players involved, in order to reach a consensus, a shared vision of the future. This vision will then make it possible to define the National Research Fund's next research programmes.

Aided by CM International, a European group of innovation and technology management consultants, the National Research Fund will use various methods in order to successfully complete this exercise: interviews, questionnaires, factual research, discussion forums on www.fnrforesight.lu, etc.

In summer 2006, the Fund will propose a list of research areas to the Minister. In a 2nd phase, national and international experts will decide on the priority research aims for each of these areas. At the end of 2006, the National Research Fund will then submit proposals for its new multi-annual research programmes to the Government with a view to getting them under way in 2007.

Reports on Research on RTL Télé Lëtzebuerg

In November 2005, the National Research Fund signed a contract with RTL Télé Lëtzebuerg with a view to producing a series – called 'Quantastesch' – of brief reports, each lasting about one minute, on research activities in Luxembourg. The first series of six reports will begin on 8 March 2006. On the same day, the broadcast Kapital will be transmitted, on research in Luxembourg. These reports are primarily aimed at drawing the attention of the public at large to the research activities that exist in the Grand Duchy, but they are also aimed at arousing an interest in science among young people, and perhaps encouraging them towards a career in research. Once the first six reports have been transmitted, the National Research Fund will issue a call for proposed topics, in which all the players involved in public-sector research in Luxembourg will be able to submit proposals while fulfilling the main selection criteria – topics must be of high scientific quality and, above all, capable of arousing the interest of the public at large. The reports will be available on the Fund's website and a DVD will be produced containing the complete series in Luxembourgish and English.

Second Call for Project Proposals under the VIVRE Programme

As part of the 'Living Tomorrow in Luxembourg' (VIVRE) programme, launched in 2002, the Fund issued a second call for proposals in December 2005 with a total budget of €7,947,341. The deadline for submission of applications is 15 March 2006. Specific information is published on the Fund's website www.fnr.lu.

Second Call for Project Proposals under the PROVIE Programme

As part of the BIOSAN sub-programme 'Processes of Ageing' (PROVIE), launched in 2004, the Fund will issue a second call for proposals in 2006 with a total budget of 672,000€. The deadline for submission of applications is 10 April 2006. Specific information is published on the Fund's website www.fnr.lu.

New Programme ATTRACT: Opportunities for High-Level Scientists to Create a Research Group in Luxembourg

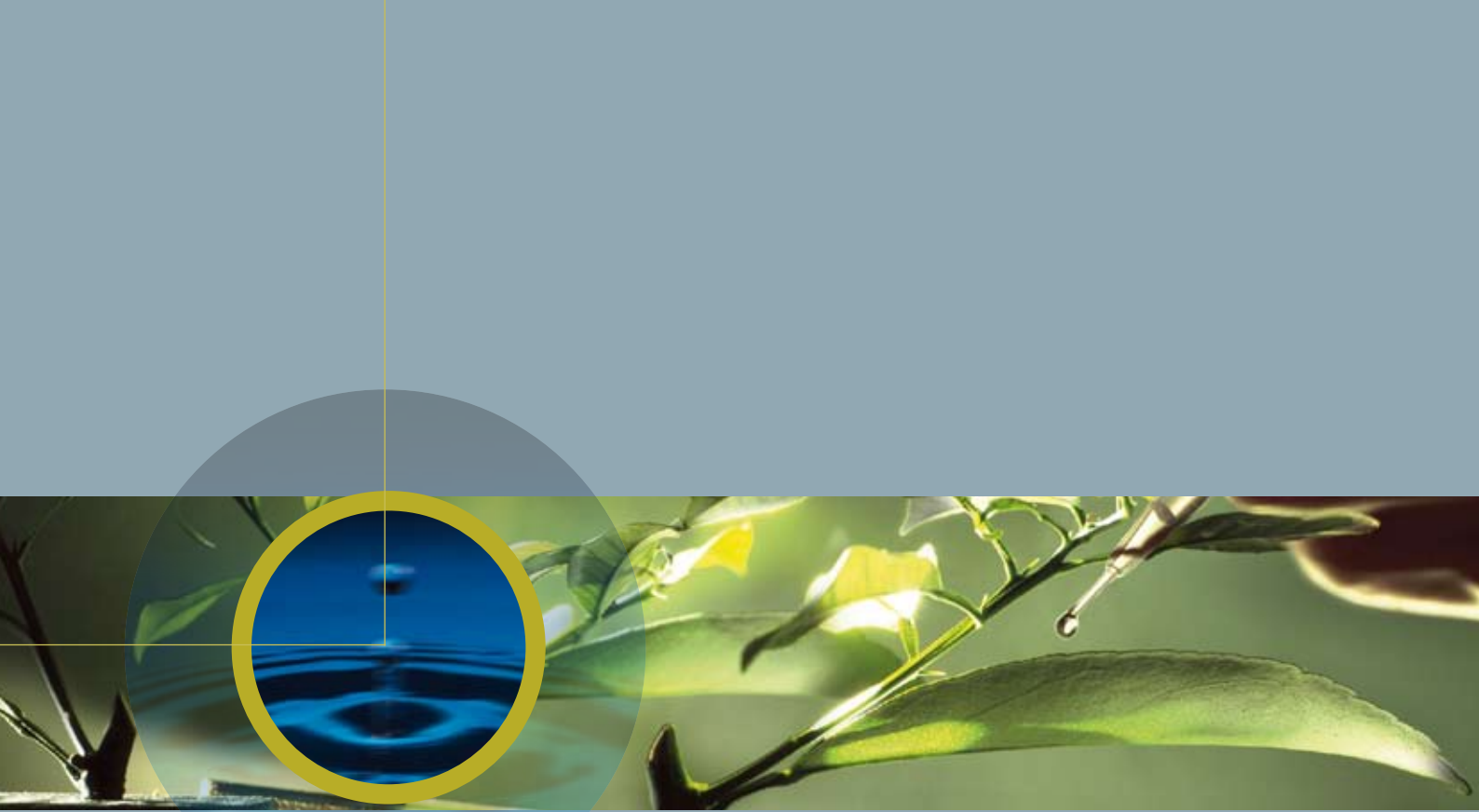
Planned Duration: 2006–2012

Planned Budget: € 6,000,000

In 2005, the new programme ‘Opportunities for High-Level Scientists to Create a Research Group in Luxembourg’ (ATTRACT) was drawn up by the National Research Fund and will be submitted to the Government at the start of 2006.

The aim of the programme is to attract to Luxembourg researchers with high-level scientific qualifications and with two to eight years’ experience following their doctorate who are not yet based in Luxembourg, so that they can initiate a research project within a public body interested in hosting it. Projects will have to be innovative and of outstanding scientific quality and will be launched jointly by the applicant and a public research institution in Luxembourg.

The combination of national and international elements will enable the programme to achieve the visibility it needs in order to attract the best-qualified researchers to Luxembourg.



VII

Annual Accounts 2005

To the Board of Administration of the
NATIONAL RESEARCH FUND
Public Institute

Luxembourg

STATUTORY AUDITOR'S REPORT

In accordance with the mandate entrusted to us by the "Conseil de Gouvernement" of June 6th, 2003, we have audited the attached annual accounts of the NATIONAL RESEARCH FUND for the year ended December 31, 2005. These annual accounts are the responsibility of the Board of Administration. Our responsibility is to express an opinion on these annual accounts based on our audit.

We conducted our audit in accordance with International Standards on Auditing. Those Standards require that we plan and perform the audit to obtain reasonable assurance about whether the annual accounts are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the annual accounts. An audit also includes assessing the accounting principles used and significant estimates made by the Board of Directors, as well as evaluating the overall annual accounts presentation. We believe that our audit provides a reasonable basis for our opinion.

In our opinion, the attached annual accounts give, in conformity with the Luxembourg legal and regulatory requirements, a true and fair view of the financial position of the NATIONAL RESEARCH FUND as of December 31, 2005 and of the results of its operations for the year then ended.

HRT REVISION s.à.r.l.



Dominique RANSQUIN

Luxembourg, March 1st, 2006

Balance Sheet

	2005	2004
ASSETS		
FIXED ASSETS	36,675.95	51,059.01
Intangible assets (note 3)	0.04	982.61
Tangible assets (note 4)	36,675.91	50,076.40
CURRENT ASSETS	23,748,258.06	17,112,524.24
Other debtors	76,554.95	37,559.39
Cash at bank and in hand	23,671,703.11	17,074,965.24
PREPAYMENTS AND ACCRUED INCOME	38,886.33	38,154.67
	23,823,820.34	17,201,738.31
LIABILITIES		
CAPITAL AND RESERVES	2,246,885.40	1,884,907.99
Reserve fund (note 5)	1,884,907.99	2,087,569.15
Surplus / (deficit) for the year	361,977.41	(202,661.16)
CREDITORS	952,983.41	292,838.46
Trade creditors	55,636.76	64,000.32
Tax and social security debt	20,070.08	15,458.75
Other creditors	877,276.57	213,379.39
PREPAYMENTS AND ACCRUED INCOME	20,623,951.53	15,023,991.86
Deferred contributions and funds (note 6)	20,623,951.53	15,023,991.86
	23,823,820.34	17,201,738.31

The accompanying notes form an integral part of these annual accounts.

Profit and Loss Account

	2005	2004
Contributions and funds (note 6)	1,270,000.00	415,000.00
Other external charges (608.144,77)	(842,901.14)	
Staff costs (note 8) (353.497,62)	(498,671.22)	
Value adjustments in respect of tangible and intangible assets (notes 3 et 4)	(25,653.06)	(29,133.10)
Operating result	(97,225.42)	(575,775.49)
Other interests receivable and similar income	460,870.55	374,474.20
Interest payable and similar charges	(1,667.72)	(1,937.40)
Financial result	459,202.83	372,536.80
Profit and loss on ordinary activities	361,977.41	(203,238.69)
Extraordinary income	-	577.53
SURPLUS / (DEFICIT) FOR THE YEAR	361,977.41	(202,661.16)

The accompanying notes form an integral part of these annual accounts.

NOTE 1 – General

The NATIONAL RESEARCH FUND (hereafter called the “FUND”) is a public institute created by the law of May 31st, 1999.

The FUND is responsible for:

- receiving, managing and using funds and donations from public or private sources with a view to promoting research and technological development in the public sector at national level, referred to as “R&D”, and
- maintaining an ongoing process of reflection in the field of national R&D policy orientation, according to economic data and scientific and technological developments, as well as on the basis of in-depth studies.

The FUND is managed by a Board of Administrators, constituted of representatives of ministries and the private sector, under the trust of the Minister in charge of scientific research and applied research.

The Board of Administrators is assisted by the Scientific Council, which is its consultative organ for scientific matters.

The FUND has its registered office at 6, rue Antoine de Saint-Exupéry L-1017 Luxembourg-Kirchberg.

The accounts of the FUND are held according to the principles and modalities of business accounting.

NOTE 2 – Accounting principles, rules and methods

General

The annual accounts are prepared in conformity with generally accepted accounting principles and in agreement with the laws and regulations in force in the Grand-Duchy of Luxembourg.

The main methods used for the establishment of the annual accounts, in conformity with these principles, are described below:

Conversion of foreign currencies

The company maintains its accounting records in EUR and the balance sheet and the profit and loss account are expressed in this currency. The assets and liabilities expressed in another currency are converted into EUR at the prevailing exchange rate of the balance sheet date.

Intangible assets

Intangible assets are recorded at the acquisition cost and depreciated on a straight-line basis over their estimated service life. The value adjustments are calculated linearly during a 3 year-period.

Tangible assets

Tangible assets are recorded at purchase price and appear in the balance sheet depreciated from their cumulative value adjustments. The value adjustments are calculated linearly on the basis of the estimated service life of the individual elements constituting the aforementioned assets.

Debtors and Creditors

Debtors are valued in the balance sheet at their lowest nominal value or their estimated realizable value. A value adjustment is carried out when the estimated realizable value is lower than the nominal value. Creditors are value in the balance sheet at their nominal value.

Capital

The Fund was not endowed with any capital at its constitution. The capital will be established by the operating annual profits, as far as the Board of Administrators decides to allocate them to this item.

Prepayment and accrued income Liabilities – Deferred contributions and funds

The allowances received from the State of Luxembourg, according to the mission the Fund was entrusted by the law of May 31st, 1999, are accounted for in prepayment and accrued income – liabilities. Only the operating allowances are included in the result, since the allowances intended for the research programs and for the “accompanying measures” are paid to the beneficiaries on the basis of the falling due provided for in contracts.

NOTE 3 – Intangible Assets

	Patents, licenses, etc. EUR
Acquisition cost	
At 1.1.2005	9,114.86
Acquisitions of the financial year	–
At 31.12.2005	9,114.86
Value adjustments	
At 1.1.2005	(8,132.25)
Adjustment of the financial year	(982.57)
At 31.12.2005	(9,114.82)
Net book value at 31.12.2005	0.04

NOTE 4 – Tangible Assets

	Other fixtures and fittings, tools and equipment EUR
Acquisition cost	
At 1.1.2005	111,388.53
Acquisitions of the financial year	11,270.00
At 31.12.2005	122,658.53
Value adjustments	
At 1.1.2005	(61,312.13)
Adjustment of the financial year	(24,670.49)
At 31.12.2005	(85,982.60)
Net book value at 31.12.2005	36,675.91

NOTE 5 – Reserve Fund

EUR

At 1.1.2005 2.087.569,15

Movements on the year

Allocation of the 2004 profit according to the BOD of 25/03/2005 (202.661,16)

At 31.12.2005 1.884.907,99

NOTE 6 – Prepayment and accrued income – Liabilities

During the year 2005, the Fund received the amount of EUR 13.090.000,00 (2004: EUR 11.165.000,00) as subsidy for the year 2005. Considering the transfer of last year of EUR 22.583.900,00, the available amount comes to EUR 46,838,900.00 and concerns the programs, the “accompanying measures” and the other affectations:

	2005 EUR	2004 EUR
Program “SECOM”	6,830,000.00	5,400,000.00
Program “NANO”	6,350,000.00	5,050,000.00
Program “EAU”	4,600,000.00	3,900,000.00
Program “BIOSAN”	7,750,000.00	5,250,000.00
Program “VIVRE”	8,250,000.00	5,250,000.00
Program “TRASU”	3,000,000.00	2,000,000.00
Program “SECAL”	2,300,000.00	1,500,000.00
“Accompanying measures”	3,420,000.00	2,300,000.00
Operating charges	4,368,900.00	3,098,900.00
	46,838,900.00	33,748,900.00

The available funds have been appropriated as follows:

	EUR
Deferred contributions and funds	
At 1.1.2005	15,023,991.86
Movements on the year	
Funds received	13,090,000.00
Allocation to research programs	(5,390,991.72)
Allocation to the “accompanying measures”	(829,048.61)
Operating adjustments	(1,270,000.00)
At 31.12.2005	20,623,951.53

The subsidies in the research programs and in the “accompanying measures” take into account the amounts that have to be paid to some beneficiaries on 31.12.2005 for a total amount of EUR 653.847,26 (2004: 37.723,00). This amount is taken into consideration in the item “other creditors”.

NOTE 7 – Taxation

In accordance with the article 16 of the law of May, 31, 1999, the Fund has been granted an exemption from taxation by state and local governments except for value added tax and salary taxes.

NOTE 8 – Personnel

	2005	2004
Average number of persons employed during the financial year	<u>8</u>	<u>7</u>

NOTE 9 – Translation

It should be noted that these annual accounts provided to you in English are a free translation of the French original version which is considered the legally binding document.

Print: Imprimerie Saint-Paul
Layout: Dominique Bernard, Sacha Heck

This report is also available online at www.fnr.lu

Ce rapport est également disponible en français sur demande (fnr@fnr.lu)
ou peut être téléchargé du site www.fnr.lu

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