Editors
Chris Mollema, Strategy & Development, José Koot (photo editing), Communications Office Radboud University Nijmegen

Translation & Text consultancy
Michael Gould Associates, Arnhem

Graphic design
Nies en Partners bno, Nijmegen

Print
Thieme MediaCenter Nijmegen

Photography
Dick van Aalst
Ineke Albers
Bert Beelen
Erik van ’t Hullenaar
Theo Hafmans/NCMLS
Arie Kievit/Hollandse Hoogte
Michiel Wijnbergh/Hollandse Hoogte
Werry Crone/Hollandse Hoogte
Peter Hilz/Hollandse Hoogte
p. 28: The death of Socrates by Jacques-Louis David, Metropolitan Museum of Art, New York
p. 32: Exhibition Herculaneum’s Final Hours, Museum Het Valkhof, Nijmegen

Radboud University Nijmegen
Comeniuslaan 4
PO Box 9102
6500 HC Nijmegen
The Netherlands
T: +31 (0)24 361 12 36
F: +31 (0)24 356 46 06
E: c.mollema@mso.ru.nl
I: www.ru.nl

© Radboud University Nijmegen, May 2007
Preface

Radboud University Nijmegen’s ambition to be one of the top European universities bore rich fruit in the summer of 2006, when it was announced that three of the 25 European Young Investigators Awards to be awarded throughout Europe had gone to researchers at our University. Each worth €1.25 million, these awards acknowledge the talent of our prize-winners and the quality of their research. They also confirm the value of the research institutes where such talented young researchers do their work and where they are coached and guided by dedicated, experienced staff. The three prize-winners – in Linguistics, Cognitive Neurosciences and Molecular Life Sciences – truly reflect our university’s strengths across its many disciplines.

If we are to continue to make a significant, high-profile, cutting-edge contribution to international developments in research, our resources need to be carefully targeted. In the past, a concentrated commitment of resources has given our research focus and mass in the humanities, and in the physical, social and medical sciences. It also allows us to conduct valuable research on interdisciplinary topics. Our research institutes are not only the home bases for the scientific talent that Radboud University Nijmegen has recruited, they also enhance the distinction and appeal of Nijmegen as a place for research.

In this Research Report, we describe the most recent developments within our 22 research institutes and their plans for future research. With some pride, we also account for our use of the resources we receive from the government, institutions and companies.

Maintaining and improving quality is one of these institutes’ core tasks, as quality research alone can underpin further scientific development as well as ensure its valorisation and societal impact. This document demonstrates that our research results find their way back into society in numerous ways – in the training we give to the next generation of researchers, and also by enriching our culture, our communities, the world of business and government.

R.J. de Wijkerslooth MSc  
President of the Executive Board

Prof. C.W.P.M. Blom  
Rector Magnificus
# Table of contents

Key figures .......................... 6

Academic reputation ......................... 7

Heyendaal Institute ...................... 14
Research Institute for Religious Studies and Theology .......... 18
    Titus Brandsma Institute .......... 22
Centre for Ethics ....................... 24
Research Institute for Philosophy .......... 28
Institute for Historical, Literary and Cultural Studies .......... 32
    Centre for Parliamentary History ........ 33
Institute for Law ....................... 38
Institute for Management Research .......... 46

Nijmegen Institute for Social Cultural Research .......... 52
Research Centre of the Graduate School of Education .......... 58
Behavioural Science Institute .......... 62

Centre for Language Studies .......... 68
Nijmegen Institute for Cognition and Information .......... 74
F.C. Donders Centre for Cognitive Neuroimaging .......... 80
Institute for Neuroscience .......... 86

Nijmegen Centre for Clinical and Translational Research .......... 94
Nijmegen Centre for Evidence-Based Practice .......... 100
Nijmegen Centre for Molecular Life Sciences .......... 108
    Centre for Molecular and Biomolecular Informatics .......... 111

Institute for Water and Wetland Research .......... 116
Institute for Molecules and Materials .......... 124
Institute for Mathematics, Astrophysics and Particle Physics .......... 132
Institute for Computing and Information Sciences .......... 138
Institute for Science, Innovation and Society .......... 142

Glossary .............................. 146
Key Figures

Research staff
Tenured
Full Professors 129.9 FTE
Associate Professors 102.4 FTE
Assistant Professors 142.4 FTE
Researchers 104.6 FTE

Non-tenured
Researchers 196.6 FTE
Postdocs 211.9 FTE
Doctoral candidates 808.8 FTE

Research input

Research output
Dissertations 241
Scientific publications 5029
Professional publications 1069
Annotations 144
Patents 20
Academic reputation

Radboud University Nijmegen is a broad, multidisciplinary, internationally-oriented university which has the ambition to become one of Europe’s top academic institutions. As was explained in the university’s Strategic Plan 2005-2009, “The Power of Quality,” the University regards quality research as the basis for achieving this ambition.

The prospects for the University improved again in 2006. Further progress was made in building a strong academic reputation and, as a result, the University became more attractive as a centre for innovation. Once again, excellent research was carried out, the infrastructure received a strong boost, international scientific networks were intensified and there was a considerable increase in innovation projects carried out in cooperation with the business community. All of this has led to greater awareness of the vital position of Radboud University Nijmegen, within the Netherlands and internationally. By focusing on the 22 research institutes in which all of the research at the University is organized, this report assembles some of the most important achievements in 2006.

One campus, united by knowledge

A good reputation is very important for a university. It helps attract good students, brilliant scientists and research funding. The importance of the pursuit of excellence was again highlighted in 2006. Greater awareness of this aspect has affected our own self-evaluations, visits by peer review committees, our publications policy and the recruitment and selection of staff. Cross-disciplinary workshops have been one of the most useful tools for exchanging best practice in relation to academic leadership, research management and winning contracts for large and complex projects.

In accordance with the University’s overall Strategic Plan, a plan for personnel was put in place in 2006. The emphasis in it is on three multi-year programmes: leadership development, career development and organizational development. Managers must be able to enthuse their staff and create loyalty and they must ensure that staff are equipped with the knowledge and skills they need to carry out their tasks. To make sure that members of staff remain enthusiastic and motivated it is important to keep in touch with their development and wishes and to consider how their knowledge and skills can best be utilized in the specific setting of this University.

In 2006, the new Huygens building was occupied by the staff and students of the Faculty of Science. A new complex of student rooms and a guesthouse were also opened. This means that the University’s major construction plans are complete for the time being. The whole of the University is housed on a single campus, which simplifies interdisciplinary research and creates a stimulating climate for dialogue. For example, Radboud University and UMC St Radboud continue to strive for more intensive cooperation in the field of auxiliary services, and the University and UMC jointly promote their interests in relation to the development and accessibility of the campus.

Societal impact

The results of scientific research are applied in society in many ways: through teaching, scientific publications, membership of advisory boards, and through cultural institutions. Four exhibitions to which historians and art historians from the Faculty of Arts contributed in 2006 are examples of the latter influence. Prof. Rietbergen contributed to the exhibition “A dispute between brothers” about the separation of the Netherlands and Belgium in 1830. Prof. Koldeweij contributed to the exhibition “Faith and good fortune, jewellery and piety”. Prof. Manuth contributed to an exhibition about “Rembrandt and Caravaggio” and Prof. Moormann was one of the organizers of a very popular exhibition in the Valkhof Museum in Nijmegen on “The last hours of Herculaneum”.

Society
Contributions to government policy were made by Prof. Kortmann who, as chairperson of the Advisory Board for the Ministry of Justice, wrote a proposal for the reform of Dutch insolvency law, and by Prof. Buruma, who led a committee devoted to evaluating the results of completed criminal cases.

Researchers at the Heyendal Institute and the Research Institute for Religious Studies and Theology organized lectures for the general public about the relationships between theology, religion and contemporary culture, and about the tension between science and religion. Researchers from the Centre for Ethics are involved in moral education for a wide range of professional bodies, including the police, army, health-care professionals, sports coaches and schools.

In 2006, there was again a marked increase in media reports about research at Radboud University Nijmegen. The number of media reports has doubled since 2003.

Centre for innovation

Scientific research also makes a direct contribution to the new knowledge-based economy. Scientists at the University work together with major corporations and regularly establish spin-off companies. To support such technostarters, Knowledge Exploitation Radboud Nijmegen (KERN) was initiated in 2006. KERN brings together Radboud University Nijmegen, the UMC St Radboud and the Arnhem/Nijmegen Polytechnic, local and regional government and the business community. KERN has been granted a four-year subsidy from the Dutch Ministry of Economic Affairs. Because patents play an important role in establishing a new company, a start was made on formulating a university patents policy in 2006. The facilities for young starters have also been organized in a transparent and simpler way by streamlining the activities of the Gelderland Knowledge Foundation (Gelderkennis) and those of the Mercator Science Park in Nijmegen.

The close integration of individuals in networks, both academic and social, leads to fruitful partnerships. For example, 104 Professors (20% of all those at the University) have extraordinary chairs, which means that they also are employed elsewhere in society.

Acknowledging excellence

In 2006 the immunologist Prof. Figdor received a Spinoza Award for his pioneering study of innovative cancer therapies. Radboud University now has six Spinoza Award winners on its staff. The success of our young researchers is a special point of pride. Three of the five European Young Investigators Awards (each worth €1.25 million) that were awarded to the Netherlands in 2006 went to researchers at Radboud University Nijmegen. Another notable achievement by our younger researchers was the admission of four new members to ‘The Young Academy’ at the Royal Netherlands Academy of Arts and Sciences (KNAW). Finally, in 2006 the Netherlands Organization for Scientific Research again awarded a relatively large number of individual scholarships: 13 Rubicon awards, six Veni awards, eight Vidi awards and three Vici awards.

Prof. Hartkamp was appointed Grande Ufficiale in the Ordine al Merito della Repubblica Italiana. He received this distinction for his activities as a member of Unidroit (Institut international pour l’unification du droit privé, of which he is the first Vice-President), for his scientific work in the field of the European private law, and for his translation of the poetry of the Italian poet Giuseppe Gioacchino Belli.

Prof. Mönks, Professor Emeritus in Developmental Psychology at Radboud University Nijmegen and the founder of the Nijmegen Centre for Talent Research, received an honorary doctorate from the Universitas Padjadjaran in Bandung Indonesia. This distinction was
awarded for his valuable contribution to the development of psychology and education in psychology in Indonesia.

Prof. Van Weel was awarded the Eric Elder Medal of the Royal New Zealand College of General Practitioners for his career-long contribution to the development of general practice.

On the basis of its performance and impact, the Committee for the Recognition of Research Schools (ECOS; established by the KNAW) accorded recognition to the Behavioural Science Institute (BSI) in 2006.

**International position**

In 2006, Radboud University Nijmegen drew up a policy document on internationalization, which sets out the university’s policy and ambitions in relation to its position in the international scientific arena.

The international position of the University was closely analysed on the basis of the Times Higher Education Supplement list of the top 200 universities. This list includes eleven Dutch universities, putting this small country in fourth place in the world. Within the Netherlands, Radboud University Nijmegen has achieved a top ranking in various respects in recent years. For example, for some years now, this university has won relatively more of the financial resources that are available from sources of competitive research funding than other general universities.

To maintain and strengthen its international position, the research institutes at Radboud University Nijmegen are periodically evaluated by an international commission of peers. If a research programme does not achieve at least a ‘very good’ evaluation, a plan is drawn up to raise it to this level. If on the following evaluation no better result is achieved, the research is terminated. Research programmes that are rated as ‘excellent’ are stimulated to continue to deliver high-quality results.

In 2006, five research institutes at the University were evaluated by an external international commission in accordance with the *Standard Evaluation Protocol*.

The commission’s report on the Research Institute for Philosophy rated three of the four programmes at least ‘very good’ on all four criteria (quality, productivity, relevance and viability). One programme was even rated ‘excellent’ in all four aspects. The programme ‘Clash of Civilizations’ did not achieve the Nijmegen norm and was therefore wound down in the course of 2006.

The Centre for Ethics was also assessed in the same evaluation. The research programmes of the Centre achieved an average score of ‘very good.’ The commission recognizes the relevance of the research, but comments that the Centre has not yet established a sufficiently strong academic standing.

The research at the Centre for Language Studies was, on average, rated as excellent. All four programmes scored at least ‘very good,’ and predominantly ‘excellent.’

The research at the Institute for Historical, Literary and Cultural Studies was evaluated as ‘very good’. One programme was rated as below the norm for three aspects. There were a number of reasons for this, excessive fragmentation being the most important. Greater synergy between researchers should be achieved by defining more focused ‘centres of emphasis’ for the research.
Three of the four programmes at the Nijmegen Institute for Socio-Cultural Research scored at least 'very good' for nearly all aspects. One of the programmes achieved a 'good' with regard to viability and another for productivity. The outcome for the development studies programme, with an average score of less than 'good' is a cause for concern. This programme is now being led by a new professor who has obtained external resources to expedite the success of the programme. The institute aims to achieve a substantial expansion in the number of Doctoral candidates.

**Top academic achievements**

The number of academic publications again increased in 2006, and more dissertations than ever before were completed. A considerable number of publications appeared in top journals such as *Nature*, *Science* and the *Proceedings of the National Academy of Sciences* (see the list of Key Publications for each institute). Theses and other academic publications are increasingly being made freely available in digital form through open access archiving. In 2006 the University Library was involved in finalizing the Dutch national programme ‘DARE’ (Digital Academic Repositories). Theses from Radboud University Nijmegen are included in the national thesis site, which was officially opened in 2006.

Another important measure of academic success is the approval of project proposals submitted to competitive research funds. In 2006, a number of the large project proposals that the University had submitted were approved by such funds, which are administered by bodies such as the EU, the Netherlands Organization for Scientific Research, by charitable funds for medical research, and by Decision of the Netherlands Government on Investments in Knowledge and Research Capacity: Fund for Strengthening Economic Structures (BSIK/FES).

The selection of topics listed below gives an impression of the academic output of the University in 2006.

The functions that rhythmic neuronal synchronization might serve and the mechanisms through which rhythmic neuronal synchronization might subserve these functions have been studied at the F.C. Donders Centre for Cognitive Neuroimaging. The Communication Through Coherence (CTC) hypothesis that states that the specific pattern of interactions among groups of neurons is governed by the specific pattern of synchronization has been put forward. Experimental evidence supporting this hypothesis has been provided. In addition, the role of oscillatory brain activity in human memory and perception has been investigated.

In 2006, the European Network on Free Movement of Workers – coordinated by Centre for Migration Law - produced 25 national reports on developments affecting the freedom of movement of workers in the Member States, and also published a European comparative report written by staff members at the Centre. Members of the Centre published various articles within the framework of the CHALLENGE programme (Changing Landscape of European Liberty and Security), a multidisciplinary project funded by the EU’s 6th Framework Programme and involving 21 universities across Europe, which is examining new regimes and security practices and their relationship to civil liberties, human rights and social cohesion.

An exciting development at the Institute for Molecules and Materials (IMM) was the demonstration of controlled magnetization reversal. A single femtosecond circularly polarized laser pulse controls the orientation of the spin in the ferromagnetic alloy GdFeCo. Demonstration of ultra-fast, all-optical magnetization reversal may lead to a new generation of ultra-fast magnetic recording devices. The newly built pulsed field installation at the High Magnetic Field Laboratory was used to establish the measurement of low-
temperature (4.2 K) luminescence at 52 Tesla of a narrow GaAs quantum well. A purely organic magnetic surface layer based on radical assemblies has been realized using the free radical galvinoxyl.

Researchers at the Nijmegen Institute for Social Cultural Research (NISCO) published a third comparative article in the European Journal of Communication on sensationalism. They concluded that both news critics and scholars often contend that increasing competition in the news market encourages journalists to sensationalize their products. Starting from this hypothesis, the article investigates changes in the level of sensationalism in three Dutch current affairs programs that merged in 1996 as part of a strategy to fight increasing competition. A content analysis of these programs in 1992 and 2001 reveals a (partial) trend towards greater use of sensationalism.

New microbes responsible for nitrate dependent anaerobic methane oxidation were discovered by microbiologists and environmental biologists of the Institute for Water and Wetland Research (IWWR). The activity of these microbes can lead to a complete new methane sink with global implications for counteracting climate change. The microbiologists of IWWR also elucidated the genome of the anammox bacterium Kuenenia stuttgartiensis. Anammox bacteria, which are important players in the global nitrogen cycle, are applied successfully in waste-water treatment. Further, the microbiologists and electron microscopic specialists of IWWR, in cooperation with geologists at Utrecht University and NIOZ, were able to add two new processes to the marine nitrogen cycle.

A novel transponson display technology was developed by plant geneticists at IWWR, and patented in cooperation with Keygene (Wageningen, the Netherlands). Recently, plant geneticists at IWWR were able to identify and characterize at the molecular level whether Solanum dulcamara plants are resistant or sensitive to late blight (an infection caused by Phytophthora infestans).

Animal physiologists at IWWR intensified their research on the two main adaptation control centres of vertebrates, the hypothalamo-hypophysial axis and the Edinger-Westphal nucleus (EW). In the frog, Xenopus, new neuropeptides were found to control the plasticity of neural and endocrine systems. With Experimental Physics (IMM) a surface-enhanced Raman spectroscopy method was used to monitor high-voltage activated Ca²⁺ channels of the L-type channels which appear essential in the signal transduction pathway concerned. The EW of male suicide victims contains eight times more urocortin mRNA than in female victims or in healthy persons. This indicates an important role of urocortin in stress adaptation. Further, EW neurons were shown to contain the feeding-related peptide CART (cocaine and amphetamine-regulated transcript) and the receptor for the obesity factor (leptin) indicating a central role of EW in regulating feeding during stress.

Scholars from the Institute for Historical, Literary and Cultural Studies (HLCS) published “The Impact of Imperial Rome on Religions, Ritual and Religious Life in the Roman Empire”. This volume offers new insights into the ways in which the Roman Empire changed religious life in the territories which it conquered. It has thus stimulated discussions on the relationship between religion and politics.

The 9/11 project at HLCS, which focuses on the representation in the arts and popular culture of the events of 11 September 2001, has resulted in the publication of the edited volume “Stof en As. De neerslag van 11 september in kunst en populaire cultuur” (Dust and ashes. The influence of 9/11 on art and popular culture).

The Biophysics group of the Institute for Computing and Information Science (ICIS) has gained a better understanding of the problem as to how human subjects can decompose
complex sounds from a variety of sources – each with different spectral content and located at different positions in 3-D space – into its original sources. This is of major importance for virtual reality applications and for the development of hearing aids. The group has further developed new algorithms for optimal decision making in machine learning, with new applications in gene-linkage analysis and medical diagnostics.

A large study at the Nijmegen Centre for Evidence-Based Practice (NCEBP) on pesticides and fertility showed that pesticide exposure affects fertility among male (and possibly also among female greenhouse workers) and causes spontaneous abortions among female greenhouse workers. These results received considerable media and professional attention.

On the basis of PubMed publications by NCEBP between 1995 and 2005, a Top 20 list of European research centres involved in research on asthma and COPD was published. The department of General Practice – the only department not specializing in lung diseases – ranks 15th.

In the cluster Religious Identity Transformation and Social Cohesion within the Institute for Religious Studies and Theology it has been shown that coping with emotions has no effect on the understanding of religious concepts in religious learning processes.

The Institute for Management Research, together with Ecorys, carried out a research project on the privatization of Schiphol Airport. This project has analyzed the total value of the real estate projects that Schiphol Airport is involved in. The project has led to a report to the Dutch Parliament entitled ‘Verkoop van een Luchthaven’ (Selling an Airport). The results of this study have received wide attention, both in the newspapers and in several real-estate journals.

Researchers at the Institute for Neuroscience have shown that during episodic memory formation it is crucial to associate information across time. The research focused on a specific neural correlate of associative memory formation of discontinuous events. The results show that the posterior parahippocampal region provides a computation that is involved in binding events or event features across time for subsequent memory retrieval.

Within the Behavioural Science Institute (BSI), progress was made in establishing the neural basis for learning about object function. The identity of cortical activity in relation to response conflict in Stroop-like tasks was also uncovered. Special attention was focused on the understanding of the dynamics of neurocognitive dynamics in language and literacy-related processes. In another study, maternal prenatal stress was shown to have long-term effects on children’s attention and concentration.

At the Nijmegen Centre for Clinical and Translational Research (NCCTR) a new biomarker for prostate cancer (DD3/PCA3) was identified. The discovery, clinical evaluation and valorization of this biomarker were initiated by the department of Urology. Researchers at this institute also discovered a new tumour-specific endothelial molecule (plexine D1).

With scientific achievements like these – as well as a well-filled portfolio of research projects for the years ahead – Radboud University Nijmegen feels confident about its future.
Radboud University Nijmegen has nine faculties:
- Faculty of Theology
- Faculty of Religious Studies
- Faculty of Philosophy
- Faculty of Arts
- Faculty of Law
- Faculty of Social Sciences
- Nijmegen School of Management
- Faculty of Science
- Medical Centre (Faculty of Medicine and University Hospital)

Fundamental and applied research is carried out within twenty-two specialized institutes:
- Heyendaal Institute
- Research Institute for Religious Studies and Theology
- Centre for Ethics
- Research Institute for Philosophy
- Institute for Historical, Literary and Cultural Studies
- Institute for Law
- Institute for Management Research
- Nijmegen Institute for Social Cultural Research
- Research Centre of the Graduate School of Education
- Behavioural Science Institute
- Centre for Language Studies
- Nijmegen Institute for Cognition and Information
- F.C. Donders Centre for Cognitive Neuroimaging
- Institute for Neuroscience
- Nijmegen Centre for Clinical and Translational Research
- Nijmegen Centre for Evidence-Based Practice
- Nijmegen Centre for Molecular Life Sciences
- Institute for Water and Wetland Research
- Institute for Molecules and Materials
- Institute for Mathematics, Astrophysics and Particle Physics
- Institute for Computing and Information Sciences
- Institute for Science, Innovation and Society

Preparing for a career in research at ten Research Masters studies:
- Behavioural Science: the study of behavioural regulation
- Cognitive Neuroscience
- Historical sciences
- Art and visual culture
- Language and communication: the empirical study of human communicative capacities
- Literature and literary sciences: new philology
- Molecular mechanisms of disease
- Business and Law
- Philosophy
- Social cultural science: comparative research on societies
The Heyendaal Institute focuses on theology, science and culture, taking an interdisciplinary research approach. The main aim is to develop insights into scientific practices and their impact on the interpretation of the world and of human existence in relation to religious thought. The Institute thus contributes to the interaction between contemporary culture – especially the sciences – and theology.

Most of the research at the Heyendaal Institute takes place in four interdisciplinary areas:

At the interface between theology and the humanities, the Institute pursues research on the relationship between art and literature on the one hand, and theological and philosophical texts on the other: to what extent are central themes from religious traditions present in contemporary cultural expressions? How is cultural memory reconstructed and what elements are likely to be retained in future human cultures?

At the interface between theology and the exact sciences, the Institute deals with questions concerning the relationship between science and religion: what factors contribute to theologically innovative interpretations, which are also not incompatible with science, of such seemingly contradictory concepts as self-organization versus divine agency, or freedom versus determinism? How can these interpretations be applied in selected fields of research?

At the interface between theology and the social sciences, the Institute researches issues such as the relationship between theology and newly developed neuro-psychological insights. It also explores new insights into the presence of religion and religious motives in the society and politics of our allegedly secular society. What are the philosophical and theological implications of these insights?
At the interface between theology and the medical sciences, the Institute deals with questions concerning the relationship between theological and medical views of what it means to be human: what are the different scientific, cultural and religious conceptions of the human being, of sickness and of suffering? How can we reflect philosophically and theologically on illness and suffering? How can these reflections be related to views and practices in the medical sciences?

In addition to the work in these four interdisciplinary areas, the Institute also researches general questions such as the relationship between religion and contemporary culture, and devotes attention to developments in contemporary science.

**Collaboration**

At the national level the Institute collaborates with the faculties of Radboud University Nijmegen, including the UMC and the F.C. Donders Centre for Cognitive Neuroimaging, the University for Humanistics (Utrecht). The Institute also participates in the Netherlands School for Advanced Studies in Theology and Religion (NOSTER).

International collaborations include those with the Faculty of Arts and the Faculty of Theology, K.U. Leuven (Belgium); the Centre for the Study of Literature, Theology and the Arts at the University of Glasgow (U.K.); the Department of Theology and Religious Studies at King’s College, London, and the Heythrop College, London (UK). The Institute participates in the International Society for Religion, Literature and Culture (ISRLC); the European Society for the Study of Science and Theology (ESSSAT), and the International Society for Science and Religion (ISSR).

**Research results**

At the interface of theology and humanities, research focused on literature and other artistic expressions responding to the Shoah. Center of attention here was Theresienstadt (Dr R. van den Brandt, Dr H. Makarova). The philosophical reflections of Hannah Arendt on totalitarianism were researched (Dr De Schutter, Dr B. Philippen, Dr R. Peters). A monograph was published on Etty Hillesum’s response to the Shoah and her vision on life (Dr R. van den Brandt). The Shoah provides a mirror through which to understand the particularities of Modernity.

At the interface of theology and the exact sciences, research focused on two main issues: on philosophical and theological questions concerning divine agency (Dr L. Consoli; Prof. P. Oomen), and on the relation between information from brain scans and philosophical-theological reflections on self, soul and freedom (Prof. P. Oomen, Dr A. Wouters). An edited volume on the concept of ‘cyberspace’ was published, a concept which proves to have important anthropological and theological aspects.

At the interface of theology and the social sciences, research focused on neurological aspects of religion (Prof. J. Janssen) and how these are related to theology (Dr I. Albers). An edited volume was published on the presence of Christian motives in contemporary critical thought (M. de Kesel), showing the persistent presence of religion in a seemingly secularized culture.

At the interface of theology and the medical sciences, research focused on the conception of man implicit in the way dementia is interpreted and treated (Dr S. van Erp, Dr D. Gerritsen). In collaboration with King’s College, London, the relation was clarified...
between theology and religion on the one hand, and medical sciences and its treatment of suffering on the other hand (S. van Erp).

Besides research in these four interdisciplinary areas, there was critical work on the philosophical theories of J.-L. Nancy concerning the inextricable relation between the Christian tradition and Modernity (Dr L. ten Kate). A monograph was published on the changing faces of religion and contemporary culture in their mutual relation (Prof. E. Borgman).

The Institute organized a conference to present the results of its work at the interface of theology and the medical sciences, entitled ‘Dooft de mens uit?’ (Is the Human Being Fading Away?). Together with the Faculty of Arts at Radboud University and the Stichting Kunstenaarsverzet 1942-1945, the Institute organized a conference on the art of Helly Oestreicher, entitled ‘“Alle Gestalten kommen aus der Ungestalt”’. In cooperation with the Soeterbeeck Programme at Radboud University, the Institute organized the Hannah Arendt lecture by Dr D. De Schutter, entitled ‘De opdracht van de politiek’ (The task of politics). A one-day conference was organized to mark the publication of the book Metamorfosen on religion and contemporary culture.

In collaboration with the Faculties of Religious Studies and Theology at Radboud University and the Netherlands School for Advanced Studies in Theology and Religion (NOSTER), the Heyendaal Institute started a series of one-day conferences with international scholars on the future of religious studies and theology entitled ‘Real Challenges to Contemporary Theology’.

**Societal impact**
The interdisciplinary research of the Heyendaal Institute offers many opportunities to get involved in public debates at a local (city and campus) and national
level about issues concerning the interaction between religion and science. The following activities should be mentioned:

Dr R. Plum, staff member of the Institute, was co-author of the exploratory study ‘Religie in het publieke domein’ (Religion in the Public Domain) published by the Wetenschappelijke Raad voor het Regeringsbeleid (Netherlands Scientific Council for Government Policy); Prof. E. Borgman was also one of the advisors. Prof. E. Borgman was involved in the project ‘Technology and Religion’ of the Stichting Toekomstbeeld der Techniek (The Netherlands Study Center for Technology STT).

There is an enduring cooperation between the Heyendaal Institute and the Soeterbeeck Program at Radboud University. Researchers at the Institute gave many lectures and published a large number of articles aimed at the general public, in line with research at the Heyendaal Institute. These lectures and articles focused mainly on the relationship between theology, religion and contemporary culture, and on the tensions between a scientific world view and religious meaning.

**Future research**

In 2007, the Heyendaal Institute will reorganize its research and redefine its research agenda. The future focus of research will be on the areas of *Theology and the humanities* and *Theology and the exact sciences*. Research at the interface of theology and the humanities will concentrate on trauma, memory, and the making and remaking of tradition. Research at the interface of theology and the exact sciences will concentrate on the relation between nature, meaning and directionality.

---

**Prof. E.P.N.M. Borgman**

Prof. Borgman is an expert on the interface between religion and contemporary western culture. In addition he studies the relationship between theology and science. From 1984 to 1988 he was a researcher at the Radboud University Nijmegen. Between 1989 and 2003 he carried out research for the Dutch branch of the Dominicans (a religious order), writing the biography of Edward Schillebeeckx. In 2000 he returned to Radboud University Nijmegen. He sits on the editorial boards of various theological journals and has published monographs, books and articles on a wide variety of issues related to the role of theology and religion in modern society.
The Research Institute for Religious Studies and Theology (RST) seeks to conduct, stimulate, integrate and internationalize research in the fields of religious studies and theology. Its point of departure is the continuing relevance of religion for present-day societies, and especially the importance of changing relations between religions (ranging from dialogue to conflict) and between religions and civil society as a whole. For the next few years the emphasis will be on the study of transformation processes in religious traditions, as well as the changing religious identities of both individual believers and religious groups. The institute strongly encourages interdisciplinary research. While Christianity is the principal field of study, other religions – especially Judaism, Islam and Indian religions – will be increasingly important research subjects during the next few years. The research results of scholars affiliated to the institute primarily target an international audience. A second objective is the dissemination of knowledge among a wider readership.

The current research theme ‘Religions and Transformation in Contexts’ (RaTiC, currency: 2005-2010), comprises five thematic research clusters that focus on the transformation of religions and inter-religious and intercultural interactions. By transformation is meant a gradual process of change in form, function or meaning of a given entity, in our case in the first place religious traditions. Changes in form, function and meaning may take place in one or more dimensions of religious systems. Researchers working on this theme study transformations of religious traditions in their social, cultural and political contexts.

The Institute’s research programme ‘Religions and Transformation in Contexts’ consists of the following five research groups:
Traditions and Transformations in Intercultural and Inter-religious Contexts (Prof. G. Wiegers).

This programme in comparative religious studies focuses on processes of transformation in the religious traditions of Islam, Indian religions, and new religious movements (including indigenous and local religions) in the Western world and their transformation processes within secular societies. The research involves an interdisciplinary approach, combining and integrating historical-critical, systematic-comparative and empirical methods.

Biblical Studies, Ancient Judaism, Early Christianity, and Gnosticism (Prof. T. Nicklas)

This programme focuses on Biblical and extra-biblical texts that can be seen to mirror religious transformations in changing social, political, or religious contexts. The research concentrates on (1) the interpretation of a number of key texts that mirror religious transformations (e.g., the Books of Judges, the Books of Samuel, early Christian apocryphal Gospels); (2) different levels of interpretation and re-working of early Christian and Jewish texts (textual history of canonical and extra-canonical texts, apocryphal and patristic interpretations), and (3) their historical, religious and hermeneutical backgrounds.

Transformation of Religion within the Structures of Modernity (Prof. G. Essen, Prof. J.-P. Wils)

The programme in systematic theology focuses on the interdependence of transformation processes and the normative substance of religious traditions. It focuses on the interrelation between communal religious identity formation – and hence normative transformation processes – and the normative content of religious traditions, illustrated by the notion of theism.

Reframing Spirituality and Mysticism in Past and Present (Prof. P. Nissen and Prof. C. Waaijman)

This programme starts from the observation that in present-day Western societies there is a growing interest in spirituality and mysticism, not only within the historical religions, but also outside these traditional settings, in the so-called ‘secular quest’ in new religious movements, alternative circuits, and secular contexts. These developments have deeply transformed both the socio-cultural manifestation of spirituality and mysticism and the scholarly awareness of the inner structure of spirituality and mysticism and their relation to texts, mater-


Dissertations: 13
Scientific publications: 89
Professional publications: 85
Social objects, images, histories, practices and theoretical presuppositions. These transformations are now subjected to an interdisciplinary study that is not limited to the traditional approaches of spiritual theology or church history. In order to describe and understand these phenomena more adequately, researchers in the programme aim to revise the scholarly approach to studies of spirituality and mysticism. There is close cooperation with the Titus Brandsma Institute and the Institute of Eastern Christian Studies.

Religious Identity Transformation and Social Cohesion (Prof. C. Hermans)
This research programme aims to develop theories concerning the relation between individual religious identity and social cohesion, in various contexts of religious pluralization and individualization. Religious identity transformation refers to people’s beliefs, actions and sense of belonging – from the perspective of transcendence and immanence – which enable them to fully realize themselves, together with others, in a context of just institutions. Social cohesion refers to the integration of individuals and groups within society. The research addresses both earlier relationships between religious identity and social cohesion – in terms of learning, attributional and ritual processes conditioned by mental, cultural and institutional factors – and subsequent changes in these relationships, in terms of consensus, tolerance, dialogue, conflicts and violence.

Collaboration
The institute collaborates with the Catholic University of America (Washington, USA); the University of South Africa (Pretoria, South Africa); the University of Munster (Germany), the Netherlands School for Advanced Studies in Theology and Religion (NOSTER, the Netherlands), and the Faculty of Theology of Dharmaram Vidya Kshetra in Bangalore (India).

Research results
From the research group Traditions and Transformations (Prof. Wiegers), articles on New Buddhism were published in which the significance of Navayana Buddhism is further explored. Prof. Wiegers and Drs H. Komsers were leading members of a committee that organized a successful international conference on Social Cohesion and the Role of Religious Studies in Secondary Education (3 and 4 November) hosted by the Netherlands Association for the History of Religions (NGG) within the framework of a project that was subsidized by the Knowledge Centre Society and Religion (KCMR). Dr Venbrux was invited to present research on indigenous religions at the Australian National University in Canberra, Australia, and at the Harvard and Peking University International Conference on Comparative Mythology in Beijing, China.

The research group led by Prof. Nicklas explored the historical growth and cultural embeddedness of the books of Samuel. In this context, an international symposium ‘Story and history in the books of Samuel’, organized by Prof. Eynikel, was held between 2 and 4 March, 2006, with 25 international participants. The results will be published in a congress volume appearing in 2007. Members of the research group gave invited papers at several international conferences. Prof. Nicklas and Prof. Eynikel were elected as members of the editorial and advisory boards of the three international book series. Prof. Eynikel served as Adjunct Professor in Residence at The University of Dallas.

In 2006, within the context of the research group Reframing Spirituality and Mysticism Past and Present, cooperation with researchers from the Titus Brandsma Institute was consolidated. Dr Hense co-edited a handbook on Carmelite spirituality and contributed a chapter on the same topic to a new handbook on spirituality. Prof. Waaijman studied the theoretical backgrounds of the digital encyclopaedic project on spirituality, prepared by the research group within the SPIRIN project (Spirituality International). Dr Ackermans published a number of biographical articles in the Biographisch-Bibliographisches Kirchenlexikon. Prof. Nissen co-authored a new handbook on Dutch church history, for which he wrote chapters on the Middle Ages after 1200 and the Reformation period. Three PhD theses on medieval mysticism were defended.

In the context of the research group Transformation of Religion within the Structures of Modernity, two monographs were published. Essen gave lectures at the Chinese Centre of Social Sciences, Beijing, and the North-West University Vanderbilt, South Africa, on his research dealing with concepts of theism in the modern world.

The design of the sub-project ‘Chronology and topography – The Impact of the spatial turn for theology and religious studies’ (De Haardt and Meyer-Wilmes), was discussed and further developed. In this framework, the conference ‘Production of Presence – What Meaning Cannot Convey’, was organized in Nijmegen. The keynote speaker was Prof. Hans-Ulrich Gumbrecht of Stanford University (USA).

In the context of the research group Religious Identity Transformation and Social Cohesion Van der Zee, Hermans and Aarnoutse showed that coping with emotions has no effect on the understanding of religious concepts in religious learning processes. Hermans, Schilderman and Van der Ven presented keynote lectures at a Conference of the International
Society of Empirical Research in Theology held in Bangor (Wales). A volume published by Castillo Guerra et al. on migrant parishes reflects the growing academic interest in migrants with a Christian background in Dutch society.

Books
IKO series (Damon); Empirical Studies in Theology (Brill); Theologie und Empirie (Kok/Deutscher Studien Verlag); Empirische Theologie (LIT-verlag); Church and Theology in Context; Eastern Christian Studies (Peeters); Nijmegen Studies in Systematic Theology (LIT-verlag); Studies in Spirituality – Supplements; New Religious Identities in the Western World (Peeters).

Journals

Meetings and other activities
Three plenary research symposia were organized: on 4 April (presentations of research in progress), on 11 May (theme: science and religion) and on 27 June, when the American political scientist Dr Jonathan Fox (Begin-Sadat Center for Strategic Studies, Israel) gave a well-attended lecture on religion and violence. The lecture was organized in cooperation with the Netherlands Chapter of the Society for International Development. All research groups convened every two months.

Societal impact
The expertise of various researchers was called upon by various groups and organizations in the fields of religion, (non-western) religious arts and other cultural and social organizations. Researchers from the Institute have been actively engaged in public debates on religions (radio interviews, printed media) and have given lectures and master-classes. After winning the Radboud Media prize in 2005, Nissen finished in 2006 as the second most active media scholar of Radboud University. Dr Van der Velde was president of the Association for Buddhism and Psychotherapy and gave several radio interviews on national television (Remembrance of the Tsunami). Prof. Gerard Wiegers acted as an advisor to the Netherlands Institute for the Promotion of Health and Disease Prevention (NIGZ) and spoke to a national conference, organized by that Institute in cooperation with the Muslim umbrella organization, Contact Orgaan Moslims Overheid, on the theme of Islam and Organ Donation. This took place in Zeist on 26 January. The international conference organized by Wiegers and others (November, 3 and 4) on social cohesion and religious studies in secondary education was successful in establishing contacts with the field of teachers of religious studies in Dutch education and other professionals. Prof. Blommestijn participated in a research on the impact of broadcasting liturgical celebrations on the occasion of the 25th anniversary of the pastoral department (‘Mediapastoraat’) of the Catholic Broadcasting Company (KRO). Dr Castillo Guerra and others used a grant from the city of Rotterdam for the development of a quick scan instrument to determine the role of religious communities in promoting social cohesion.

Future research
Prof. Wiegers (comparative sub-programme) is preparing a study on Muslim ethics in Europe (with Prof. H.L.Beck, Tilburg) (to appear in 2007). Dr Venbrux, who was appointed to the Chair of Indigenous and Local Religions and their Relations with World Religion as of January 2007, will act as leader of the recently awarded Research Project ‘Refiguring Death Rites: Post-Secular Material Religion in the
In March 2007 a joint venture symposium ‘Other worlds’ is planned by the group led by Prof. Nicklas, together with members of the faculty of Theology at the KU Leuven in Belgium. The work on Apocryphal Texts will mainly focus on ancient Christian passion traditions and their reception in different contexts. Further publications on the Septuagint are in preparation.

In 2007, researchers in the sub-programme Reframing Spirituality and Mysticism Past and Present will organize an expert meeting on the cluster’s research programme, together with colleagues from the UK and Germany. Prof. Waaijman will retire from the chair of spirituality in 2007, but he will continue to participate in the research cluster. It is hoped that his successor to the Chair of Spirituality will join the research group in the spring of 2007.

Researchers of the sub-programme led by Prof. Essen will organize an international conference on ‘Theism and ethics in the modern world’. A major subsidy was received from the EU (Norface programme) by Dr Hans Schilderman and Prof. Peer Scheepers (sub-programme Religious Identity Transformation and Social Cohesion) for an international cross-cultural research study of religious sources of solidarity.

**Prof. G. A. Wiegers**

Prof. Wiegers specializes in the history of Islam and Muslim minorities in the western part of the Islamic World (the Maghreb and the Iberian Peninsula) and Europe. He publishes regularly on relationships between Islam and other religions and on method and theory in the science of religion. He is a member of several editorial boards, chair of the Dutch Association for the Study of Religions (NGG) and a board member of the Dutch School for Advanced Studies in Theology and Religion (NOSTER).
The research falls into two main categories:

**Fundamental ethics**
The philosophical and theoretical orientation of the Centre is characterized by a predominantly hermeneutical approach. Other approaches, including the methodology of the social sciences, are also employed. Both historical and systematic approaches are employed in studying moral dilemmas and problems.

**Applied ethics**
The main focus of research is on ‘Conflict and consensus in civil society’. With the classical role of the state diminishing, it is widely recognized that serious moral debate in civil society is vital. However, the erosion of traditional religious and political frameworks means that it is not easy to discuss moral issues. Taking this as a starting point, the Centre’s research deals with such issues as the following: religion, morality and citizenship; religion, society and human rights; police ethics; justice and poverty, restorative justice and ethics; religion, citizenship and the sensus communis; and various branches of professional ethics, particularly medical ethics, ethics of public administration, political ethics and ethics of education.

Most research within the institute takes an interdisciplinary approach, involving...
cooperation with the Faculties of Philosophy, Theology, Medicine, Law, Science and Social Sciences. The unique position of the Centre arises from a combination of fundamental and applied ethics and an interdisciplinary approach to issues in both of these areas.

**Collaboration**
Within Radboud University the Centre collaborates with other Faculties in projects of interdisciplinary research.

At the national level, the Centre for Ethics cooperates with the Dutch Research School of Ethics, the Centre for Ethics at Utrecht University, the Centre for Science and Values at Tilburg University, SOCIRES (a foundation for reflection and research on culture and society in The Hague), and the Dutch Society, Security and Police Foundation (SMVP, Dordrecht).

Internationally, the Centre cooperates with the Nederlands-Afrikaanstalig Genootschap voor Wijsbegeerte, the European Centre for Ethics K.U. Leuven (Belgium), the Centre for Ethics in Sciences and Humanities at the University of Tübingen and the Centre for Ethics at the University of Münster (Germany), Dialog Ethik Zürich (Switzerland), the Institute for Philosophy of the University Hildesheim (Germany), the Institute for Philosophy of the Humboldt University, Berlin (Germany), the Faculty of Philosophy, Fribourg (Switzerland), the Centres for Ethics at the University of Stellenbosch and the University of Pretoria (both South-Africa).

**Research Results**
A project was completed on the Dutch politics towards the European Union, after the rejection of the European Constitution by the Dutch people. In this project the Centre cooperated with political and social scientists. The main conclusion of the project was that citizens’ attitudes towards the European project should go beyond a narrow focus on one’s own interests, and suggestions have been made with regard to how this can be encouraged. Another completed interdisciplinary project, on circumcision, resulted in Besnijdenis, lichamelijke integriteit en multiculturalisme (Circumcision, bodily integrity and multiculturalism).

A member of the Centre published a book on deliberative democracy. This study first shows that in practice citizens’ forums do not meet the conditions of ‘argumentation between equals’ and ‘consensus formation’. Secondly, it is explained that it is not dialogue, but the input of non-familiar information and experiences that stimulates a learning process.


Dissertations: 0
Scientific publications: 51
Professional publications: 36
Symposia were held on the Regensburg-letter of Pope Benedict XVI, on circumcision and on ‘Ethics and equity’. The annual meeting with ethicists from Tübingen, Münster and Utrecht was entitled ‘Dignity and Recognition’.

Societal impact
The Centre takes its involvement in the development of moral debates in the public domain very seriously. Our hermeneutical approach has allowed us to make a fruitful contribution to these debates. The results include the following:

- The Centre contributes directly to the moral education of a wide range of professional bodies (the police, army, health-care professionals and sports coaches).
- Members of the Centre are directly involved in moral education programmes in schools.
- Members of the Centre gave dozens of lectures for professional groups as well as for the general public.
- Members of the Centre often contribute to public discussions on radio and television.
- Members of the Centre are on the board of several international journals and book series.

Future research
Future lines of research will include:

- Research on moral aspects of democracy and civil society. Special attention will be given to the interpretation of tendencies to dissatisfaction with democracy, to the possibilities of strengthening democratic attitudes, and to enhancing the moral quality of debate and communication in society. A conference will be held on ‘deliberative democracy’.
- Research on the role of religion in a pluralistic and democratic society, with special attention to the irenic and polemic power of religions. Conferences will be held on ‘Moral limits and profanity’ and ‘Forgiveness in public discourse’.

Prof. P.J.M. van Tongeren

Prof. van Tongeren was Extraordinary Professor of Philosophy at the University of Leiden from 1985 to 1991. Since 1991 he has been a Full Professor of Moral Philosophy at Radboud University Nijmegen. As of 2002 he also became an Extraordinary Professor of Ethics at the Catholic University in Leuven. Prof. van Tongeren is an expert in Virtue Ethics and Hermeneutic Ethics, History and Methodology. He is editor-in-chief of the international book series ‘Morality and the Meaning of Life’, editor of the international journal ‘Tijdschrift voor Filosofie’ (Leuven) and a member of the editorial board of several other national and international journals and book series.
The systematic study of rationality is organized into the following three programmes, which interconnect and overlap in various ways:

Rationality and Cognition
(Prof. R. van der Sandt)

The project of a hermeneutic philosophy
(Prof. P. van Haute)

From natural philosophy to science
(Dr P. Bakker)

At the most basic level, rationality concerns the standards for truth and consistency. The concept of rationality is routinely used in a normative sense, i.e. one that conveys justification. But what are these norms, if any? The three programmes explore different aspects of the wide variety of things that can be said to be rational: beliefs, individual actions and social practices. From what standpoint can we judge the rationality of the beliefs, actions and practices of others? Do our categories of reasoning enhance or distort our understanding and interpretation of others? And what are the foundations of rationality in the first place?

These headline questions are taken up by each of the three programmes. The first studies the conceptions of belief, cognition, and language. It analyses the different notions of scientific and natural rationality, both in their normative and descriptive senses.
dimensions. The second examines the relation between rationality, meaning and interpretation. It focuses in particular on the hermeneutical and related criticisms of the modern idea of rationality. The third focuses on the emergence of science as the key paradigm of rational thinking in Western Europe, and traces the history of long-term developments and transformations in scientific thinking from its philosophical beginnings.

In tackling these problems, the programmes employ a variety of methodological approaches: analytical, hermeneutical, critical, and historical-philological. Taken together, the programmes aim at clarifying the complex notion of rationality.

The Institute’s research programmes are characterized by the value they attach to the works of past thinkers, either as discussion partners or as autonomous historical subjects, for the practice of philosophy.

Research facilities
The faculty library houses one of the finest collections of books and journals on philosophy in the Netherlands, particularly in the history of philosophy, and one of the world’s largest microfilm holdings of manuscripts in the fields of medieval logic and natural philosophy.

Collaboration
There are formal cooperative arrangements with the Universities of Leuven (Belgium), Pretoria, Stellenbosch, Durban (South Africa) and De Paul University (Chicago, USA). We are in the process of preparing new cooperative agreements e.g. with the University of Sao Paolo (Brazil).

In addition, the members of the research programmes maintain long-term contacts with such institutions as the Departments of Philosophy at the Universities of Uppsala (Sweden), Middlesex (UK), Antwerp (Belgium), Stuttgart and Tübingen (Germany), Stanford (USA), The Centre of Excellence ‘History of Mind Research Unit’ at the University of Helsinki (Finland), and the Institute of Philosophy at the University of Leuven.

The Institute hosted several scholars, who were recipients of a Huygens stipend.

Research results
In October 2006, QANU published its report on philosophical research in the Netherlands, which included most of the research groups and Faculties in this country. The results were very encouraging for our Institute. Three of the programmes


Dissertations: 6
Scientific publications: 34
Professional publications: 23

Members of the Institute edited several book series. Among these is a new Dutch series on ‘Questions to Freud’ that is edited by The Centre for Psychoanalysis and Philosophical Anthropology (Radboud University-University of Leuven) which is part of the Institute’s programme “The project of a hermeneutic philosophy”. Eight volumes have been published since its initiation at the end of 2003, including one volume in 2006.

Other members of the Institute are editing the book series ‘Medieval and Early Modern Science’, which is dedicated to the investigation of scientific thought from 1200 to 1700. So far, seven volumes have been published.

During the year 2006 a new NWO programme on ‘Visualizing the Invisible. Representations of Matter and motions since the Renaissance’ (Prof. Dr H. Thijssen) was started. The programme will study the relationship between theory (text) and visual representations of invisible entities (minute configurations of matter, and motion) from the seventeenth to the nineteenth century.

The Institute also hosts several other NWO programmes. The programme ‘Cognition and consciousness’ (Dr B. Geurts) is part of the NWO project “Reasoning and the brain” which is an initiative of researchers in the philosophy of language and logic, psychiatry, and neuroscience at the universities of Nijmegen and Amsterdam. Dr P.
Bakker is directing the Vidi project ‘Form of the Body or Ghost in the Machine? The Study of Soul, Mind, and Body (1250-1700)’, which is part of the programme ‘From natural philosophy to science’. Apart from several other postdocs who continued their activities at the Institute as Veni bursaries of the NWO, Dr S. Micali received a Rubicon grant from now in 2006. His research is part of the programme ‘The project of a hermeneutic philosophy’.

Societal impact
Members of the Institute regularly participate in forum discussions and contribute to public debate with articles in newspapers, radio and other media reaching a wider audience than the scientific community. One such example is the lectures series Publiekslezingen organized by the faculty.

The series is intended to introduce the ideas of well-known contemporary philosophers to a wider audience. In addition, some of the Institute’s members are contributors to international encyclopaedias and general works of reference.

Future research
Several large NWO programmes that were started in previous years will be continued in 2007. These are all dedicated to studying different aspects of the history of modern rationality. In addition, the Institute expects to receive a Veni grant next year that will used to examine the concept of a hermeneutic rationality.

Research Institute for Philosophy
Postal address
PO Box 9103
6500 HD Nijmegen
The Netherlands

Visiting address
Erasmusplein 1
Nijmegen

T: +31 (0)24 3612474
F: +31 (0)24 361802
E: pvhaute@phil.ru.nl
I: www.ru.nl/phil

Prof. P.I.M.M. van Haute

Prof. Van Haute has been a Full Professor of Philosophical Anthropology at Radboud University Nijmegen since 1994. His research focuses on the philosophical meaning of psychoanalysis in the work of Freud and his followers (such as Lacan and Klein) and on the problematic of a clinical anthropology in which the human being is approached primarily from the perspective of psychopathological variants. Van Haute is president of the Belgian School for Psychoanalysis.

Prof. P.I.M.M. van Haute

Bakker is directing the Vidi project ‘Form of the Body or Ghost in the Machine? The Study of Soul, Mind, and Body (1250-1700)’, which is part of the programme ‘From natural philosophy to science’. Apart from several other postdocs who continued their activities at the Institute as Veni bursaries of the NWO, Dr S. Micali received a Rubicon grant from now in 2006. His research is part of the programme ‘The project of a hermeneutic philosophy’.

Societal impact
Members of the Institute regularly participate in forum discussions and contribute to public debate with articles in newspapers, radio and other media reaching a wider audience than the scientific community. One such example is the lectures series Publiekslezingen organized by the faculty.

The series is intended to introduce the ideas of well-known contemporary philosophers to a wider audience. In addition, some of the Institute’s members are contributors to international encyclopaedias and general works of reference.

Future research
Several large NWO programmes that were started in previous years will be continued in 2007. These are all dedicated to studying different aspects of the history of modern rationality. In addition, the Institute expects to receive a Veni grant next year that will used to examine the concept of a hermeneutic rationality.

Research Institute for Philosophy
Postal address
PO Box 9103
6500 HD Nijmegen
The Netherlands

Visiting address
Erasmusplein 1
Nijmegen

T: +31 (0)24 3612474
F: +31 (0)24 361802
E: pvhaute@phil.ru.nl
I: www.ru.nl/phil

Prof. P.I.M.M. van Haute

Prof. Van Haute has been a Full Professor of Philosophical Anthropology at Radboud University Nijmegen since 1994. His research focuses on the philosophical meaning of psychoanalysis in the work of Freud and his followers (such as Lacan and Klein) and on the problematic of a clinical anthropology in which the human being is approached primarily from the perspective of psychopathological variants. Van Haute is president of the Belgian School for Psychoanalysis.
In 2006 HLCS started with a new cycle of programming which includes five renewed research programmes:

- **The Ancient World**: this programme combines all the research in the Faculty of Arts that is centred around Greco-Roman Antiquity and its influence on later Western culture, from the study of archaic Greek poetry to the reception of Greek and Roman literature in modern music and art, but its main emphasis is the study of the Roman Empire. It supports research on the classical civilizations in all their aspects (literary, material, etc.), including early Christian Greek and Latin and the reception of antiquity in later, post-classical periods (Middle Ages, Renaissance).

- **Christian Cultural Heritage**: the history of Christianity and Christian culture are the subject of one of the research priority areas of the University. The HLCS programme is part of an inter-faculty research group involving the faculties of Arts, Philosophy and Theology. It derives its coherence from the perspective from which the
Christian tradition is studied, i.e. the formation of individuals as Christians. The programme centres on the questions of how a Christian culture is created and maintained, what instruments are used to this end, which individuals and groups create and maintain such a Christian culture, and why they do so.

- The Dynamics of Islamic Culture: the research in this programme focuses on central issues in the integration of the Islamic societies in the modern world. Two types of issues are covered: those having arisen in the West and those articulated within traditional Islamic cultural settings. The programme combines two approaches: philological and historical research on Islamic texts and traditions on the one hand, and social scientific research on social movements and trends on the other.

- History after the Middle Ages: the programme consists of all historical research on the period after 1500, subdivided into three thematically distinguished disciplines: political history, cultural history and economic and social history. These three sub-programmes focus on the past from their different conceptual perspectives and use different methods and sources for their interpretations.

Simultaneously, the three sub-programmes take up the challenge of examining together, each from its own perspective, a single shared theme during each faculty research period.

- Literature, Culture, Media: research is carried out in two sub-programmes: Cultural Memory and The Infrastructure of Literary and Cultural Life. The first sub-programme is principally concerned


Dissertations: 9
Scientific publications: 278
Professional publications: 175
with the problems of the construction of cultural memory, whereas the current focus of the latter is mainly on periodical research, which has a long and well-respected tradition within the Nijmegen Faculty of Arts, especially within the Pierre Bayle Institute.

The year 2006 saw the 6-year research quality assessment, carried out by an independent international review committee that also visited the Faculties of Arts of the University of Amsterdam, Amsterdam Free University and the University of Tilburg. The results of the assessment contained much important advice to help us improve programmes within the institute.

Awards
Prof. H. Motzki was one of the winners of the 14th World Prize for the Book of the Year of the Islamic Republic of Iran, awarded for his book The Biography of Muhammad and for his studies on the raditions concerning the Prophet.

Dr V. Hunink was awarded the Public Award (‘Publieksprijs’) of OIKOS, the Dutch Research School of Classical Studies, for his contribution to popularization of the field, especially through his translations of Latin prose.

K. van ’t Land PhD was awarded the ‘Pieter van Foreest Wetenschapsprijs’ for young scholars in the medical humanities. Van ’t Land received the award for three medical-historical articles about medicine in the Middle Ages.

Research facilities
- Humaniora library (135,000 volumes, 15,500 serial volumes, 750 serial subscriptions and 600 manuscripts)
- Catholic Documentation Centre: archives and publications of Dutch Catholic institutions, 1800-2000 (see: www.ru.nl/kdc)
- Centre for the Documentation of Art History: collections of pictures, photographs, and slides (see: www.ru.nl/ckad)
- Archaeological collections (Provincial Roman History; excavations in the former territories of Germany Inferior, and especially Ulptia Noviugamus Batavorum
- Database of medieval pilgrim badges and souvenirs (KUNERA)

Collaboration
Prof. L. de Blois, Prof. O. Hekster and Dr G. de Kleijn (The Ancient World) are members of the executive team of the International Network ‘Impact of Empire’. This is an international research network that focuses on the existence of the Roman Empire and the consequences of its actions in the regions it dominated. The network is directed by an international board of reputed scholars drawn from Classics, Archaeology, Ancient History, and History of Law.

Prof. M. Monteiro (Christian Cultural Heritage) is a member of the board of RELINS-Europe (European Forum on the History of Religious institutes in the 9th and 20th centuries), a collaboration between KADO Leuven, Universität Fribourg, Hochshule Vallendar, and Radboud University Nijmegen.

Members of The Dynamics of Islamic Culture cooperate with:
- the Research group ‘Bases for a New Biography of Mohammed’ of the Department Altertumswissenschaften und Orientalistik, Orientalisches Seminar, University of Basel. The aim of the project is to reconstruct the earliest sources of the biography of Mohammed.
- the Mu’tazilite Manuscripts Project, established in 2003. The project to date involves an international group of fifteen scholars collecting, recording and preparing critical editions of all unpublished material of Mu’tazili provenance.

Members of Literature, Culture, Media are involved in a research project on ‘The reception of foreign literature in the Netherlands in the twentieth century’, carried out in collaboration with researchers of the Faculty of Arts of the University of Utrecht and the Huygens Institute of the KNAW.

Research results
In 2006 nine dissertations were defended. G. Rutten’s doctorate for his De Archimedische punten van de taalbeschouwing. David van Hooogstraten (1658-1724) en de vroegmoderne taalcultuur was awarded cum laude.

The year 2006 saw the publication of The Impact of Imperial Rome on Religions, Ritual and Religious Life in the Roman Empire, edited by L. de Blois, P. Funke and J. Hahn. Proceedings of the Fifth Workshop of the International Network ‘Impact of Empire’ (Roman Empire, 200 B.C. - A.D. 476), Münster, June 30-July 4, 2004, Brill, Leiden/ Boston, with contributions by Prof. L. de Blois, Prof. O. Hekster, M. Icks PhD, Dr J. de Jong, I. Mennen PhD and Dr D. Slootjes (all members of HLCS). The volume gives new insights into the ways in which the Roman Empire changed religious life in the territories which it incorporated. It thus stimulates discussion on relations between religion and politics. This volume is the first in a new Brill series named ‘Impact of Empire’, whose editors are L. de Blois, O. Hekster, G. de Kleijn and J. Rich.

The 7th workshop of the International Network ‘Impact of Empire’: The Impact of Crises on the Roman Empire (20-24 June 2006), was organized by Prof. O. Hekster,
Dr G. de Kleijn and Dr D. Slootjes in Nijmegen, with speakers from 27 universities in 10 different countries. The papers presented at this workshop clearly showed how crises were instrumental in the creation of the Roman empire and in its various subsequent structural changes. The resulting proceedings should be an important contribution to the ongoing debate about the creation and development of pre-industrial empires.

The scope of the Pierre Bayle Institute, which is based in the Department of History of the Radboud University, has been expanded. Traditionally concerned with the history of the so-called ‘Republic of Letters’ and the cultural relations among Western European countries in the 17th and 18th century it now includes research into periodicals, correspondences and networks in the 19th and 20th century. Its most recent project on periodicals and networks has resulted in the publication of the collaborative volume Periodieken en hun kringen (eds Hans Bots and Sophie Levie; Vantilt, Nijmegen).

The 9/11 project, which started in 2003 and focuses on the representation in the arts and culture of the events of 11 September 2001, has this year resulted in the publication of the edited volume Stof en As. De neerslag van 11 september in kunst en populaire cultuur (eds Liedeke Plate and Anneke Smelik; Van Gennep, Amsterdam), with contributions by Dr J. van der Bent, Dr L. Plate, Prof. F. Schuerewegen, Dr M. Smeets, Prof. A. Smelik, M. Stevens PhD, and W. Weijers PhD.

A research project on ‘The reception of foreign literature in the Netherlands in the twentieth century’ is carried out in collaboration with the University of Utrecht and the Huygens Instituut of the KNAW. A special issue of the journal Nederlandse Letterkunde (2006, no. 3) was dedicated to contributions by members of the project group, which includes three HLCS members (Prof. S. Levie, Dr M. Sanders and Prof. M. Steenmeijer). A symposium on reception issues was held at the Radboud University on 2 November 2006.

**Societal impact**

The classical archaeologists Dr S. Mols and Prof. E. Moormann wrote a book to accompany a major exhibition on ancient Herculaneum. With their experience and contacts in this area they played an important role liaising between the Valkhof Museum in Nijmegen and the directors of the National Museum in Naples and the Excavations of Herculaneum.

Prof. J. Koldewej organized and for the greater part produced a major exhibition in the Gruuthuse Museum, Bruges, on the pilgrimage signs of the late Middle Ages and early Renaissance. The exhibition was the culmination of his long-standing work on this group of devotionalia in North-West Europe. Several staff members of the Department of Art History assisted in mounting this highly successful exhibition, which was accompanied by a catalogue (Geloof & Geluk. Sieraad en devotie in middeleeuws Vlaanderen. Arnhem: Terra Lannoo).

Prof. V. Manuth was involved in various major exhibitions on Rembrandt upon the occasion of his 400th anniversary, e.g. in Amsterdam (Rembrandt-Caravaggio; Rijksmuseum/Van Gogh Museum) and Berlin (Rembrandt - Genie auf der Suche; Gemäldegalerie, Staatliche Museen zu Berlin).

Dr R. Meijer acted as expert witness for the Piranha trial in which several Dutch Muslims were accused and later convicted for terrorism. A report was written for the trial, Inhoud van de religieuze en ideologische documenten aangetroffen in het beslag van de verdachten in het Piranha-onderzoek.

**Future research**

Following the results of the quality assessment, discussions were begun to strengthen the research profile of HLCS. A number of key research themes for the institute were defined, taking into account several considerations: the strengths of excellent individual researchers, the possibilities of funding both on the national and the EU level, and the potential to create a broad recruitment pool of researchers within HLCS. Four themes are to be further explored in 2007: (i) The Roman empire; (ii) Dealing with the religious past; (iii) Literary border traffic. Reception and literary criticism in an international perspective; (iv) Political Culture. These themes, for which small development teams have been set up, provide an umbrella for specific research proposals.

Prof. J. Joosten (Modern Dutch Literature) obtained a NWO grant for for his project ‘The Best Intentions: Literary Criticism in the Netherlands 1945-2005’. Together with Prof. P.J. Schellens (Applied Linguistics), Joosten, two PhD students and a postdoc researcher will analyse change and constancy in strategies of argumentation in literary criticism in the Netherlands since second World War. This will be the first time that expertise in Dutch literature and applied linguistics are combined at this level. The project results will form the basis of a monograph on the history of literary criticism in the Netherlands in the post-war era.
Institute for Historical, Literary and Cultural Studies

Prof. E.M. Moormann

Prof. Moormann has been a Full Professor of Classical Archaeology at Radboud University Nijmegen since 2002. Before that he was Assistant Professor at the University of Amsterdam and a staff employee at the Netherlands Institute in Rome. He is an expert in the archaeology of the Hellenistic-Roman era, in particular in the citizen’s environment in ancient times (housing, furniture, decoration and city structure). Prof. Moormann has been a Corresponding Member of the German Archaeological Institute since 1998. He has published several monographs and articles in a variety of books and journals on Roman wall decorations, Greek and Roman sculptures, the history of Archaeology and the impact of antiquity on art and literature. He is editor-in-chief of the Bulletin Antieke Beschaving, a peer-reviewed annual publication on archaeological studies in the Mediterranean region. Prof. Moormann received the Winckelmann Medal for his research on this 18th-century pioneer scholar of Classical Archaeology.

Institute for Historical, Literary and Cultural Studies

Postal address
PO Box 9103
6500 HD Nijmegen
The Netherlands

Visiting address
Erasmusplein 1
Nijmegen

T: +31 (0)24 361 23 36
F: +31 (0)24 361 54 81
E: hlcs@let.ru.nl
I: www.ru.nl/hlcs

Prof. H. Motzki, Prof. A. Tayob and Prof. M. van Bruinessen (University of Utrecht) have obtained a NWO grant for their proposed research project ‘Salafism: Production, Distribution, Consumption and Transformation of a Transnational Ideology in the Middle East and Europe’. Salafism is a widespread Islamic movement that has a major influence in the Middle East and Europe. The project aims to understand this ideological movement at both the transnational and the local level. In order to understand the impact of interdisciplinary approach, studying the full cycle of production, transmission, consumption and transformation of religious knowledge.
Institute for Law

The Institute for Law consists of four major research centres:

- the Business and Law Research Centre
- the Centre for Migration Law
- the Centre for State and Law
- the Centre for Notarial Law

**Business and Law Research Centre**  
(Prof. S.C.J.J. Kortmann)  
The Business and Law Research Centre – known in the Netherlands by its Dutch abbreviation 'OO&R' (Onderzoekcentrum Onderneming & Recht) – is a cooperation between the Law Faculty of Radboud University Nijmegen and a dozen prominent, mostly international, law firms and Dutch multinationals. The following law firms and companies are partners: ABN AMRO Bank, ABP Pension Funds, Akzo Nobel, Allen & Overy, De Brauw Blackstone Westbroek, Clifford Chance, Houthoff Buruma, Loyens & Loeff, Nauta Dutilh, Pels Rijcken & Droogleever Fortuijn, Rabobank Netherlands and Stibbe.

The Centre conducts extensive fundamental research in business and law, and critically analyses national and international developments in legislation and case law pertinent to this field. It also provides a thorough educational programme for gifted young scholars and is actively involved in a wide variety of postgraduate educational and professional training programmes.

The OO&R, which encourages a practical approach to academic research, engages in research that has substantial scientific and societal value. As well as contributing to the drafting and implementation of new legislation in its fields of expertise, it is involved in the further harmonization of rules on business and law in Europe and internationally.
The OO&R is accredited as a research school and a ‘centre of excellence’ by the Royal Academy of Arts and Sciences (KNAW). The four key research areas of the OO&R are Capital Markets and Company Law (Van der Heijden Institute), Banking, Finance and Insolvency Law, General Business Law (including European private law, Dutch general private law and private international law) and Employment Law.

The OO&R’s main strength lies in combining academic excellence with the expertise and practical experience of its partners. This unique collaboration has led to ongoing cross-fertilization between legal practice and the academic world, generating results that are important both to academic research and to legal practice.

Centre for Migration Law
(Prof. C. A. Groenendijk)

The Centre for Migration Law brings together researchers from various disciplines within the Institute for Law. Its purpose is to provide a stimulating context for high-quality research – both legal and empirical – on migration and the protection of minorities. The Centre is unique in Europe for its interdisciplinary approach and the composition of its staff, who include lawyers, sociologists, anthropologists and political scientists. It is also known for the comparative international approach it takes to much of its research.

The Centre for Migration Law provides a thorough academic training and a stimulating research climate, operating a guest programme that receives promising PhD students and young postdocs from all over Europe. Its staff conducts research and consultancy for organizations such as the European Community, the Council of Europe, UNHCR, the International Organization for Migration, the UN Centre for Human Rights, Amnesty International and the European Council on Refugees and Exiles.

The Centre also contributes to drafting new European migration laws. As well as conducting fundamental and applied research, it organizes international conferences, edits a journal (European Journal of...
Migration and Law), a book series (Immigration Law and Policy in Europe) and a yearbook on Dutch and international migration law (Rechtspraak Vreemdelingenrecht). The latter has been edited by members of the Centre since 1975, in collaboration with researchers from Utrecht University, Leiden University (Instituut voor Immigratierrecht) and the Free University of Amsterdam. The Centre seeks to balance the funding of its research by maintaining equilibrium between funds from the University, NWO, and other external sources.

Centre for State and Law
(Prof. C.A.J.M. Kortmann)
The Centre for State and Law – known in The Netherlands by its Dutch abbreviation ‘SteR’ (Staat en Recht) – focuses mainly on the central issues and basic principles in public law. Its researchers critically analyze national, European and international developments in constitutional law, administrative law and criminal law. The Centre has committed itself to creating a stimulating environment in which high-quality, national and international multidisciplinary law research can flourish. It publicizes its results through authoritative publications (including its own book series), and also disseminates these results through lectures, conferences and symposia.

The Research Unit ‘Administration of Justice’ was established within SteR to enhance a multidisciplinary approach, providing excellent opportunities for its members to benefit from each other’s know-how. This unit focuses on law in action – the workings of the courts, public prosecutors and the legal profession. Further research is conducted in a number of programmes: Sociology of Law, Administrative Law, Constitutional and Comparative Constitutional Law, European and International Law, Criminal Law, Legal History, Sociology and Philosophy of Law.

This research has led to studies on international arbitration, European integration, the background and future of the European and national constitutions, the general provisions of administrative law and the law relating to local and regional governments. ‘Administration of Justice’ encompasses four main themes: 1) legislation and case law concerning procedural law, 2) organizational design and practice of the Administration of Justice, 3) the quality of Administration of Justice from the point of view of legality, effectiveness and efficiency and 4) the legitimacy of the Administration of Justice, from the perspective of the ethics of legal professionals (magistrates, lawyers and others).

Centre for Notarial Law
(Prof. M.J.A. van Mourik)
Researchers at the Centre for Notarial Law study the principles, system and development of the fields of law in which civil-law notaries work – for example, real-estate law, company law, and particularly non-limited liability partnerships as well as marital property, and the law pertaining to inheritance, business succession, estate planning and inheritance tax. They also examine such closely related fields as personal and family law, agricultural law and the law on pensions. Particular attention is paid to the bearing of these fields on the general law of property. The approach to all such work is a practical one, several of the researchers also being active in notarial practice.

The Centre for Notarial Law seeks to make a major contribution to the scientific foundations of notarial practice by publishing handbooks and other influential publications. It aims to maintain its prominent position in notarial law in the Netherlands, and to shape the legislative process and the practice of notarial law through its research.

Research facilities
The Business and Law Research Centre houses the Information and Documentation Centre for Business and Law (CIDOR) – a centre of expertise which supplements the library of the Faculty of Law. It has a collection of books, journals and electronic publications on international and domestic business law unique in the Netherlands.

The Institute for Law has a large, well-equipped library with state-of-the-art ICT facilities. Within it, SteR has as its disposal the so-called Cerutti Room, where old and rare legal books can be consulted.

Collaboration
As part of the ‘Improving Human Potential’ programme, the OO&R collaborates with the Universities of Barcelona (Spain), Lyon – Jean Moulin Lyon 3 (France), Münster (Germany), Oxford (England), Turin (Italy) and Warsaw (Poland). In addition, there is collaboration within the framework of the International Working Group on Protected Funds in the EU and the International Working Group on Security Rights in Europe (both established by the OO&R) with the Universities of Berlin – Humboldt (Germany), Bern (Switzerland), Edinburgh (Scotland), Leuven (Belgium), Linz (Austria), London - King’s College (England), Luxembourg (Luxembourg), Madrid (Spain), Milan-Bicocca (Italy), Montpellier (France), Oxford (England), Prague (Czech Republic), Rome – Luiss Guido Carli (Italy) and Thessaloniki (Greece).

The systematic collaboration between the Institute of Insolvency Law of the University of Leuven and the OO&R has been further strengthened by joint participation in
International Working Groups, the Ius Commune Insolvency Law Casebook Project and the award of funding for a joint doctoral research project on prejudiced recourse opportunities under Belgian and Dutch insolvency law. There is also structural cooperation between the OO&R and the University of Leuven in the field of company law and insurance law.

Within the context of the strategic alliance between the Radboud University Nijmegen and the University of Poitiers, several researchers at the OO&R participated in the Colloquium jointly organized by these universities on 22-24 May 2006 in Nijmegen. The OO&R also participates in Working Group sessions of the United Nations Commission on International Trade (UNCITRAL) on insolvency law and the law on secured transactions and it collaborates with INSOL Europe within the framework of the Academic Wing of INSOL Europe.

The Centre for Migration Law is responsible for co-ordinating the European Network on Free Movement of Workers within the European Union (funded by the European Commission). The Centre has long-term collaborative arrangements with the Research Centre for Institutional Behaviour and European Integration at the Austrian Academy of Sciences, the European Centre for Social Welfare Policy and Research in Vienna (Austria), the Centre for European Policy Studies (Belgium), the Danish Institute for Human Rights in Copenhagen (Denmark), the Research Centre for International and European Immigration and Asylum Law at the University of Constance (Germany), the Institute of Political Science in Paris (France), the London School of Economics (UK) and the Odysseus Network of Experts in European Migration and Asylum Law.

The Centre for State and Law collaborates with the Max Planck Institute for Foreign and International Criminal Law in Freiburg (Germany), the Working Group of the Legal Professions of the Law & Society Association, the Stephan Kuttner Institute of Medieval Canon Law in Munich to the Universities of Antwerp (Belgium), Leuven (Belgium), Poitiers (France), Montpellier (France), Münster (Germany), Glasgow (Scotland), Florence (Italy), Exeter (UK), Kiel (Germany), Minneapolis (USA), and Toronto (Canada). It participated in a Programme for European Criminal Law and Procedure, led by Ludwig-Maximilians-Universität München Institut für die


Dissertations: 8
Scientific publications: 204
Professional publications: 252
Annotations: 144
gesamten Strafrechtswissenschaften, Rechtsphilosophie und Rechtsinformatik (Munich, Germany).

The Centre for Notarial Law works with ABN Amro Bank NV in the field of estate planning, and monitors the academic level of the consultancy services provided by the bank. It also works with the Dutch Foundation for Professional Education of Notaries (SBN), the Foundation for the Training of Notary’s Clerks, the Royal Notarial Association (KNB), the Association of Estate Planners in Notarial Practice (EPN), and with Tilburg University as part of its course in Notarial and Fiscal law.

Research results

Research in the field of general private law, European private law and the overarching principles of private law is carried out on a continuous basis by the authors of the volumes on the Law of Obligations in the Asser Series. In this prestigious series for practitioners and researchers Verbintenissenrecht, part III, De verbintenis uit de wet (12th ed.) was produced in 2006. Various books (including doctoral dissertations) were published in the following series:
- Business and Law (Onderneming en Recht) (currently 37 volumes)
- Law of Business and Finance (currently 9 volumes)
- The Van der Heijden Institute series (currently 91 volumes)

Detailed comparative research was carried out by two International Working Groups established by the OO&R. Results obtained include various national reports cataloguing the domestic legal systems in the field of security rights in Europe and an extensive introduction.

Regarding the effect of the EC Treaty provisions on the validity of contracts concluded in violation of the principles underlying those provisions, a contribution was made in the Secola (European Society of Contract Law) conference on Fundamental Rights and Contract Law (Berlin, September 2006).

The following conferences were organized or co-organized by the OO&R in 2006:
- INSOLAD Annual Conference ‘De bewindvoerder, een octopus’ on 24 November 2006, Theater La Bonbonnière, Maastricht

In 2006, the European Network on Free Movement of Workers – coordinated by the Centre for Migration Law – produced 25 national reports on developments affecting the freedom of movement of workers in the Member States, and also published a European comparative report written by staff members at the Centre. Members of the Centre published various articles within the framework of the CHALLENGE programme (Changing Landscape of European Liberty and Security), a multidisciplinary project funded under the EU’s 6th Framework Programme involving 21 universities across Europe, which is examining new regimes and security practices and their relationship to civil liberties, human rights and social cohesion.

Another comparative research programme funded by the European Commission and co-organized by the Centre – on the Acquisition of Nationality in EU Member States: Rules, Practices and Quantitative Developments (NATAC) – led to the publication of two books in 2006. In 2006 studies were completed on communication within the Dutch asylum procedure, on the legal measures and social consequences of criminal law in six Member States related to people trafficking and smuggling, on the effects of the new Dutch naturalization exam, on the effect of the return policy of the Dutch government with regard to asylum seekers at the municipal level and on the effects of group-related asylum policy.

The output of the Centre for State and Law includes a corollary of two conferences organized by the Centre’s focal point ‘Administration of Justice’. On 7 April a conference was organized entitled: De ongehoorzame rechter (The disobedient Judge). Another conference was organized in close cooperation with the District Court in Arnhem, on ‘Concentratie en specialisatie van rechtpraak: noodzaak of overbodig?’. On 20 January Dr T. Havinga organized and chaired a seminar on ‘Regulation of Food Safety’ for researchers from the Universities of Wageningen, Utrecht, Amsterdam and Nijmegen.

Societal impact

In 2006, numerous books, articles, case notes, conference papers and other contributions written by researchers at the OO&R were published. These have made a significant contribution to public debate in the field of business and law. In addition, researchers at the OO&R have been actively involved in various prominent governmental and non-governmental organisations (NGOs), including:
- AFM (Netherlands Authority for the Financial Markets)
- EBRD (European Bank for Reconstruction and Development)
- IIL (International Insolvency Institute)
- INSOLAD (Netherlands Organisation of Insolvency Professionals)
- INSOL Europe (European Organisation of Insolvency Professionals)
The Municipality of Nijmegen and the Institute for Multicultural Development, the Dutch Refugee Council, FORUM the Advisory Committee for Aliens’ Affairs, Commission, the Dutch Ministry of Justice, out research on behalf of the European Community Contract Law.

The Centre for Migration Law carried out research on behalf of the European Commission, the Dutch Ministry of Justice, the Advisory Committee for Aliens' Affairs, the Dutch Refugee Council, FORUM (Institute for Multicultural Development), the Municipality of Nijmegen and the Dutch Foundation for Legal Aid for Asylum Seekers. Consultancy services were also provided to the Council for the Judiciary, the Dutch Refugee Council and FORUM.

The Centre's publications on institutional communication in the asylum procedure and on the effects of the new Dutch naturalization exam have affected both the political and the public debate on these issues. In October 2006, the Centre organized an international seminar in Nijmegen at which researchers and civil servants from fifteen EU member states discussed the implementation of the new EC Directive 2004/83 on refugee and subsidiary protection (the Qualification Directive).

The Centre for State and Law works together with the Study Centre for the Administration of Justice in Zutphen, the District Court and the Court of Appeal in Arnhem and the Court of Appeal in Amsterdam.

The Centre for State and Law participated in the public debate on ‘administration of justice’. Senior participants carried out research on behalf of the Research and Documentation Centre (WODC), Ministry of Justice, the Netherlands Council for the Judiciary and the Dutch Board of Prosecutors General.

Prof. Y. Buruma chairs the Admittance Committee Regarding the Evaluation of Completed Criminal Cases (Toegangscommissie Evaluatie afgelopen strafzaken) – in other words the Dutch innocent convicts commission. Prof. C. Kortmann, who holds an Academy Professorship endowed by the Royal Netherlands Academy of Arts and Sciences, is a member of the Royal Academy. Prof. P. Bovend’Eernt is a substitute judge in Zutphen. Prof. P. Tak is Secretary General of the International Penal and Penitentiary Foundation. Prof. Y. Buruma is a member of the Supervisory Council and the Programme Committee of the Research and Documentation Centre of the Dutch Ministry of Justice (WODC), as well as chairman of the Scientific Advisory Board of the NSCR in Leiden. Prof. A. Machielse is Advocate General in the Supreme Court and Prof. P. Vegter is vice-president of the Court of Appeal in Arnhem. Prof. K. Wellens is chairman of the Advisory Committee on International Law Issues, which advised the Dutch government on pre-emptive action.

Many members of staff gave courses organized by the Study Centre for the Administration of Justice to trainee judicial officers, judges and public prosecutors.

The interaction between science and notarial law practice advocated by the Centre for Notarial Law involves a strong bond between the Centre and legal practice. Researchers are actively involved in lectures, training and legal advice, while acting as preliminary advisors. F. Schols, B. Schols and W. Burgerhart are lecturers for the Stichting Beroepsopleiding Notariaat, and are also involved in training the estate planners of EPN, the association of estate planners in notarial law. Prof. M. van Mourik appeared regularly in the Dutch media (on the radio, on television and in the newspapers).

Future research
Primary research within the OO&R will cover the following topics:
- Security Rights in European perspective (pending research)
- Protected Funds in the EU (pending research)
- Domestic Insolvency Cases and lus Commune (not yet started)
- Delegation of powers regarding the issue of securities (pending research)
• The legal concept and use of the LLP and LLC (pending research)
• The social corporate entity (not yet started)
• Banking, Finance and Insolvency in historical perspective (not yet started)

Currently, a Commentary is being prepared that will formulate recommendations regarding future developments regarding secured transactions law. The International Working Group on Protected Funds in the EU is preparing a Draft EC Directive on Protected Funds, which is intended to facilitate trust and trust-like arrangements in the Member States of the European Union.

Other books will be published on Corporate Integrity, European private law, prospective Dutch insolvency law reform, public offerings, the Financial Supervision Act, naming & shaming in corporate criminal and administrative law and other topics in the field of private, company and commercial law.

Various researchers at the OO&R will participate in the deliberations of UNCITRAL Working Group V on Insolvency and Groups of Companies, the UNCITRAL Working Group VI on Security Interests and the UNIDROIT Working Group on the formation of additional chapters to the Principles of International Commercial Contracts. The OO&R will also establish – in conjunction with the Institute of Insolvency Law of the University of Leuven – a Working Group which will aim to publish the Ius Commune Insolvency Law Casebook. Members of the OO&R can be expected to play an active role in the forthcoming INSOL International Conference in Cape Town in March 2007 and the INSOL Europe Annual Conference in Monaco in the fall of 2007. The Van der Heijden Institute will organize a Conference in the Netherlands on public offerings and protection in the spring of 2007 and a conference on flexible corporate entities in the autumn of 2007. Upon receiving funding from the European Commission, international trust funds and/or other GO or NGO entities, further comparative research may be carried out (for example by newly established International Working Groups) on e.g. avoidance provisions in European Insolvency Law.

The programme on general private law and European private law will further develop research on the theoretical and practical implications of European Law for national private law and, in the course of 2007, the Advisory Committee to the Minister of Justice on the reform of Dutch Insolvency Law will submit a draft bill for a new insolvency law. Prof. Kortmann is chairman and several researchers are involved in drafting the bill.

As part of the CHALLENGE programme, the Centre for Migration Law will collaborate with the Centre for European Policy Studies on the organization of three seminars in Brussels in 2007. It will also continue to coordinate the Network on Free Movement of Workers in the EU.

The Centre will participate in a comparative project on the implementation of ten new EC Directives, including reception conditions, long term residency, qualification and temporary protection, which is coordinated by the Odysseus Network and funded by the European Commission. In cooperation with universities in seven other EU countries, the Centre has tendered for a study on the content and the effects of integration tests for immigrants.

In 2007 the Centre for State and Law will undergo a transition. The prominent place of ‘Administration of Justice’ will be maintained, while other themes will be developed in order to extend the scope of research on public law.

In collaboration with the Supervisory Committee on the Secret Services an international conference of Human Rights and the Accountability of the Secret Services will be organized by Prof. Y. Buruma in the Ridderzaal (The Hague) in June 2007. In the autumn of 2007 the department of Administrative Law will organize a conference on ‘Unity of administrative law’ in cooperation with members of the Council of State and the Central Court of Appeal, focusing on issues related to social security.

Current projects within the Centre for Notarial Law will continue, including the including research on the executor of last wills (in the law of succession) of the executor of last wills, the historical development of the legal position of the surviving spouse in Dutch civil law, the legal meaning of the term ‘value’ and the term ‘appraisal’ concerning the succession of companies, the exegesis of last wills and international aspects of estate planning.
The Institute for Management Research (IMR) conducts fundamental and applied research on the development, design and effectiveness of the public and private structures that regulate, govern and manage human interaction. These structures exist at various levels, ranging from societies as a whole to urban networks and from macro-economic systems to individual organizations and firms.

IMR’s multidisciplinary composition makes it possible to analyse such structures from a number of theoretical perspectives such as managerial, economic, geographical and political. By combining and integrating these perspectives, the Institute offers richer insights into international, societal and organizational phenomena in all their complexity and interrelationships. It is the breadth and integration of this work that has helped the IMR gain recognition as a strong player in the international research arena.

There are currently six research programmes:

- The Governance and Places (GaP) programme covers the processes, substance and context of spatial-environmental governance, employing various policy analysis approaches. The study, which is informed by a wide range of positivist, institutionalist, constructivist and interpretatist theories, includes cross-sectional and case-study oriented empirical research. The research aims not only to make scientific contributions, but also wants to make a direct contribution to spatial policy praxis.

- Nijmegen Centre for Economics (NiCE). The research, which is based on three themes: Institutions and culture, new economic approaches and the empirical analysis of markets, acknowledges pluralism in economics and includes multifaceted topics that are to a certain extent influenced by economics, such as Accounting and Finance. Research in Accounting, as part of the theme ‘Institu-
tions and Culture', mainly concentrates on change and is therefore also closely connected to SHIFTS and PARTNER.

Researchers in Organizational Cybernetics (OC) conduct research on organizations and organizational behavior, using, developing and combining cybernetics and social systems theory. The research deals with two related topics: organizations in modern society (which a special emphasis on ethical issues as well as on corporate social responsibility) and interventions with respect to 'messy' problems. The research is descriptive/analytical as well as constructive and a number of laboratory experiments are conducted.

The Participation and New Employment Relations (PARTNER) programme addresses changes in employment relationships within both public and private organizations (at the micro level) against the background of changing performance requirements as well as changes in the institutional context of regulation and governance of employment relations at a societal (i.e. macro) level. Moreover, the interrelations between changes at these two levels are studied and a variety of research methods are used.

Researchers in Relationship Management (RM) study the governance and management of relationships between firms and their stakeholders from both a strategic and a marketing perspective. Horizontal as well as vertical co-operation and alliances between companies are studied using a variety of research methods.

The programme on Shifts in Government and Governance in a Comparative and International Perspective (SHIFTS) deals with superficial as well as fundamental changes in public governance and management. The main hypothesis is two-fold. First, that many of the traditional forms, mechanisms, locations, capabilities and styles of government have never really 'shifted' to the extent that current theories would suggest. Second, that to the extent that there have been such shifts, a counter trend away from the 'new' forms of governance back to 'old' ones is already taking place. The research is theoretical as well as empirical.

**Awards**

Dr J. Smits received a ranking from CentER in Tilburg, the Netherlands as one of the top 40 'Economen' in 2006.

R.C.J. Zwinkels MSc received the Young Researcher Grant for his presentation “Heterogeneity of Agents and Exchange Rate Dynamics: Evidence from the EMS”, at the International Conference on Economic Sciences with Heterogeneous Interacting Agents (WEHIA06) in Bologna, Italy.


Dissertations: 11
Scientific publications: 263
Professional publications: 240
Research facilities
Research programmes at IMR develop and use specialized national and international databases, adapting and combining them to suit the Institute’s research themes and requirements.

Researchers in the business sciences use mergers, acquisition and alliances data from the MERIT-CATI database and Thomson Security Data as well as company-specific data from Worldscope, Osiris and Dun and Bradstreet. Country and sector level data from the World Bank, United Nations and OECD are also used. The Institute has access to a large dataset of employee commitment data belonging to a large multinational company and a panel dataset of companies listed on the stock exchange in several European countries is being developed, covering the topics employee share ownership and performance data. Furthermore, the CRANET database is used for the analysis of performance and innovation data of companies. This is a compendium of survey rounds on human resource management practices in more than 40 countries. On this note, PARTNER has been nominated within the Development Group of The CRANET Network to develop a worldwide International Human Research Management Survey in 2008. The Institute’s economists use the Datastream International database, Consensus Economic Survey database, Educational Participation Database, Regional Indicator Database and Inequality of Mortality Database.

The Institute has the following research facilities:

• the Visa skills lab, an Electronic Meeting Room at the Nijmegen School of Management, which is equipped for conducting experiments on group decision processes.

• In the year under review a new experimental research laboratory has been set up and new facilities will be built to accommodate research on the application of game theory as well as experiments on cooperation between firms.

Collaboration
The Institute collaborates with the following Dutch research schools and networks:

- Research School for Resource Studies for Development (CERES), Netherlands Graduate School of Urban and Regional research (NETHUR), Netherlands Network of Economics (NAKE), Netherlands Institute of Government (NIG), Netherlands Organisation for Research in Business Economics & Management (NOBEM) and the Research School on TRAnsport, Infrastructure and Logistics (TRAIL).
- The Institute cooperates with numerous national and international universities, institutions (public and private) and networks including:
  - the Universities of Duisburg, Düsseldorf, Aachen, Maastricht and Nijmegen – within the Framework of the INTERREG programme ESPRO
  - the Universities of Delft and Groningen in the context of the NWO research programme BAMADAS, focusing on innovation in advanced driver assistance technology
  - Coordination of EUFINPART, an European Research Network on Employee Financial Participation;
  - Bilateral research collaborations with Freie Universität Berlin (on competencies for individuals, organizations, networks and society as a whole), Aston University Birmingham (in the ESRC Project ‘The Impact of Higher Education Institutions on Regional Economies’, funded by the UK Social Science Research Council), the University of Mannheim (on dynamic decision making), the University of Albany and State University of New York (on group model-building as organizational intervention)
  - Public-private collaboration in the BSIK programmes, through involvement in Habiforum and Connekt, the Stichting Next generation of Infrastructures (NGI) and Transumo.
  - Participation in the new NICIS research institute (Netherlands Institute for City Innovation Studies), which was established through an alliance between universities and the Ministry of Education, Culture and Science with support from the Netherlands Organisation for Scientific Research (NWO)
  - Cooperation with partners from all over the world on ‘Global Migration from the Eastern Mediterranean and Eurasia: Security and Human Rights Challenges to Europe’. GLOMIG is a Specific Support Action in EU FP6
  - EU programme IN-SAFETY (INFrastrucure and SAFETY). IN-SAFETY project aims to use combinations of new technologies and traditional infrastructure best practice applications, in order to enhance the road environment development and road safety assessment and inspection.

Research results
Since many programmes were concluded in the year under review, this is a good moment for reflection. The research programmes have met the targets set for quality and productivity and there has been some overall convergence of themes, resulting in a stimulating research environment and an increase in the acquisition of externally financed projects, both public and private, and in participation in Dutch and EU based public-private programmes.
The following projects are worthy of special mention:

- Dr E. van der Krabben, together with Ecorys, has carried out a research project, commissioned by the Dutch Parliament, on the privatization of Schiphol Airport. This project, which analyzed the very substantial total value of the real estate projects Schiphol Airport is involved in, has resulted in a report to the Dutch Parliament entitled 'Verkoop van een Luchthaven' (‘Selling an Airport’);
- Prof. E. Nijssen, Dr B. Hillebrand, Dr P. Vermeulen and Dr R. Kemp asked to what extent product development is different from service development and showed that both follow the same underlying model, including mechanisms of differentiation and organizational inertia, but that the effects of these mechanisms differ according to the service or product context.
- Prof. E. de Jong, Prof. W. Verschoor and R. Zwinkels MSc explored the expectations of agents in the exchange rate market, who use incomplete information and have different beliefs about future exchange rates. The empirical results suggest that there is heterogeneity in the behaviour of these agents, given the simultaneous existence of fundamentalism and one or two forms of chartism. Furthermore, the results show that the heterogeneous agent model outperforms the random walk model in forecasting future exchange rate returns in practically all country/horizon combinations.
- Dr E. Poutsma showed that American multinationals face resistance when introducing human resource management from their home country in Europe. However, over time, these multinationals do influence European human resource management, making HRM more performance oriented and less participative and commitment oriented.
- In his research on how and how not to discuss the compatibility of liberalism and ecologism, Prof. M. Wissenburg found that, while interpreting political theories as evolving bodies of thought, ecologism can and must develop its own concept of moral neutrality, while liberalism can and must develop a substantive view on ecological constraints to human emancipation. This research may lead to a discussion as to whether ecological neutrality is compatible with liberal survivalism.

**Societal impact**

IMR researchers frequently participate in debates on economics, politics, organizational and labour market issues. They lecture on managerial, economic, geographical, and political issues, write articles for newspapers, are members of national and international policy institutes, and are regularly contracted to conduct cutting-edge research. To ensure that the Institute’s activities remain relevant and topical, participants in the programmes also maintain close relations with professional partners and policymakers.

The memberships and projects selected below are of special particular interest:

- Prof. P. Leroy gave a keynote lecture on Environmental policy evaluation in Flanders at an expert meeting on ex-post policy effectiveness evaluation organised by the European Environmental Agency in Copenhagen
- Prof. A. Zoomers gave various keynote lectures on migration and development for the Dutch Ministry of Foreign Affairs and for the OBREAL/Europe Aid cooperation office
- Prof. R. van der Heijden was appointed to the International Review Committee for Scientific Research on Traffic Safety (Stichting Wetenschappelijk Onderzoek Verkeersveiligheid, SWOV)
- In cooperation with the National Expertise Centre for Housing and Care (KCWZ) Prof. G. de Kam has developed AREADNE, a decision-support model for real estate developments designed to combine housing, care and social support
- Dr S. Dühr participated in debates on European territorial cooperation, including roundtable discussions organized by the German Federal Ministry For Spatial Development (BMVBS) on transnational territorial cooperation and the German EU Presidency in 2007 at the Euregia Workshop in Leipzig
- Prof. J. Vennix and Dr E. Rouwette organized the 2006 International Conference of the System Dynamics Society in Nijmegen. Special sessions were held on typically Dutch issues, such as changes in the care system, endemic problems in Public Administration, innovation in business and regional innovation
- Prof. M. Leyenaar appeared regularly in the media in the context of national general elections in the Netherlands
- Dr M. Verloo received a contract to provide training on gender mainstreaming for the Committees of the European Parliament.

**Future research**

In mid-2007 IMR will be evaluated according to VSNU standards for public research organizations. The assessment is expected to endorse our new research programmes for the period from 2007-2013, which are currently being developed. Research within IMR focuses on the design, development and consequences of policies, structures and practices that construct, govern or manage human interaction in
and across organizations, in public space and in society at large. The multidisciplinary composition of IMR supports a multifaceted – managerial, economic, geographical and political – approach which distinguishes IMR from other research institutes.

In the years ahead the research environment at IMR will be taken to a higher level. The Institute will implement a new quality assessment protocol, including a publication strategy designed to further enhance its positioning and development. Moreover, IMR has set targets for maintaining the growth in its share of publications in top academic journals, extending international cooperation with top researchers and institutes, and attracting new scholars with an excellent publication list, external acquisition track record and international network. Finally, IMR will seize opportunities for acquiring externally financed projects – both public and private – and for participating in Dutch and EU based public-private programmes.

In 2006 NWO awarded Dr I. Robeyns a Vidi grant to do research on social justice and the consequence of recent socio-demographic changes on the design of the so-called ‘new welfare state’. The project will examine principles of social justice on the basis of which the welfare state can be reformed to explain this new socio-demographic constellation.

Prof. E.G.J. Vosselman

Prof. Vosselman was Associate Professor of Management Accounting at Eindhoven University of Technology from 1985 unto 1997. In 1997 he became a Full Professor of Management Accounting at Erasmus University Rotterdam, where he held the position of Dean of the Faculty of Economics from 2000 to 2004. As of October 2005, Prof. Vosselman has been a Full Professor of Accounting in the Nijmegen School of Economics at Radboud University Nijmegen. He is a member of the European Accounting Association and sits on the editorial boards of several scientific journals. He is president of NOBEM, a Dutch scholarly organization dedicated to research on business economics and management.

Institute for Management Research

Postal address
PO Box 9108
6500 HK Nijmegen
The Netherlands

Visiting address
Thomas van Aquinostraat 5
Nijmegen

T: +31 (0)24 361 59 95
F: +31 (0)24 361 15 68
E: imr@fm.ru.nl
I: www.ru.nl/imr
Three themes guide the research in the various disciplines: inequality, cohesion and rationalization. Researchers examine these three aspects, both within a single society and between societies, i.e. from a historical perspective within one society and comparatively (between two or more societies). A comparative approach has been chosen because it is more informative and because it leads to a better understanding of societal phenomena and processes than research on a single society in one historical period. The comparative research areas are:

**Inequality**
The Institute explores comparative questions related to differences in access to and control over resources that affect peoples’ opportunities in life, such as educational level, labour-market success and differences in lifestyle. Research focuses on the effect of resources on socio-economic achievement and on how variation between and within countries is affected by structural differences and national policies. How individual and family resources affect lifestyle outcomes such as cultural participation, media access and media use is also studied.
Cohesion
In this area the focus is on describing and explaining social participation in formal organizations and in informal social networks, including families and other groups. Three topics form the core of this research. First, there are the developments in the relationship between social participation and both pro-social and antisocial behaviour and the variation in this relationship between societies whose welfare-state regimes differ. The second is a comparative examination – keeping in mind the effect of economic and demographic contexts – of the extent to which social groups engage in exclusionist attitudes and behaviour towards particular out-groups. Third, representations of social reality in mediated communication (including public awareness campaigns), the production of mediated communication, and the reception and interpretation of these representations of social reality are studied and related to social participation and exclusionism in societies whose democratic systems differ in terms of stability and longevity.

Rationalization
By comparing secularization in Dutch society to other societies with other rationalization processes, the scope of this study is continuously extended. Moreover, researchers broaden the study of secularization within Dutch society by comparing its indigenous and non-indigenous denominations. They apply a historical perspective as well as compare the systems of beliefs and meaning and the ideologies and practices of the members of these groups to those of non-members.

Research facilities
The Institute specializes in making and analyzing small and large data collections, including longitudinal data collections on individuals and their life courses within their social contexts, in the Netherlands as well as in several other countries. Then there are cross-national collections from a wide range of countries. These data are partly collected by Institute staff, and partly by other researchers, but all are considered pertinent for comparative research. Four staff members collect, archive and provide support for those who analyze the data in the Institute’s extensive archive.

Collaboration
The Institute collaborates with the following Dutch research schools: Research School for Resource Studies for Development
On an international level the Institute collaborates with the Universidad Católica Cardenal Raúl Silva Henríquez (Chile), University of Aarhus (Denmark), Centre National de Recherche Scientifique (Paris, France), Institut de Recherche sur le Sud-Est Asiatique (Marseille, France), Max-Planck-Institut für Ethnologische Forschung in Halle, Universitas Gadjah Mada Yogyakarta (Indonesia), Australian National University (Canberra, Australia), University of Port Elizabeth and University of the North (South Africa), Center for Comparative Social Surveys in London, Royal Anthropological Institute of Great Britain and Ireland in London, Universities of Edinburgh, London, Oxford and Southampton (UK), and Harvard University (USA).

The Institute also participates in several international networks such as the European Consortium for Sociological Research, European Research Centre on Migration and Ethnic Relations (ERCOMER), Research Network on European Port Cities, ERANET Learning in Knowledge Society, Network of Excellence 'Enhancing the Interest in Science in a Developing Europe' (EISDE), International Communication Organization and International Association of Mass Communication Research (IAMCR).

**Research results**

One important article, authored by van Meijl and published in the *Journal of the Royal Anthropological Institute*, focuses on the renaissance of Maori culture and tradition, which has played a significant role in the political campaigns of New Zealand’s indigenous population over the past few decades. At the same time, it has brought to light the fact that many Maori youngsters are unable to construct a cultural identity in terms of the discourses of culture and tradition that dominate the political arena. This article analyses the experience of urban Maori youngsters in ceremonial settings (marae) by examining the question as to how different representations of their cultural identity are mediated within the self. It shows that many young Maori people are engaged in a psychological dialogue between, on the one hand, the classic model of a Maori identity which prescribes that they embrace traditional culture and, on the other, their personal experience as outcasts in daily practices of New Zealand society.

Another article, co-authored by Lubbers et al. and published in *European Sociological Review*, focuses on objections to the numerous asylum seeker centres that have been founded in the Netherlands. The researchers set out to answer the question which individual and contextual characteristics contribute to explain objections to various asylum seeker centres which differ in size. A large-scale survey of a representative sample of the Dutch population was used. Objections to large centres were found to be far more widespread than objection to small centres. At the contextual level it was found that people object more strongly to small centres in neighbourhoods with high real estate values. The percentage of ethnic minorities at the postal code or municipality level is not related to objections to centres, whereas the actual presence of an asylum seeker centre in the neighbourhood is correlated with fewer objections.

A third comparative article, co-authored by Hendriks Vettenhein et al. and published in *European Journal of Communication*, examines sensationalism. Both news critics and scholars often contend that increasing competition in the news market leads to sensationalism in journalism. Starting from this hypothesis, the article investigates changes in the level of sensationalism in three Dutch current affairs programs that merged in 1996 as part of a strategic response to increasing competition.

A content analysis of these programs in 1992 and 2001 reveals a partial trend towards greater sensationalism.

An article co-authored by Ruiter and De Graaf and published in *American Sociological Review*, focuses on the question: to what extent does the national religious context affect volunteering? Does a religious environment affect the relationship between religiosity and volunteering? Based on multi-level analyses of data from 53 countries, frequent church-goers are shown to be more active in volunteer work and a devout national context appears to have an additional positive effect. However, the difference between secular and religious people is substantially smaller in devout countries than in secular countries. Church attendance is virtually irrelevant for volunteering in devout countries. Furthermore, religious volunteering has a strong ‘spill-over’ effect, i.e. religious citizens also volunteer more for secular organizations. This effect is stronger for Catholics than for Protestants, non-Christians and non-religious individuals.
Societal impact
As a spin-off of research at the Institute, various members act as advisers to several public and private institutes in a number of domains. Several hold positions related to Dutch public and commercial television institutes (such as NOS/Kijk- en Luister-onderzoek, NPS/Sesamstraat, Nederlands Instituut voor de Classificatie van Audio-visuele Media, Bedrijfsfonds voor de Pers, Publieke Omroep and BNN). Others are engaged in research with institutions that deal with international relations (such as Dutch ministries as well as various EU committees and centres). Members of the institute also assist organizations working in developing countries such as ICCO, Care Nederland, CMC, Cordaid, Foster Parents Plan, Hivos, NiZa, Novib, PSO, VNG International, VSO and ZOA Vluchtelingenzorg.

Memberships
Prof. Hüsken was Chairman of the Scientific Advisory Committee for Social Anthropology in the Max Planck Society (Munich, Germany), a member of the NWO’s Vidi committee and of the Programme Committee Scientific Cooperation Indonesia-Netherlands of the Royal Netherlands Academy of Arts and Sciences. Prof. Wester was a member of the Veni committee and Prof. Eisinga of the Vici committee. Prof. Renckstorf was a reviewer of the Sixth Framework Programme of the EU and Prof. Ruben was a member of the Organising Committee of the World Congress of the International Association of Agricultural Economists. Prof. Scheepers is a member of the Royal Netherlands Academy of Arts and Sciences and chaired the committee set up by the Ministry of Justice to evaluate the new Law on ‘Inburgering in het Buitenland’.

Dr Need became a member of the Young Academy of the Royal Netherlands Academy of Arts and Sciences.

Future research
The Ministry for Development Cooperation and members of the Department of Development Studies – headed by Profs. Schulpen and Ruben – signed a five-year partnership agreement known as the IS Academy, which was set up to bridge the gap between policy and scientific research. The partners carry out research on the impact of development interventions, partnerships between Southern and Northern NGDOs, the role of CSOs and NGDOs in democratization and their role in international negotiations (e.g. within the WTO). Central to the research are the interfaces between southern and northern


Dissertations: 8
Scientific publications: 130
Professional publications: 26
Non-Governmental Development Organizations (NGDOs) and the assumed demand for change in the South. In addition to several research projects, four PhD positions are part of the agreement.

In one of these projects, the focus is on civil society, which is assumed to play a major role in contemporary development cooperation. There are indications that the capacities of Southern Civil Society Organizations (SCSOs) have grown and that the realities in which they operate have changed. The central question addressed in the research is to what extent Northern donors are able to 1) adapt to changing capacities and realities among the SCSOs and 2) facilitate their empowerment. The study, which has a comparative design and takes a mixed methods approach, is based on fieldwork in three developing countries.

Another project, which is funded by NWO and headed by Coenders, Lubbers and Scheepers, focuses on the limits of tolerance, assessing variations in and differential determinants of ethnic exclusionism in the Netherlands. The project builds on a tradition of research on ethnic prejudice that shows greater prejudice among non-privileged groups such as less educated and lower income groups. However, when the ethnic difference with a target group is relatively large or the social distance in a given context decreases, ethnic exclusionism occurs among more privileged groups as well. In this study the following research questions are tackled: To what extent are there variations in exclusionary reactions with regard to individual determinants, neighbourhood characteristics and intervening variables? Data from the longitudinal programme ‘Socio-cultural developments in the Netherlands’, which includes randomized experiments, will be used. The focus will be on 2005 but earlier waves (1995/2000) may also be studied. In addition, neighbourhood level data will be collected.

A third project builds on epidemiology, implying that – alongside socio-economic determinants – aspects of people’s social environment may be important in explaining health differentiation. Recently, researchers have begun to explain health differences by employing the concept of social capital. Social capital essentially deals with the structure and quality of an individual’s social network. However, in order to correctly understand the effects of social capital, individual effects need to be separated from population effects. For a person’s health it might be relevant to have a vivacious social network, but also to live in a country with vivacious social networks. This leads to the main research question: How do individual and contextual measures of the social environment affect individual health differences in Europe? Theories about the effects of social capital will be used to derive testable hypotheses. The main research question will be answered using individual data from the European Social Survey 2002/2004. Contextual information will be collected from various institutional sources. This makes it possible to disentangle contextual and individual aspects of social capital in a multi-level design.
Research Centre of the Graduate School of Education

Director: Prof. J.M. Pieters (from 1 January 2007)

The aim of the research programme is to advance both theoretical and empirical knowledge on learning and teaching, focusing on the professional development of teachers as part of a dialogue between the academic world and those engaged in educational practice. The Centre’s research provides a link between the professional development of current and future teachers and scientific reflection on this development. The ultimate goal is more effective teaching in a variety of subject areas.

The Centre’s primary area of research is teachers’ learning processes at schools and the ways in which teachers influence student learning. These are seen as dynamic, nonlinear and developmental. Dynamic because prior conceptions and beliefs held by teachers evolve over time as they acquire new knowledge and understanding and through interactions with students and colleagues. Nonlinear because acquisition can be rapid, while consolidation of knowledge and understanding can be slow. Developmental because they are relevant throughout the working lives of teachers.

To acquire insight into these processes, the Centre collaborates closely with teachers in schools to analyze and identify successful teaching practices. In terms of teachers’ professional development, the Centre distinguishes two areas of research. The first is related to ways in which teachers engage in teaching and encouraging student learning, while the second focuses on how schools serve as learning communities for teachers. These two areas are clearly inter-related, as the teachers’ professional development ultimately contributes to students’ learning and learning outcomes. A topic of special interest within both areas is the
development of school subjects in secondary education and how this is related to teachers’ professional development and student learning.

Various research methods are used – from ‘collaborative inquiry’ and ‘action research’ to ‘teacher as researcher’ – in order to bridge the gap between theory and practice. Methods ranging from empirical-analytical to empirical-interpretative traditions are often employed concurrently, sometimes within the same study.

**Research facilities**
The Centre’s research focuses on the classroom environment. The complexity and the practical constraints of this context requires specific measures to organize research in such a way that it meets scientific standards. Mutually valuable long-term partnerships with schools have proved useful in achieving these standards.

**Collaboration**
The Centre cooperates with ICLON Graduate School of Education at Leiden University and IVLOS at Utrecht University (both in the Netherlands) and participates in a research project on 'Teacher learning', which is funded by the Netherlands Organisation for Scientific Research. Together with Volkshochschule Aachen (Germany) and eight other institutes from six European Union countries, the Centre participates in 'Living and learning in border regions', a project funded by EU (Socrates Programme). Together with the Ruud de Moor Centre and the Open Universiteit, (both in the Netherlands), the Centre is engaged in a pilot study called Academic School, which is funded by the Dutch government.

**Research results**
Research on active and self-directed learning yielded valuable insights into teacher learning and helped define the teacher’s active role in developing and researching methods for students’ self-directed learning. The results, which will be used to design new solutions for highly controversial issues in schools, will be published in a book in 2007.

Research on school-university partnerships contribute to the development of small scale theory on teachers’ and schools’ professional development. Teachers develop ownership over theory and they will more increasingly use theory in daily classroom practices. Substantial additional grants


Dissertations: 1
Scientific publications: 14
Professional publications: 6

have been obtained for research on collaboratively designing teaching methods and materials for various school subject areas by teachers and researchers.

Research on Teaching English as a Foreign Language showed that the amount and quality of students’ use of the target language in the classroom is positively related to teachers’ knowledge of foreign language. Grants have been obtained for establishing a National Centre of Expertise for Mother Tongue Education and Dutch as a Second Language, in which Radboud University (ILS) and Hogeschool Utrecht participate.

Societal impact
Members of the Research Centre hold leading positions in national and international organizations for the development of the school subjects and educational reform. The results of the Centre’s research on teaching Foreign Language provides teachers with opportunities to develop a better understanding of the role of the discourse patterns they use while teaching the target language, and to change these patterns where necessary.

In research on active and self-directed learning in particular, the Centre cooperates closely in partnerships with secondary schools. This research has yielded various thoroughly tested and widely disseminated methods for pupils’ self-directed learning in several school subjects. As a result of the school-university partnerships in which the Research Centre participates, schools and teachers have come to better appreciate the importance of practice-oriented small-scale research with and for teacher and schools. A new element in national educational policy is to provide schools with financial resources for promoting school-based research. The Centre successfully participates in these externally funded school-university partnerships.
Future research
In 2007 the programme will further focus on domain-specific learning and teaching processes in the classroom. Research on characteristics of students’ and teachers’ learning will be conducted in teams and networks of researchers and practitioners. Through this partnership, perspectives, knowledge, and solutions from teachers will become available for further explorations and, together with results from more fundamental studies, new insights will arise for designing more effective teaching environments.

Three research questions are central to the programme. First, what are the characteristics of domain-specific learning and teaching processes, when students are actively engaged in constructing knowledge and understanding in a rich environment in collaboration with teachers and other students?

Secondly, how can principles derived from studies on domain-specific learning and teaching processes be communicated to student-teachers and practitioners through communities, networks or teams in which they cooperate with subject matter experts, pedagogical content experts, and educational specialists?

Thirdly, what conditions foster or constrain students’ and student-teachers’ learning at professional development schools and academic schools (schools in which the role of teachers as innovators and researchers is promoted)? All three avenues of research are explored in the context of school-university partnerships.
The Behavioural Science Institute (BSI) studies individual human behaviour in both its psychosocial and physical contexts. The central goal is to gain insight into the causal factors and regulatory processes that govern individual human behaviour. In 2006 BSI received accreditation as a research school from the Royal Netherlands Academy of Arts and Sciences. The Institute offers a two-year course leading to a Research Master’s degree in Behavioural Science (www.ru.nl/master/behaviouralscience).

BSI maintains the following research programmes:

**Cognition and Behaviour**
This programme is concerned with the micro-analysis of intrapersonal processes involved in the control and guidance of human behaviour. It focuses on the impact of cognition, affect and motivation on normal and pathological patterns of behaviour.

**Learning Processes**
Learning is seen as a dynamic, non-linear process involving enduring change over time. The main focus is on learning and developing communicative, behavioural, and information-processing abilities in normal and atypical populations, such as highly gifted people, people with specific learning problems, and/or mental, physical or sensory handicaps.

**Person-Environment Interaction**
Researchers in this programme study human behaviour and both normal and atypical development as a function of the dynamic interplay between individuals and their psychosocial and physical environments. The research focuses on three environments: (i) family and professional child care, (ii) peer group and school, and (iii) work.
Mental Health and Addiction
This programme focuses on the analysis, maintenance and termination of addictive behaviours and mental problems. Central issues are the role of (i) the perception and interpretation of social cues, (ii) personality traits, genetic susceptibility, attitudes, outcome expectations and social norms, and (iii) emotion and affect regulation in the development of mental problems, unhealthy habits and addictive behaviours.

Awards
Prof. Riksen-Walraven was appointed a member of the Social Sciences Council (SWR) of the Royal Netherlands Academy of Arts and Sciences (KNAW).

Sabine Geurts received the 2006 Top paper award from the journal Work & Stress (together with Ulla Kinnunen and Saija Mauno) for her article 'Work-to-family conflict and its relationship with satisfaction and well-being: a one-year longitudinal study on gender differences'.

Evelien Poelen received the Young Scientist Award from the Kettl Bruun Society.

Dr J. van Helle and Dr M. van Turennout are members of the Jonge Akademie.

Prof. C. van Lieshout received the Award for Distinguished Contribution to the International Advancement of Research and Theory in Behavioural Development from the International Society for the Study of Behavioural Development (ISSBD).

Research facilities
The Behavioural Science Institute has the following research facilities:

- the Radboud Immersive Virtual Environment Research (RIVER) laboratory. Head-mounted displays are used to create an immersive virtual environment. The RIVER lab enables us to do interactive Virtual Reality (VR) experiments with attendant state-of-the-art measurement facilities (for measuring a variety of variables of interest, e.g., participant locomotion, physiological measures). In 2006 NWO awarded an investment grant of €500,000 for the further extension and upgrading of the VR research facilities
- a laboratory for experimental psychological research consisting of several cubicles equipped with computers for stimulus presentations and response registration as well as cameras for behavioural observations
- a Bar Lab (research facility for observation studies of social behaviour in

Staff

Tenured
- Full Professors 7.2 FTE
- Associate Professors 7.9 FTE
- Assistant Professors 12.8 FTE

Non-tenured
- Researchers 7.7 FTE
- Doctoral candidates 41.8 FTE
natural settings) equipped with cameras and recording devices for behavioural observations
• facilities for video observation and analysis: ‘Observer’ computerized video coding system (Noldus)
• several experimentation rooms with physiological measurement equipment
• several rooms for inter- and interdisciplinary research with cameras and recording devices for observation purposes
• several observation rooms with one-way screens and cameras for observing/testing children and parents for various longitudinal research projects
• two mobile labs, one equipped for EEG research and one for computerized experimentation and observation.

BSI supports software for experimental research (e.g. e-prime, inquisit and authorware) and for internet research (PERSEUS). Furthermore, the Institute houses several large data collections, including a sample of > 10,000 pupils to investigate the link between asthma and smoking (funded by the Dutch Asthma Foundation, Prof. Engels).

Collaboration
The BSI has close links with the Academic Centre for Social Sciences (ACSW) at the University. This collaboration includes joint externally funded projects by BSI and ACSW researchers working together on health-related topics.

There is close collaboration on VR with researchers from the University of Groningen (Gordijn), Utrecht University (Aarts), and the University of Amsterdam (Van der Pligt). With Louvain-la-Neuve (Yzerbyt) there is a collaborative ESF-funded project on inter-group emotions. Also noteworthy are collaborations on psychopathology and intervention in anxiety disorders with the Department of Psychology of the Technical University of Dresden (Germany), based on three research grants from the German Research Foundation) and with Stanford University, California, USA, as well as new cooperation with Oxford University (UK) and the University of Basel (Switzerland).

Pathological eating behaviour is studied in collaborative projects with researchers from the University of Toronto (Herman), the Catholic University of Gent (Breet) and the University of Texas at Austin (Stice). Collaboration by Prof. Gerris with de University of Jyväskylä (Family Research Unit) resulted in a project grant for 2006-2009 from the Finnish Academy of Science worth €450,000. In the field of learning processes, there are close links with the Learning Research and Development Center at Pittsburgh University, with the National Technical Institute for the Deaf at Rochester and with the Psychology Department of Pennsylvania State University.

Research results
Within the Cognition and Behaviour programme, social cognitive research has focused mainly on the effects of unconscious processing. First, research and theorizing on unconscious thought focused on how people make choices without deliberation (Dijkstraertius, Bos, Nordgren, & van Baaren, 2006) and whether complex decisions are better made unconsciously (Dijkstraertius & Nordgren, 2006). Second, research on behavioural responses focused on the effects of mood on non-conscious mimicry (van Baaren, Fockenberg, Holland, Jansen, & van Knippenberg, 2006), on breaking and creating habits on the shop floor in industry (Holland, Aarts, & Langendam, 2006), and on the impact of subliminal priming on brand choice (Karrermans, Stroebbe, & Claus, 2006). Third, research on language and social cognition focused on how we communicate expectations about others by using subtle language biases (Wigboldus, Semin, & Spears, 2006). Fourth, research on inhibition demonstrated that forming an intention induces automatic inhibition of distracting stimuli (Veling & van Knippenberg, 2006). Fifth, research was performed on non-conscious goal pursuit (Oettingen, Grant, Smith, Skinner, & Gollwitzer, 2006) and on the influence of power primes on information processing (Smith & Trope, 2006).

Research in work psychology focused on biological and cognitive effects of mental fatigue (van der Linden et al., 2006a, 2006b). Research on processing traumatic experiences focused on intrusive memories. The processing of emotional facial expressions was studied using reaction time measures, fMRI and MEG techniques. Associations which are critical for anxiety patients (e.g., associating physical sensations with danger) were studied using a wide range of indirect measures (reaction time tasks such as EAST, AAT, and priming tasks). By means of the Approach-Avoidance Task (AAT), automatic avoidance tendencies were revealed among the socially anxious and spider phobics, both in adults and in children (Rinck & Becker, 2007). In collaboration with the WHO, studies on the prevention of a variety of disorders were conducted (Allart-van Dam et al., in press) and several randomized clinical trials evaluated the efficacy of psychological treatments (Keijsers et al., 2006).

Within the programme on Learning Processes, research has focused on learning and plasticity. Progress was made in understanding the neural basis for learning about the function of objects (Weisberg, et al., 2006). The identity of cortical activity in relation to response conflict in Stroop-like tasks was also revealed (Roelfs, et al., 2006). Special attention was paid to understanding the dynamics of cognitive and neurocognitive dynamics in language and processes related to literacy. In two doctoral dissertations typological issues related to language impairment in native Dutch and minority children were examined (van Weerdenburg, Steenge). Evidence was found for the role of morphemes as sublexical units in word decoding (Verhoeven, et al., 2006a), for the learnability constraints of graphotactic rules in word identification (Verhoeven, et al., 2006b), and for the benefits of regular reading for improving spelling (Bosman, et al., 2006). With respect to reading problems, the absence of a mismatch response in infants at-risk for dyslexia was shown (Leeuw, et al., 2006). A further analysis was also made of the cognitive underpinnings of the reading process in deaf children (Wauters, et al., 2006) and visually impaired children (Bosman, et al., 2006). Progress was also made in increasing our understanding of
the adaptive possibilities of children with developmental disabilities. Evidence was found for the visual rehabilitation potential of visually impaired children (Vervloed, et al., 2006), for the benefits of sign learning in deaf children (Marschark, et al., 2006), for the effects of computerized vocabulary training on physically impaired children (Segers, et al., 2006), and for the benefits of teaching sight words to children with mental retardation (Didden, et al., 2006).

Within the Person-Environment Interaction programme research showed that the quality of professional care giving can be improved by reducing the number of children per caregiver (De Schipper et al., 2006). In another study, maternal prenatal stress was shown to have long-term effects on children’s attention and concentration (Gutteling et al., 2006). In a series of novel experiments, children’s use of tools was investigated (Cox & Smitsman, 2006). Results from a 10-year longitudinal study on the development of social competence revealed the determinants of variations in trajectories of adolescent popularity (Cillessen & Borch, 2006). In research on work and stress, Geurts and Sonnentag (2006) provided evidence of lack of recovery as an explanatory mechanism for acute stress reactions leading to chronic health impairment. Taris’ (2006) meta-analysis of the relationship between employee burnout and performance demonstrated that high levels of fatigue are not by definition related to impaired job performance. Kompier (2006) examined the creation and survival of the myth of the well-known ‘Hawthorne effect’. Research in psychogerontology revealed factors in social relations and self-systems that support or detract from the maintenance of well-being during the process of aging in a dynamic society (Stevens et al. 2006; Westerhof & Keyes, 2006; Van Alphen et al. 2006). In a study on value transmissions a cross-lagged analysis revealed that direct spousal transmission occurred in areas such as social criticism and hedonism, with wives influencing their husbands, and that this effect was stronger with couples experiencing higher levels of marital satisfaction (Roest et al., 2006).

Within the Mental Health and Addiction programme, longitudinal research on substance use showed that alcohol rule setting strongly affected the development of adolescent drinking in general (Van der Vorst et al., 2006ab) and influenced a sample of adolescents enrolled in special education in particular (Van Zundert et al., 2006). Furthermore, studies on smoking revealed that parental anti-smoking socialization efforts affect the likelihood of adolescents engaging in smoking themselves (De Exter Blokland et al., 2006; Huver et al., 2006), investigated whether young people who smoke are motivated to quit (Van Zundert et al., 2006b), and whether children progress through various stages when smoking (Otten et al., 2006). In addition, multi-informant studies revealed that parents are often not aware whether their offspring smoke (Harakeh et al., 2006) or drink (Engels et al., 2006), and that underestimating children’s substance use jeopardizes adequate parenting efforts. In the field of eating pathology, the assessment of restraint eating in experimental, survey and observational research was reviewed (Van Strien et


Dissertations: 13
Scientific publications: 332
Professional publications: 52
and the widely used RS scale was shown to have psychometric flaws (Van Strien et al., 2006). Further it was shown that whether TV viewing in early adolescents is related to unhealthy eating habits depends on the presence or absence of a general eating pathology (Snoek et al., 2006), and that body mass index and body weight satisfaction are substantial indicators of risk factors for internalizing and externalizing distress among adolescents (Ter Bogt et al., 2006).

Societal impact

- Prof. L. Verhoeven is head of the Expertise Centrum Nederlands (National Language Education Centre), which was set up to improve the teaching and learning of Dutch language and literacy at Dutch primary schools. The Centre celebrated its 10th year with a national conference on 1 December 2006.
- Prof. L. Verhoeven is chairman of the Dutch Dyslexia Association.
- The BSI has strong links with the Expert Centre for Atypical Communication, where researchers collaborate with national institutions for children with communicative disorders in order to conduct both fundamental and practical studies on deaf children, children with language problems, and children who are multiply handicapped.
- The BSI also has close links with institutions for people with a mental handicap (Winkelsteegh), physical handicaps (Groot Klimmendaal), and sensory handicaps (Vitaal, Sint Marie).
- Prof. C. Witteman was appointed chairman of the Ethical Committee Behavioural Science Research (ECG) of the Faculty of Social Sciences.
- Dr G. Keijser was appointed chairman of the Fall Conference committee of the Dutch Society for Behaviour Therapy and Cognitive Therapy.
- Prof. C. van der Staak is a member of the ‘Kamer Gezondheidszorgpsycholoog’ and of the ‘College Specialisten Gezondheidszorgpsychologie’ (health care psychology organizations).
- Prof. C. de Jong is a member of the Advisory Board of ‘European Addiction Research’.
- The Friendship Enrichment Program (Stevens et al., 2006; research in psychogerontology), which is widely used by mental health institutions in the Netherlands, received extensive media attention.

Future research

Within the Cognition and Behaviour programme, Prof. Dijksterhuis started his Vici project on ‘Unconscious and Conscious Thought Theory’, which includes three PhD projects and one postdoc project. Dr M Dechesne received an NWO grant for the project ‘Cognitive, affective and motivational components of religious beliefs’. In 2006 a PhD project supervised by Prof. D. Wigboldus was launched to study stereotyping and discrimination using virtual reality techniques. Another PhD project, supervised by Dr J. Karremans, focused on automatic forgiving responses in close relationships.

In the programme on Learning Processes, Prof. Verhoeven was awarded an NWO personal research grant. Dr van Hell received a grant for a sabbatical stay at Pennsylvania State University and Dr Embregts for a sabbatical stay at the University of Queensland, Australia. Tellings, Schreuder and Verhoeven will start an NWO-funded project on lexical learning processes in deaf children, Knoors and Verhoeven started a PhD project on the communicative competence of deaf children at primary school level, Didden and Verhoeven started a PhD project on interventions for those with autistic disorders, and Embregts, Veerman and Verhoeven started a PhD study on competence-based learning in disabled group settings.

In the Person-Environment Interaction programme, Dr Geurts and Dr de Weerth started a quasi-experimental study on the effects of vacation on stress, recovery and work motivation. Prof. Janssen received two competitive grants: ‘Cognitive, affective and motivational components of religious beliefs’ (NWO); and ‘Religious Sources of Solidarity’ (NORFACE Research Programme Pilot Call, ‘Re-emergence of Religion as a Social Force in Europe?’).

In the Mental Health and Addiction programme, several new projects will start in 2007. Two Veni projects were acquired, one on ‘Alexithymia as emotional regulation mechanism’ (Dr J. Larsen) and one on ‘Social-emotional adjustment’ (Dr G-J. Overbeek). Furthermore, in an NWO project obtained in 2006, gene-environment interactions related to alcohol misuse will be studied in a longitudinal full-family study. Another NWO project focuses on imitation processes in relation to alcohol use in same-sex and mixed-sex interactions. In a NWO Mozaiek project, early development of intimate relationships and maladjustment will be studied in a longitudinal observational design. A large ZonMw project in five juvenile institutions will focus on the development of aggressive and delinquent behaviours. Another PhD project focuses on social modelling and eating behaviours, and another on automatic processes linked to the development of substance use in adolescents. Two postdoc projects deal with precursors of early appetitive processes related to alcohol use in childhood and with the effects of prototypes on actual alcohol use.
In January 2006 CLS started a new programming cycle, which comprises five new research programmes:

- **Grammar and Cognition**, combining theoretical research on language as a major cognitive function with psycholinguistic research on language processing, language acquisition and language breakdown.

- **Language in Time and Space**, focusing on the comparative study of patterns of language contact, diffusion and change in a variety of language settings and historical periods.

- **Linguistic Information Processing**. The aim of this programme is to develop computational and mathematical models of both human and machine processing of spoken and written language, to test these models under laboratory and real-world conditions and to deploy the resulting knowledge and technology in real-world tasks.

- **Multilingualism**, focusing on how human beings acquire and use more than one language and on how proficient they become as multilingual speakers.

- **Professional Communication**, focusing on the identification and explanation of communication problems in an organisational context in order to provide empirically based guidelines for tackling these problems.
The outcome of the external peer review that took place in October 2006 was very positive. The institute as a whole, as well as the four previous research programmes, received excellent ratings. In particular, the innovative scope and international visibility of the research were praised by the review committee.

**Awards**

In 2006 nine dissertations were defended. One of these, ‘A grammar of Movima’, by Dr K. Haude received cum laude.

Dr van Boxtel received the AVT/ANéLA dissertation price for her dissertation entitled ‘Can the early bird catch the worm? Ultimate attainment in L2 syntax.’

In 2006 CLS received a large number of new grants (the prestigious EURYI grant awarded to Dr M. Ernestus received considerable attention in the national press).

**Research facilities**

Research at CLS is becoming more and more experimental. This means that facilities such as experimental laboratories, experimental equipment and software are becoming increasingly important. In 2006 a small experimental laboratory was set up and equipped and CLS contributed to the purchase of advanced eye-tracking equipment. A license for the Dutch National (speech) Corpus was obtained and this was then made available to all CLS researchers. Finally, the faculty has become a financial partner in the Baby Research Centre.

**Collaboration**

- There is long-standing collaboration with a number of groups at the Max Planck Institute for Psycholinguistics on the campus, involving language processing, sign language and gesture studies, descriptive and comparative linguistics, databases and digital infrastructure, multilingualism (also involving NICI and BSI) and child language (also involving NICI).
  - Collaboration with the Universities of Utrecht and Groningen on the NWO Cognition project ‘Conflicts in Interpretation’.
  - Collaboration with the Meertens Instituut on the NWO programmes ‘Intonation in varieties of Dutch’ (also involving Leiden University), the Dutch Bilingualism Database (also involving the University of Tilburg), and the ‘Roots of Ethnolects’ programme.
  - The Typological Database System (TDS; also involving Utrecht University), the Suriname Creole Archive, and the


Dissertations: 9
Scientific publications: 237
Professional publications: 75
Dutch Sign Language Database were set up together with the University of Amsterdam.

- Collaboration with the Sint Maartenskliniek Nijmegen and the OSTT Development Centre for Speech and Language Technology in a Communication Assessment project.
- Involvement in the FP6 ACORNS project with the Royal Institute of Technology, Stockholm, the University of Sheffield, the Technical University Helsinki and the K.U. Leuven.
- Involvement in the NWO-STEWIN project MIDAS with K.U. Leuven Research and Development.

- CLS collaborates in the Bisk Programme ICIS together with the Nijmegen Institute for Cognition and Information (NICI) with Technical University Delft, the University of Amsterdam, the University of Twente, TNO Defence and Security, Thales Research and Technology and DECIS Lab.

**Research results**

Prof. Stassen finished working on the Typological Database Nijmegen (TDN) – containing over 700 variables for 140 languages, which was reformatted and integrated into the Typological Database System (TDS). The aim is to facilitate access to typological databases developed independently at various research centres. The system provides software which allows a user to simultaneously query multiple typological databases through a single, consistent web interface. From September 2006 the system has been available on the internet.

Prof. Versteegh has now completed the second volume of a monumental international project ‘Encyclopaedia of the Arabic language and linguistics’.

Dr Fikkert showed that phonological representations develop over time and become segmented. Evidence for these changing representations comes from both perception and production. Certain features do not become specified before two years of age. In a series of experiments it was investigated when children are able to form plurals of words ending in an underlying voiced stop (such as in the Dutch word bed). When using real words, children up to the age of six made relatively few errors of two types: (a) either they chose the wrong plural suffix –s, instead of –en, or (b) they used a ‘t’ rather than a ‘d’, producing betten instead of bedden.

Prof. Gussenhoven showed that an issue in the perception of Limburgian tone contrasts was related to the different patterns of brain activation through tonal contrasts and phonetically comparable intonational contrasts in the same speakers. MEG registrations suggest that, in comparison with speakers of non-tonal dialects, speakers of tonal dialects apply a more elaborate strategy when dealing with intonational contrasts.

Neri PhD completed a large experiment in which she showed that automatic speech processing can be deployed effectively to provide feedback on the pronunciation quality of learners of Dutch as a second language in a computer-assisted pronunciation training system.

Prof. Baayen and Tabak PhD obtained evidence for lexical competition at the level of phonological form in speech production using word naming, by employing measures of neighbourhood density that target the position of mismatch. Lexical neighbours that are mismatched at the initial phoneme slow down production, whereas neighbours that are mismatched at phoneme positions 2 or 3 may facilitate production.

A large group of researchers in the programme Professional Communication studied the use of foreign languages in job advertisements and product advertisements in a number of European countries. For example, the effect of the use of English and French was investigated in terms of the image of the company and the product, the attitude towards the text and the comprehensibility of the English and French text. They did not find any relationship between the comprehensibility and the attractiveness of the advertisement.

**Societal impact**

Research results on case, animacy, acquisition and conflicts in interpretation have been presented to a wider audience at an event (the Taalgala) in Utrecht, at the public event Bessensap, which was organized by NWO, in an interview for Radio Hoezo!? and in an exhibition in the Utrecht University Museum.

Dr Strik, Dr Cucchiarini and Prof. Boves were involved in the discussions about the language proficiency test that prospective immigrants must take in order to be eligible for a visa to enter the Netherlands. These contributions were closely connected to ongoing research aimed at applying speech technology to support the second language acquisition of immigrants. Also, research was conducted on applying speech and language technology for forensic applications. A new line of research is being started up, with the aim of developing speech and language technology for improving assisted and augmentative communication and remote monitoring of outpatients.

The Dutch Ministry of Health asked Prof. Jansen to advise on the use of scary pictures that are used on cigarette packs to warn consumers about the hazards on smoking. Their request was based on the study conducted by Jansen et al. on the effectiveness...
of such pictures. They studied the effectiveness of the images printed on cigarette packs to visually communicate the dangers of smoking. The results showed that depicting, for example, the effects of smoking on fertility using metaphorical images, such as an empty baby carriage, backfires.

Dr van Onna and Prof. Jansen showed in their research that the Dutch consistently overestimate their proficiency in foreign languages. The results of this study received a great deal of media attention and contributed to a discussion on the mastery of foreign languages.

The Bolivian Indian communities involved received copies of Dr van Gijn’s work on Yuracare, and Dr Haude’s work on Movima. In addition, practically oriented material in Spanish was made available to the speakers. Dr van der Voort was a consultant for the highly successful book about Brazilian Indians by Ineke Holtwijk Rooksignalen (2006).

**Future research**

Discussions started to define a number of key research themes for CLS. A number of considerations play a role: the strengths of excellent individual researchers, the possibilities of funding, both at the national and the EU level, and the potential to recruit researchers, often across programmes, within CLS. Three themes will be further explored in 2007: ‘Databases and Digital Infrastructure’, ‘Language and Cognition’, and ‘Language and Diversity’. Starting in 2008, pending further funding possibilities, two further themes may be explored: ‘Text, Context, and Argumentation’ and ‘Language, Speech Pathology and Enhanced Communication’.

The following long-term grants were awarded:

- Corpus Nederlandse Gebarentaal. NWO Investment grant, Prof. R. van Hout. Period: 2006-2008


---

**Prof. P.C. Muysken**

Prof. Muysken was a Full Professor of General Linguistics at the University of Amsterdam from 1989 to 1998. From 1989 to 1992 he was Adjunct Professor of Caribbean Studies at the University of Leiden, where he was appointed Full Professor of Linguistics from 1998 to 2001. Since 2001 he has been a Full Professor of General Linguistics at Radboud University Nijmegen. Prof. Muysken is a member of the Royal Netherlands Academy of Arts and Sciences, a winner of the Spinoza Award (the most prestigious award in science in the Netherlands). He is also a member of the Netherlands Science Academy and the Max Planck Society. Prof. Muysken has edited a large number of various scientific journals, book series and monographs. In addition he is a member of numerous advisory boards and scientific councils.
The relationship between modality and language structure: Insights from comparisons of sign languages and gestures. NWO Vidi grant, Dr A. Özyürek.


Acoustic reduction in European languages, Dr M. Ernestus, EURYI grant, European Commission, Period: 2007-2011.


Avoiding the 'ham' in 'hamster', Dr O. Scharenborg, Veni award, NWO. Period: December 2006-March 2010.

AwareShoe, intelligent shoeware for diabetic patients, Prof. T. Rietveld, Prof. L. Booves and Prof. H. Hoeken, IOP-MMI, Period: 2007-2010.


Prof. P.J. Schellens was a co-applicant for a project on the use of arguments in literary criticism that was funded within the NWO programmatic competition.

Profs. H. Hoeken and M. van Mulken received a grant for organising an International workshop on multimodal metaphors.
Nijmegen Institute for Cognition and Information

Director: Prof. H.J. Schriefers

The Nijmegen Institute for Cognition and Information (NICI) conducts interdisciplinary research and offers a PhD programme in cognitive neuroscience, cognitive psychology and related disciplines. At NICI, scientists from different disciplines study jointly the psychological and neurobiological principles of information processing. In October 1992, NICI was accredited by the Royal Netherlands Academy of Arts and Sciences. The NICI plays a central role in the University’s research focus on Cognitive Neuroscience and cooperates closely with the other participants in this research area, most notably the F.C. Donders Centre for Cognitive Neuro-imaging (FCDC) and the Max Planck Institute for Psycholinguistics (MPI).

The institute comprises the following research divisions:

**Psycholinguistics**
Psycholinguistics is the study of the cognitive processes and representations underlying the use of language. The research programme covers language production, language comprehension, the bilingual lexicon, and deviant language behaviour.

**Action, Intention and Motor control**
In this division, the research focuses on understanding the goal-directed behaviour of primates, such as object-manipulation (including eye-head and eye-hand coordination) and social interaction. Research methods include behavioural studies in healthy and clinical populations, neuro-imaging, and computational modelling.

**Perception**
The research of this division centres on perceptual organization, visual processing, and object perception. Aspects of perceptual organization studied include complexity, regularity, and hierarchy. The division further conducts psychophysical research focusing on the perception of colour.
brightness, depth, and spatial frequency, and on the micro-genesis of object interpretation.

**Cognitive Neuroscience**
The central theme is the processing of information by the brain. Taking a multidisciplinary approach, scientists in this division study cognitive functions such as learning, memory, attention and alertness, as well as the processes of waking and sleeping. Moreover, cognitive and neurological disorders such as epilepsy, schizophrenia and depression are studied, as well as the effects of psychoactive substances on cognitive processes.

**Cognitive Artificial Intelligence**
This division studies formal techniques and cognitive models in order to design, build and evaluate systems that enhance communication and cooperation among human agents and their artificial counterparts. Major research topics in this division are: embedded embodied cognition, which is studied by means of simulation, formal techniques and conceptual analysis; and cognitive systems targeting multimodal and pen-based human computer interaction.

**Awards**
C. Vissers MSc received a Freye Stipendium from Radboud University Nijmegen.

**Research facilities**
- three 32-channel EEG/ERP laboratories for measuring brain activity while subjects are performing cognitive tasks
- a 256-channel EEG laboratory for online processing in Brain-Computer Interfacing
- two eye-movement laboratories
- laboratories with 2D and 3D motion-tracking systems for measuring movements and movement trajectories during the execution of tasks such as reaching, grasping and manipulating objects
- an EMG laboratory for measuring muscular activity
- “Reach-in” 3D-visualisation and force-feedback machinery, allowing experiments on manual actions in three-dimensional virtual reality
- a cognitive artificial intelligence laboratory for the study of human-computer interaction, the analysis of the dynamics of intelligent behaviour, the study of ‘embedded embodied cognition’, and the study of information retrieval
- a laboratory for research on auditory perception and music cognition
• a large number of laboratories for behavioural (reaction-time) studies with visual and/or auditory stimulus presentation
• an animal laboratory for long-term electrophysiological recordings using rats with chronically implanted electrodes
• facilities for stereotactic animal operations
• a biochemical laboratory for identifying brain substances.

In addition, NICI researchers have access to the brain-imaging facilities of the FCDC (fMRI, MEG and EEG).

Collaboration
The Institute has a structural collaboration with a large number of institutes. Among these are the following institutes abroad:
• Center for Psycholinguistics, Department of Language, Antwerp University, Bilingualism
• Department of Psychology, University of Leipzig, Germany, Lexical Processes in Language Production
• Institute of Psychology, Jagiellonian University Kraków (Poland), Emotion and Motivation
• Johann Wolfgang Goethe-Universität, Frankfurt, Vigilance
• Katholieke Universiteit Leuven, Leuven, Belgium, Motor Control
• Max Planck Institute for Human Cognitive and Brain Science, Leipzig, Germany, Cognition and Action
• Russian Academy of Science, Institute of Higher Nervous Activity and Neurophysiology, Moscow, Absence Epilepsy

Research results
The division Action, Intention, and Motor control concentrated its research effort on the relation between cognition and action. Behavioural and neuro-imaging data unravelled some of the complex interactions between action goals (the outcome of an action) and action means (the effectors used to achieve the desired outcome). New evidence was found for the dominance of cognitive goal processing over means. Another major line of research within the EU-project on Joint Action was dedicated to understanding human cooperation in a complex construction task. Using behavioural as well as neuro-imaging techniques, new insights arose concerning perceptual attunement, action coordination and reasoning. Importantly, both motivation (in competitive versus cooperative settings) and task knowledge were found to affect joint action performance. In addition, the complex impairments in adolescents with Cerebral Palsy were further analyzed. A major finding in this population was that, besides well-studied motor impairments, higher cognitive functions, e.g. the visual imagery related to the planning of movements, were also damaged. Finally, numerous new findings outlined the neural computations needed to integrate target and effector information in the human brain during reach planning.

The research of the Cognitive Artificial Intelligence division in the area of cognitive abilities like handwriting recognition and multimodal interaction continues through participation in large-scale projects, such as the ICIS project on ‘Interactive collaborative information systems’ (in the context of the BSIK initiative of the Netherlands government), and the NWO-ToKeN project ‘Trigraph’, which develops novel methodologies for writer identification. Knowledge about cognition has been successfully incorporated in automated information retrieval. There is also a fruitful cooperation with researchers in Brazil on embodied embedded cognition. The division has started two multidisciplinary projects cross-linking with other NICI divisions in ICIS (with Bekkering) and the RE-phrase project (with Desain).

The division of Cognitive Neuroscience investigates the role of the level of vigilance and consciousness on cognitive processes and information processing. Generally, the electroencephalogram (EEG) and event-related potential (ERP) in humans and in experimental animals such as rats, are mostly used in this type of research. Features in these electrical parameters, such as the power spectrum, dimensional complexity and synchronization, are used to track learning patterns, to follow the processing of (emotionally coloured) information into memory, to study the start-and stop- mechanisms of epileptic seizures, and to unravel the brain focus of these attacks. The effects on cognitive processes (consciousness and memory) of a decrease in vigilance – as happens in sleep and anaesthesia – are being studied. A relatively new topic is the study of attention and vigilance processes on sensory gating of perceptive processes, such as the experience of (chronic) pain.

One theme under investigation in the Psycholinguistics division is the role of cognitive control, monitoring processes, and task constraints in language comprehension and production, both for monolinguals and for bilinguals. The ability to cope with multiple-task situations (such as talking while driving) depends on a speakers’ ability to coordinate linguistic and cognitive processes across the tasks at hand. Using eye movement research, a computational model has been developed for how such coordination is achieved. Similar issues also play a role in research involving the cognitive mechanisms underlying bilinguals’ language (or “code”) switches during comprehension and production of utterances. Other research is
concerned with the roles of discourse and prosody in sentence processing, and with contextual influences on lexical access in language production. Another continuing theme involves visual, auditory and semantic aspects of word recognition in monolinguals and bilinguals. One example of this type of investigation concerns whether second language users have access to the full range of meanings available to first language users.

Research in the Perception division dealt with the effects of global organizations on visual interpretations and visual awareness. Effects of grouping on the visibility of perceptual elements were studied in fading and binocular-rivalry experiments. Using naturalistic stimuli, context effects due to material properties were found relatively early in the visual process. Perception-action interaction was further studied in grasping experiments. Depth perception and regularity perception were found to interact in the differentiation between visual regularities. In addition, the perceptual interaction of symmetry axes in multiple symmetry was studied using spatial-frequency separation. Finally, a new lightness illusion and a new motion illusion were discovered. Various illusions can be experienced at http://www.nici.ru.nl/~robvl/

Societal impact
NICI researchers contribute to the dissemination of fundamental research via public conferences and the media.

The NICI is one of the main initiators of an inter-faculty two-year MSc programme in cognitive neuroscience (www.ru.nl/master/cns). Furthermore, the division of Cognitive Artificial Intelligence is involved in setting up an “Erasmus Mundus Masters Programme in Cognitive Science” with the Cognitive Science Institutes of Osnabruck University (Germany) and the University of Rovereto (Italy) as well as other participating universities.

Scientists at the NICI organized a number of workshops (including the NWO workshop Linguistic and psycholinguistic approaches to code-switching and language switching, Dijkstra), help to organize a lecture series designed to make state-of-the-art research on cognition accessible to a broader scientific audience (Active Memory, Bekkering; Summer University on Consciousness in Kraków, Coenen), lectured at summer schools (for example at the 13th International Summer School in Cognitive Science in Sofia, Coenen), and at the national brain festival called Brainspotting (Kolk).

NICI members also presented research results on Dutch television and radio

Prof. H.J. Schriefers

Prof. Schriefers has been a Full Professor of Psycholinguistics and Cognitive Psychology at Radboud University Nijmegen since 1994. From 1981 to 1990, he worked at the Max-Planck Institute for Psycholinguistics, and from 1990 to 1994 he was an assistant professor at the Free University of Berlin. He is an expert in the psycholinguistics of language production and language comprehension. He has been a Visiting Professor at the University of Massachusetts Amherst (USA) and at Humboldt University in Berlin.

Prof. H.J. Schriefers

Prof. Schriefers has been a Full Professor of Psycholinguistics and Cognitive Psychology at Radboud University Nijmegen since 1994. From 1981 to 1990, he worked at the Max-Planck Institute for Psycholinguistics, and from 1990 to 1994 he was an assistant professor at the Free University of Berlin. He is an expert in the psycholinguistics of language production and language comprehension. He has been a Visiting Professor at the University of Massachusetts Amherst (USA) and at Humboldt University in Berlin.

Prof. H.J. Schriefers


---

**KEY PUBLICATIONS**

**Dissertations:** 13
**Scientific publications:** 189
**Professional publications:** 15
programmes (e.g., Coenen), in regional and national newspapers (e.g., Trouw, Van Lier), and popular magazines (Psychology, Van Lier). Van Lier and Vergeer’s visual illusion (catching patches) was nominated for the best visual illusion of the year (Florida, USA).

Prof. A.M.L. Coenen was appointed visiting professor at Jagiellonian University Kraków (Poland) and Atma Jaya Katolik Universitas Jakarta (Indonesia).

Prof. H. Schriefers became a member of the international advisory board of the Center for Cognitive Science, New Bulgarian University, Sofia.

Dr R. Van Lier became a member of the editorial board of ACTA Psychologica.

Prof. H. Kolk was a member of the KNAW committee for the Hendrik Muller Prize in the Social Sciences.

Future research
On May 15, 2006 a NICI Institute’s day was held to discuss future research lines and how the NICI should respond to anticipated scientific developments. As a consequence, research across divisions will be stimulated by the joint definition of interdisciplinary topics that involve a complex interplay of various cognitive functions.

The NICI contributes to the University’s research focus on cognitive neuroscience, within the Cognitive Neuroscience Centre Nijmegen (CNCN). In line with the aims of the CNCN, research at NICI will continue to focus on cognitive systems, especially on action, perception, and language. Research on the functional architecture of these systems will be complemented by a further intensification of parallel research on the underlying neural substrate. Research also maintains focussed on the cognitive and computational issues involved in the human interaction with artificial cognitive systems. Members of CNCN have also started an initiative to set up a Graduate School of Cognitive Neuroscience for PhD training which should complement the MSc programme in Cognitive Neuroscience. Research in 2007 will be continued in the context of other projects granted in earlier years, such as a European Research and Training Network on Language and Brain (6th Framework Programme, Marie Curie Actions), the integrated project on Joint Action (6th Framework Programme, Cognitive Systems), the BSIK projects ICIS, two so-called VICI projects (Bekkering, Roelofs) and a VIDI project (Medendorp), the projects Vindit and Trigraph, and several open competition awards from NWO. The NICI has also joined the Senter projects DEAL (optimal use of transport capacity using agent-based technology) and CIM official partner.

Nijmegen Institute for Cognition and Information

Postal address
PO Box 9104
6500 HE Nijmegen
The Netherlands

Visiting address
Montessorilaan 3
Nijmegen

T: +31 (0)24 3612620
F: +31 (0)24 3616066
E: secr@nici.ru.nl
I: www.nici.ru.nl
The mission of the F.C. Donders Centre for Cognitive Neuroimaging (FCDC) is to conduct basic and applied research in cognitive neuroscience (i.e. human and animal cognition, as viewed from the perspective of the brain). Much of the rapid progress in this field is driven by the development of complex neuroimaging techniques for the in-vivo scanning of activity in the human brain – an area in which the F.C. Donders Centre plays a leading role. The research themes of the FCDC cover central cognitive functions, such as perception, action, attention, memory, language, learning and plasticity. The aim is to unravel these complex cognitive functions and discover how they are represented in the brain. This is done by identifying the networks of brain areas that are vital to each of these functions.

The Centre also aims to establish how the different brain areas coordinate their activity with very high temporal precision (in the order of tenth of milliseconds) to enable human and animal cognition.

A further aim is to understand how neurons make networks, and how networks carry out cognitive functions – in other words, how to get from neurons to cognition. Another important aspect of the research is to improve the imaging methods themselves, by optimising the combination of imaging techniques with high spatial (fMRI) and high temporal (MEG and EEG) resolution (i.e. multimodal imaging) and by developing advanced data analysis tools to extract the relevant information from the highly complex signals which these imaging systems provide.

The FCDC research is organized in eight research groups, each headed by a Principal Investigator:
Neurocognition of Language  
(Prof. P. Hagoort)  
This group studies the neural basis of reading, speaking and listening.

Intention and Action  
(Dr I. Toni)  
This group explores ways in which perception translates into action and investigates the brain circuitry that makes human action possible.

Language and Multilingualism  
(Dr P. Indefrey)  
This group investigates the organization of the multilingual brain – in particular how learning a second language reorganizes language areas in the brain.

Learning and Plasticity  
(Dr M. van Turennout)  
This group studies the principles of neural plasticity in relation to learning-induced changes in cognitive functions.

Cognitive Neurology and Memory  
(Prof. G. Fernández)  
This group focuses on the neural underpinnings of memory, emotion and their interaction in healthy and diseased states. In addition to fundamental research, this group develops new cognitive neuroimaging techniques for clinical application in neurology, psychiatry, geriatrics, and anaesthesiology.

Neuronal Coherence  
(Dr P. Fries)  
This group investigates the mechanisms and functions of neuronal synchronization.

The working hypothesis is that functional interactions among groups of neurons are subserved by rhythmic synchronization.

MR methods for Cognitive Neuroscience  
(Prof. D. Norris)  
This group improves and develops methods for MR imaging, such as Diffusion Tensor Imaging, and develops methods for multimodal imaging (e.g. EEG and fMRI).

Measuring and Modelling Electromagnetic Brain Activity  
(Dr O. Jensen)  
This group develops and applies advanced methods for EEG and MEG data analysis. In addition, it develops computational models and interprets related experimental findings. Of particular interest is the role of oscillatory brain activity in perception and memory.

Fifty-five percent of the staff at F.C. Donders Centre are seconded by another organization (either inside or outside Radboud University Nijmegen).

Staff  
- Prof. M.G.H. Coles (o)  
- Prof. G. Fernández (o)  
- Prof. P. Hagoort (o)  
- Prof. D.G. Norris (o)

Tenured  
- Full Professors 3.0 FTE  
- Researchers 6.0 FTE

Non-tenured  
- Researchers 1.0 FTE  
- Post-docs 21.5 FTE  
- Doctoral candidates 45.3 FTE

Prof. G. Fernández was appointed Professor of Cognitive Neurology at the UMC St Radboud.

Dr P. Fries has been awarded an European Young Investigator Award.

Fifty-five percent of the staff at F.C. Donders Centre are seconded by another organization (either inside or outside Radboud University Nijmegen).
Research facilities

- three MR scanners, dedicated to research (at 1.5, 3, and 7 Tesla), for measuring structural anatomy and functional brain activity with high spatial resolution.
- a whole-head, 151-channel MEG system, for measuring neuronal activity with high temporal and good spatial resolution.
- three EEG laboratories, with 128 channel recording possibilities, for measuring the synchronous electrical activity of large ensembles of neurons.
- a dedicated 32-channel EEG system for measuring EEG in the MR scanners.
- a behavioural laboratory for collecting behavioural data (e.g. reaction times).
- integrated stimulus presentation facilities for auditory and visual presentation, for somatosensory stimulation, etc.
- a computer infrastructure that combines personal desktop PC computation with centralized storage management and central computation power.
- a facility for awake monkey neurophysiology, allowing the simultaneous recording from 256 sites across the brain.
- access to a laboratory for Transcranial Magnetic Stimulation (TMS).

Collaboration

The F.C. Donders Centre for Cognitive Neuroimaging is a research centre at Radboud University Nijmegen with participation by the universities of Maastricht, Tilburg, and Twente (Netherlands) and the Max Planck Institute for Psycholinguistics (MPI), which is also located in Nijmegen. It has formal collaborations with a large number of international institutions, including the University of Aalborg (Denmark), the Institute of Medicine of the Forschungszentrum Jülich, the Department of Medicine of RWTH Aachen, the Department of Medicine of the University of Bonn, the Departments of Psychology and Medicine, and the MEG Center of the University of Münster (Germany), the Karolinska Institute in Stockholm (Sweden), Norwegian University of Science and Technology (Trondheim), the Department of Neuropsychology of the University of Oxford (UK), the Cold Spring Harbor Laboratories in New York, the Departments of Psychology and Neuroscience of the University of Arizona, the Department of Cognitive Science of the University of California at San Diego (USA), the Chinese Academy of Sciences (Beijing), Erasmus University Rotterdam (Research School ERIM), University of Hamburg, the Max-Planck-Institute for Brain Research (Germany), the McGovern Institute at MIT (USA), The University of Wageningen (Wageningen Centre of Food Sciences), the University Medical Center Leiden, the University Medical Center Utrecht, the Swammerdam Institute for Life Sciences (University of Amsterdam). In 2006, a joint research centre for high-field MR-imaging was established together with the University of Duisburg-Essen. This centre houses a 7 Tesla MRI scanner, one of the first in Europe and the first one that can be used by a Dutch research facility.

Research results

Research in 2006 was particularly successful, with publications in a number of major impact journals in the field including Nature and PNAS.

Part of the Centre’s research programme focuses on rhythmic neuronal synchronization, the functions that it might serve and the mechanisms through which it might subserve these functions. We have put forward the Communication Through Coherence (CTC) hypothesis, which states that the specific pattern of interactions among groups of neurons is governed by the specific pattern of synchronization. In the past year, experimental evidence that supports this hypothesis was provided.

In addition, the role of oscillatory brain activity in human memory and perception was investigated. The primary technique used to investigate this is magnetoencephalography (MEG) which makes it possible to detect oscillatory activity and localize where in the brain it is produced. Researchers at the Centre established that neuronal oscillatory synchronization at theta (~6 Hz) and gamma (60-90 Hz) frequencies are involved in memory formation and retrieval. In contrast, posterior alpha activity (~10 Hz) serves to inhibit brain regions not engaged in memory processes.

The two main achievements in 2006 with regard to MR methods development were the development of the parallel-acquired inhomogeneity-desensitized (PAID) method for fMRI acquisition and the identification of the BOLD correlate of the post-movement beta rebound. It was shown that with the PAID technique the sensitivity and image quality in fMRI can be improved throughout the brain, but particularly in those regions affected by image distortions using conventional methods. The localization of the beta-rebound is the first combined EEG-fMRI study to localize the BOLD correlate of EEG activity in the beta frequency range.

Research on human action focuses on the cognitive and cerebral properties of movement representations, given their crucial role in organizing our own movements, in imaging future actions, and in perceiving other people moving. What is the nature of these movement representations? Are they general rules of biological motion, or on-line simulations of one’s own body movements? Evidence has been produced for the latter hypothesis, showing that imagining hand movements depends on the current position of the hand in space.

Another topic of research relates to the neural underpinnings of memory, emotion and their interaction in healthy and diseased states. For instance, a prospective fMRI study on memory consolidation was conducted, following up newly formed memories over three months. Transfer of putative linking nodes from the hippocampus to a ventral medial prefrontal
region, which is promoted by deep sleep, was identified. These findings revise the classical consolidation theory by demonstrating the role of this prefrontal region in remote memory retrieval.

Research on learning and plasticity focuses on investigating the principles of neural plasticity in relation to learning-induced changes in cognitive functions. Using fMRI, evidence was found for cross-modal category learning in visual and auditory regions in the adult brain. Studies on the neural basis of route learning revealed distinct neural pathways for experience-related representation of landmarks and route direction. Automatic performance of newly learned arithmetic tasks was found to be mediated by plastic changes in a network of number and language-related brain regions.

Research on multilingualism showed that Dutch participants who learned German phrases such as “mit dem kleinen Kind” demonstrate rapid neural reorganization after the subject has learned new grammatical rules. In addition, the magnitude of a negative potential (ERN) following grammatical judgement errors predicted the learning success of participants. EEG experiments with Dutch speakers who were proficient in English showed that semantic integration in non-native listening can start on the basis of word initial phonemes.

Research on the language system focuses on two aspects. How is core linguistic (i.e. semantic, syntactic, and phonological information) integrated with non-linguistic information, such as that provided by co-speech gestures, visual input, or background information about the speaker. A whole series of fMRI and ERP studies has shown that all these different sources of information are immediately used in constraining the interpretation of linguistic utterances, and, moreover, that the left inferior frontal cortex plays a crucial role in integrating the different types of information. Computational modelling has provided an explicit computational account of so-called unification operations.

**Societal impact**

According to the World Health Organization diseases of the nervous system will become the top medical priority during this century. Already the costs of treating nervous system disorders are ten times higher than those associated with treating cancer. Cognitive neuroscience contributes to our understanding of cognitive deficits related to nervous system disorders such as Alzheimer dementia (memory), aphasia (language), neglect (attention), motor function (Parkinson’s disease), among other conditions.

In addition, life-long learning is a crucial component of technologically advanced societies. According to the OECD a brain-based learning science is urgently needed. Learning and plasticity is one of the key research lines at the FCDC.

**Prof. P. Hagoort**

Prof. Hagoort is the founding director of the FCDC. In November 2006 he was appointed director of the MPI in Nijmegen. Since 1990 he has been leading the research group “Neurocognition of Language Processing” at MPI. He is also Professor of Cognitive Neuroscience at Radboud University Nijmegen. His research interests relate to the domain of the human language and how it is instantiated in the brain. Professor Hagoort has been a visiting scholar in Cambridge (UK) and California (USA), and a member of many international scientific boards and councils. For his scientific contributions, the Royal Netherlands Academy of Arts and Sciences (KNAW) awarded him with the Hendrik Mullerprijs in 2003. In 2004 he was awarded the “Knighthood of the Netherlands Lion.” In 2006 he received the Spinoza Prize from the Netherlands Organisation for Scientific Research (NWO). Hagoort is an elected member of the KNAW.


Dissertations: 3
Scientific publications: 81
Patent: 1
FCDC also contributes to dissemination of its expertise. An annual series of courses (`The cognitive neuroscience tool-kit’) attracts students and researchers from all over Europe. An advanced analysis “tool-box” for analysing MEG and EEG data (source modelling) is being developed and made available to the neuroscience community. In addition, staff at the FCDC give numerous lectures for the general public (e.g. extracurricular lectures and lectures for patient societies).

The Centre provided advice to the European ‘Burgerforum’ on the brain sciences, to the Stichting Toekomst der Techniek (STT) and other organizations that evaluate the societal impact of cognitive neuroscience.

In addition, a project on brain-computer interfaces has recently been started, based on EEG and MEG signals. The idea is to develop techniques that will allow subjects to control a computer or an external device by modulating their own brain activity. This research is expected to result in applications which can help the disabled and paraplegics to communicate and control artificial limbs. To this end, a Smartmix grant proposal has been submitted with the FCDC as one of the co-applicants.

**Future research**

The FCDC is part of the Cognitive Neuroscience Centre Nijmegen (CNCN). Members of the CNCN are the FCDC, the Nijmegen Institute for Cognition and Information, the Max Planck Institute for Psycholinguistics, the Institute for Neurosciences of the UMC St. Radboud/FNWI. The CNCN coordinates and strengthens cognitive neuroscience research at the Radboud University Nijmegen and related institutions.

Having established that selective synchronization does indeed result in selection of interactions among neuronal groups, an attempt will be made to test whether this mechanism is used during normal cognitive functioning. Specifically, tasks in which cognitive top-down control alters the brain-wide pattern of interactions will be used and it will be investigated whether this is achieved through altering synchronization patterns.

The Centre will further investigate the role of oscillatory brain activity, focusing on cross-frequency interactions. Based on animal findings and computational modeling it has been argued that synchronization and cross-frequency interactions play a key role in neuronal computation. This work will be used to gain a better understanding of the physiological substrate of human memory and perception.

Improved techniques for fMRI acquisition – with reduced distortion and improved motion correction – will be developed and the use of high-resolution fMRI, in particular for the differential detection of activation in the laminae of the human cortex will be further explored.

How do simulating and intending to move differ? Assuming that motor intentions are related to a need to account for the social consequences of our actions, the hypothesis will be tested that there is cognitive and cerebral overlap between the generation of third and first-person intentions.

The Centre will start probing the effects of steroid hormones on specific brain operations that underlie mood regulation, stress perception and memory. Moreover, an attempt will be made to identify the genetic basis of individual differences in these domains, with the aim of identifying subjects who are particularly vulnerable for stress-related mental disorders.

In addition to studying the adult brain, an investigation commenced recently that focuses on language learning and plasticity in the developing brain (i.e. in children). Using event-related brain potentials, the researchers aim to unravel the neural correlates of phonological processing in relation to learning how to read in pre-school children.

With regard to learning a new language, research will focus on the role of EEG responses predicting the success of second language learning and on the question as to whether native language is activated while subjects listen to sentences in a second language.

Finally, research on the human language system will focus on the functional and structural connectivity between areas in the language cortex with differential contributions (e.g. memory, unification and control) to language comprehension and production. In addition, subtle changes in language function and the underlying neurobiology in patients with autistic spectrum disorder will be investigated.

The relationship with the Max Planck Institute for Psycholinguistics has been strengthened by the appointment of Prof. Peter Hagoort as one of its directors. With this directorship the Max Planck Gesellschaft has increased its participation in the FCDC. A participation contract has been signed with the University of Twente. This participation will be increased in 2007. Discussions on the participation of the University of Leiden are in its final phase. This participation will be effective in 2007.

**F.C. Donders Centre for Cognitive Neuroimaging**

**Postal address**
PO Box 9101
6500 HB Nijmegen
The Netherlands

**Visiting address**
Kapittelweg 29
Nijmegen

**T:** +31 (0)24 3610651
**F:** +31 (0)24 3610652
**E:** info@fcdonders.ru.nl
**I:** www.ru.nl/fcdonders
The main goal for the future is to bridge the gap between processes occurring at the subcellular and neuronal levels and the activity of complete brain structures, with special reference to how these influence normal and pathological behaviour. Findings will be used to develop new techniques for diagnosis and therapy in neurology and psychiatry as well as for applications in research on artificial intelligence and machine learning.

The Institute brings together multidisciplinary basic and clinical research groups from the Faculty of Science, Mathematics and Computing Science and the Radboud University Nijmegen Medical Centre. Their expertise and skills are used to train students, researchers, physicians, clinical specialists and professionals active in the field of neuroscience, while also helping to apply existing knowledge in clinical practice.

The main emphasis of research is on cognitive neuroscience – investigating the neuronal processes involved in attention, action, perception, stress adaptation, emotion and language. Applied clinical research at the Institute focuses on diagnosis and therapy, on techniques for use in normal and pathological cognitive dysfunction, and on understanding the pathophysiology and aetiology of psychiatric and neurological syndromes.

The Institute's primary aim is to reveal the neuronal mechanisms underlying the normal and pathological cognitive processes involved in perception, action and adaptation. The central nervous system is an adaptive self-organizing system, whose potential for adaptation has genetic roots and is expressed through interaction with the environment. Research on animal models and human subjects is carried out at various levels: that of genes, biomolecules, neurons, networks of neurons, as well as the behaviour of the total organism.
Research groups within the Institute:

The Departments of Neurobiology, Molecular Animal Physiology, Cell Biology, Applied Biology, and Neuroanatomy. These groups carry out fundamental and applied research on adaptation and cognitive processes, with particular emphasis on neuropharmacology and on the epigenetic, genetic and molecular/cellular mechanisms that underlie communication within the brain and pituitary gland. In addition, experimental and theoretical research is carried out on information processing by neurons and neural networks during action and perception, which has applications in Artificial Intelligence.

The Departments of Neurology, Psychiatry, Clinical Geriatrics, Rehabilitation Medicine and Medical Psychology, which carry out fundamental and applied research on neuromuscular disorders, neurodegenerative disorders, child neurology, neurorehabilitation, clinical neurophysiology and neurodevelopmental and mood disorders.

Researchers at the Departments of Ophthalmology, Audiology, Otorhinolaryngology, Biochemistry and Human Genetics study the genetic mechanisms of mental retardation and other neurodevelopmental disorders, retinal and cochlear disorders, and neuronal and perceptual adaptation after the insertion of cochlear implants, partial and fully implantable hearing aids and the Bone Anchored Hearing Aid (BAHA).

Research facilities

- The Institute has access to:
  - well-phenotyped and genotyped population and clinical samples of children, adolescents and adults with various neurological and psychiatric disorders
  - large samples of genetically hearing-impaired families, as well as with age-related hearing impairment and clinical otosclerosis; and large series with genetically visually impaired families and populations with age-related macula degeneration
  - large cohorts of patients with X-linked mental retardation, autosomal forms of mental retardation, and a variety of severe neurodevelopmental disorders, including Walker-Warburg syndrome and other dystroglycanopathies.
  - Multidisciplinary integrated clinical and research expert centres for various neuropsychiatric disorders (Alzheimer Centre Nijmegen; Parkinson Centre Nijmegen; Neuromuscular Expertise and Consultation Centre Nijmegen).
  - The TMS facilities at the Department of Clinical Neurophysiology now includes a stereotactic image guidance system.

STAFF

- Prof. G. Bleijenberg (p)
- Prof. J.K. Buitelaar (o)
- Prof. A.R. Cools (p)
- Prof. C.W.R.J. Cremers (e)
- Prof. B.J.P. Crul (o)
- Prof. J.R.M. Crujysberg (o)
- Prof. J. Damen (p)
- Prof. J.E.J. Duyzens (o)
- Prof. B.G.M. van Engelen (e)
- Prof. G. Fernández (o)
- Prof. R.J. van der Gaag (o)
- Prof. A.C.H. Geurts (o)
- Prof. C.C.A.M. Gielen (o)
- Prof. J.A. Grotenhuis (o)
- Prof. B.C.J. Hamel (e)
- Prof. Y.A. Hekster (o)
- Prof. B. Hillen (o)
- Prof. W.H.L. Hoefnagels (o)
- Prof. H.J. Kappen (p)
- Prof. J.E.E. Keunen (o)
- Prof. R. Kötter (o)
- Prof. F.W. Kraaimaat (o)
- Prof. H.P.H. Kremer (o)
- Prof. G.J.M. Martens (o)
- Prof. M.G.M. Olde Rikkert (o)
- Prof. A.J. van Opstal (p)
- Prof. G.W.A.M. Padberg (o)
- Prof. W.O. Renier (o)
- Prof. J.J. Rotteveel (o)
- Prof. G.J. Scheffer (p)
- Prof. A.E.M. Speckens (o)
- Prof. D.E. Stegeman (c)
- Prof. K.C.P. Vissers (o)
- Prof. R.A. Wevers (o)
- Prof. M.J. Zwarts (o)

Tenured

- Full Professors 7.8 FTE
- Associate Professors 9.2 FTE
- Assistant Professors 1.5 FTE
- Researchers 16.5 FTE

Non-tenured

- Researchers 32.5 FTE
- Post-docs 11.0 FTE
- Doctoral candidates 61.3 FTE


Dissertations: 26
Scientific publications: 519
Professional publications: 1
system (Brainsight) that facilitates the positioning of transcranial magnetic stimulator coils over a subject’s brain on the basis of MRI and fMRI images.

- A balance platform in the Nijmegen Motor Unit - NMU (a joint venture with the Department of Rehabilitation Medicine).
- A proteomics facility in a full molecular biology laboratory that also employs advanced histological techniques for muscle tissue investigation, such as an EM-pact machine and mitochondrial enzyme measurement (Laboratory of Paediatrics and Neurology).
- A confocal laser scanning/fluorescence microscope.
- A facility for breeding laboratory animals with unique facilities for phenotyping genetically altered rats and mice (used in investigating the functional consequences of gene-environment interactions and also in developing transgenic/knockout animal models); this includes a facility for generating and analysing Xenopus laevis with cell-specific transgene expression. The fruit fly Drosophila melanogaster has been introduced as a new organism for modelling mental retardation and other neurodevelopmental and neurodegenerative disorders.
- Advanced neuro-imaging facilities, which include 1.5-tesla, 3-tesla and 7-tesla fMRI, and high-resolution EEG and MEG.
- Facilities for single-unit and multi-unit recording in primates to measure the role of neurons in perception and action.
- A patch-clamp set up for in vitro recording, which can measure the activity of ion channels in the cell membrane and how these are modulated by neurotransmitters and pharmaceuticals.

- A vestibular chair for investigating interactions between visual and vestibular systems during navigation.
- A molecular biology laboratory with quantitative PCR, proteomics and cell culture facilities for investigating the functional role of particular genes and proteins in the living cell.
- A research lab with a treadmill, force platform and platform for linear accelerations.
- A 7-tesla small bore MR from the Department of Radiology to perform in vivo NMR imaging and spectroscopy in rats and mice.
- Genotyping facilities as Fluorescent STR analysis, and Microarray facilities: Array Comparative Genomic Hybridization (ArrayCGH; X-chromosome, 32k full-tiling path BAC array), Affymetrix SNP arrays (10K, 100K, 500K).

Collaboration

- Copenhagen Muscle Research Centre, Denmark (Dr J. Vissing).
- Center for Molecular Neurobiology (ZMNH) Hamburg (Dr Wassmuth).
- Institute de Myologie, Paris, France (Dr G Bonne).
- School of Electrical, Electronic and Mechanical Engineering, University College Dublin, Dublin, Ireland (Dr R. Beck).
- Department of Orthodontics, School of Dental Medicine, University of Freiburg i.Br., Germany (Dr B. Lapatki).
- Department of Functional Restoration, Stanford University, USA (Dr K. McGill).
- Nihon University Tokio, Japan (Dr N. Koshikawa).
- Hubrecht Laboratory, Utrecht University, (Dr D. Plasterk and E. Cuppen).
- Bioinformatics, Utrecht University (Dr A. Siebes).
- Umea Neurosteroid Research Center, Umea University – Sweden (Dr R. Backstrom).
- Swammerdam Institute for Life Sciences - University of Amsterdam (Dr M. Joels).
- SUNY Upstate Medical University, Syracuse, NY (Dr S. Faroane).
- in the context of Alzheimer Research Nederland between Alzheimer Centrum Nijmegen, Alzheimer Centrum Limburg and Alzheimer Centrum VUmc (Radboud University, University Maastricht, Free University Amsterdam).
- Institute of Psychiatry, University College of London (Dr Ph. Asherson).
- MeVis Research Center for Medical Image Computing, Bremen, Germany (Dr C. de Carli).
- University of Kuopio (Dr H. Tanila, H Soininen; J Jolkkonen).
- Mol Cell Biol Heidelberg (Drs Beyreuther; Hartmann).
- Department of Neurobiochemistry, Faculty of Life Sciences, Tel Aviv Israel, (Dr D. Michaelson).
- Institute of Clinical Neuroscience, Goteborg University, Goteborg, Sweden (Drs I Skoog/D Gustaffson).
- Department of Cell Biology, University of Alabama at Birmingham, Birmingham (Dr Th van Groen).
- Dept of Genetics Alz Centre Bristol, (Dr P. Kehoe).
- Universiteit of Maastricht (Dr E. Formisano).
- EURO-XLMR consortium consisting of K.U. Leuven (Dr J.P. Fryns); INSERM/Institute Cochin, Paris (Dr J. Chelly); University Hospital, Tours (Dr C. Moraine); Max Planck institute, Berlin (Dr H.H. Ropers); University of Adelaide (Dr J. Gecz).
- University of Siena (Dr A. Renieri).
Research results
Systematically studying the largest cohort ever – 264 patients – led to a redefinition of the clinical spectrum and the prognosis of neuralgic amyotrophy.

Projects were started on vascular factors that contribute to dementia, complementing ongoing research in Alzheimer’s disease as well as research at the Department of Geriatrics, thereby integrating research activities in that department with those of the Department of Neurology.

Novel insights have been generated into using CSF biomarkers (phosphorylated tau protein, neurofilament light chain proteins) to distinguish the various forms of late onset dementias, ataxias, as well as the various forms of parkinsonism.

Probing the neural correlates of declarative memory consolidation prospectively showed for the first time that the ventromedial prefrontal cortex takes over the pointer function during remote memory retrieval, which is supported by the hippocampus during recent memory retrieval.

Researchers investigated whether the medial temporal lobe is also involved in short-term memory maintenance, and if yes, under which circumstances. This study revealed that the hippocampus is involved in short-term memory maintenance when subjects keep associations with a spatial feature about object location active in working memory.

During episodic memory formation it is crucial to associate information across time. Research focused on whether there is a specific neural correlate of associative memory formation of discontinuous events. The results show that the posterior parahippocampal region provides a computation that is involved in binding events or event features across time for subsequent memory retrieval.

Pharmacogenetically selected apomorphine-susceptible rats that share more than 11 features with patients with schizophrenia have been found to be marked by the lack of 1-2 copies of the aph-1b gene, raising the possibility that just a simple gene mutation may underlie highly complex, neurodevelopmental phenotypes.

Analysis of the SERT knockout rat generated by ENU-driven target-selected mutagenesis has shown that this is a very fruitful animal model of depression.

It was found that type 1 diabetic patients tended to report more cognitive and depressive problems than control subjects, but this did not correlate with the performance on cognitive tests. The conclusion is that cognition in older type 1 diabetic patients is only mildly disturbed.

To provide further clarification of reported associations and identify novel associated genes, 1,038 SNPs spanning 51 candidate genes in 776 cases with ADHD were examined. Nominal significance was found with one or more SNPs in 18 genes, including the two most replicated findings in the literature: DRD4 and DAT1. Gene-wide tests, adjusted for the number of SNPs analysed in each gene, identified associations with TPH2, ARR2, SYP, DAT1, ADRB2, HES1, MAOA and PNMT.

The first placebo-controlled maintenance versus withdrawal trial of its kind in disruptive behaviour disorder was performed, providing evidence that patients who respond to initial treatment with risperidone would benefit from continuous treatment over the longer term.

A better understanding of neuronal responses to correlated input was obtained, in particular focusing on synchronization of neuronal activity. The results show that the coherence for multi-unit activity is larger than that for single-unit activity. This is in agreement with the results of experimental data obtained using the visual cortex of monkeys (V4).

It was shown that the compensation for body rotation in the computation of line orientation in space – although always incomplete – depends on vestibular rotation frequency and on the availability of gravity cues. In the supine condition, the compensation for ego motion sharply increased with frequency, a result which is compatible with an integrated canal signal.

Reflex responses are often less pronounced when they are self-induced, but this question has hardly been investigated quantitatively. The observation that facilitation is reduced and suppression enhanced in several muscles is taken as evidence that anticipation of self-induced reflex responses reduces the excitatory drive to motor neurons, for example through presynaptic inhibition of facilitatory reflex pathways.

Researchers at the Institute improved the accuracy of belief propagation methods and were able to show that the Cluster Variation Method gives a more precise estimate of the localization of genes in Genetic Linkage Analysis than state-of-the-art Monte Carlo sampling methods.

Using Array CGH, ZNF674 was identified as a novel causative gene in X-linked mental retardation (XLMR). This gene is located in a cluster of zinc finger genes on Xp, which have arisen through recent duplication events as they are unique to the primate lineage. Since mutations in three of these primate-specific zinc finger
genes cause problems in the normal functioning of the brain, these may have an impact on species-specific brain development.

A relatively prevalent, severe mental retardation syndrome is caused by micro-deletions of the subtelomeric region of chromosome 9q. It was established that the 9q-subteleomeric deletion syndrome is caused by haplo-insufficiency of the EHMT1 gene, which encodes an Euchromatic Histone methyltransferase.

**Societal impact**

Prof. B. van Engelen has been elected to the scientific committee of the European Neuromuscular Centre (ENMC).

In 2006, Prof. H. Kremer was chairman of the Dutch Neurological Society. He was also appointed to the scientific committee of the European Huntington’s Disease Network, EHDN.

Prof. A. Cools was invited by the Soeterbeeck Programme to give six lectures in order to stimulate cross-fertilization between groups working on society, neuroscience and philosophy of life. He also participated in the national Brain Spotting Festival in order to enhance the interest of the Dutch public in neuroscience.

Prof. J. Duysens is a member of the board of ISPGR (International Society of Posture and Gait).

Prof. M. Zwarts is chairman of the board of the Dutch Society of Clinical Neurophysiology.

Research activities by members of the Institute have an impact on the diagnosis and treatment of patients with neurodegenerative conditions such as Parkinson’s disease and related disorders, Alzheimer’s disease, and Huntington’s. The development of CSF markers for dementia, Parkinsonian syndromes and ataxia is an increasingly important tool for making a correct diagnosis; and they provide biomarkers that may be employed as surrogate end-points in intervention trials.

Prof. J.K. Buitelaar has been a Full Professor of Psychiatry as well as Child and Adolescent Psychiatry at Radboud University Nijmegen since August 2002. From 1995 to 2005 he was Professor of Biopsychosocial Determinants of Human Behaviour at Utrecht University. His research focuses on neurodevelopmental disorders at all stages of life. Prof. Buitelaar is editor-in-chief of *European Child and Adolescent Psychiatry*, a member of the Programme Committee of the European College of Neuropsychopharmacology and a member of several other scientific boards.
Prof. A. Geurts was appointed by ZonMw to the Programme Committee for the 2nd national stimulation programme on Rehabilitation Research (2006-2010).

Prof. J. Buitelaar was appointed to the Programme Committee for Prevention Research by ZonMw.

In 2006 the company Promedas BV was founded as a collaborative venture between Radboud University and UMC Utrecht. The company aims to commercialize diagnostic decision support systems which are based on the application of techniques used in Artificial Intelligence and machine learning. The products are a generic expert system for internal medicine which can be accessed via Internet, as well as specific modules for use in companies.

Members of the Institute for Neuroscience were strongly represented in the public media in 2006, spanning various television channels and main news programmes, as well as the radio and the main newspapers. Topics that were covered included Parkinson’s disease, Alzheimer, depression and mindfulness treatment approaches, rehabilitation medicine, neurobiological research and forensic psychiatry, ADHD and substance abuse in adolescents.

Future research
Several prestigious grants, which were awarded to members of the Institute in 2006, will guide future research:
- A Veni grant went to Dr A. Takashima for his work on “Memory consolidation and reconsolidation in humans: the role of the amygdala and stress hormones on emotional memories”.
- A Vidi grant went to Dr B.R. Bloem for “Unravelling the complexity of Parkinson’s disease”.
- A Vidi grant went to Dr J. Goossens for “Executive control mechanisms for action and perception in the primate brain”.
- A Vici grant went to Prof. G. Fernández for “The three dimensions of aversive memories: neurons, hormones and genes”.
- A Vici grant went to Prof. A.J. van Opstal for work on “Sound processing in the primate brain: from neuron to cognition and behaviour”.

Other grants included:
- A research grant that was awarded to J. Liu and G. Fernández by the Royal Netherlands Academy of Arts and Sciences (KNAW) and the Chinese Academy of Sciences (CAS) for the study “Bridging the gap 2: how the hippocampus associates discontinuous events in memory”.
- An NWO research grant that was awarded to O. Jensen and G. Fernández for their study “Does sequence encoding in long-term memory require working memory maintenance?”.
- A Top Institute Pharma grant which went to G. Martens and A. Cools for their work on “Novel susceptibility pathways and drug targets for psychosis”.
- An UMCN research grant which went to B. Franke and J. Buitelaar for “ADHD in adults: brain morphology and neuropsychology as intermediate phenotypes between genes and clinical phenotypes”.
- I. Tendolkar and A. Speckens received a UMCN research grant for their work on “Memory bias in depression”.
- A Frye Stipendium (UMCN) which was awarded to M. van Iersel.
- A Top talent award which went to Dr R. Kessels.

The Institute’s research on neurodegenerative disease focuses on:
- Increasing both genetic and biochemical retardation, autism, ADHD, schizophrenia and depression, the Institute aims to:

- Studying how the central nervous system and the peripheral neuromuscular and motor systems are integrated dynamically. This research, which will lead to better understanding of the cognitive modulation of human motor control, is relevant to the study of Chronic Fatigue Syndrome.
- Exploring the molecular causes of neurodegenerative processes in retinal pathology.
- Establishing the roles of Alzheimer’s amyloid-precursor protein APP and Parkinson’s synuclein through functional studies in transgenic Xenopus.
- Developing novel therapies for neurodegenerative diseases through either small mechanistic proof-of-principle studies (e.g. inhibition of Aβ-induced cell death in cell systems), medium-sized clinical interventional studies (e.g. balancing improvements in Parkinson’s disease and ataxias), and large international multi-centre controlled neuro-protection trials (e.g. riluzole for Huntington’s disease).
- Assessing new drugs for the treatment of epilepsy and Parkinson’s disease.
- Unravelling the role of urocortin in the epigenesis of anxiety and major depression, using Xenopus, rat and mice models and post mortem human brain material.
- Developing novel therapies for neurodegenerative diseases through either small mechanistic proof-of-principle studies (e.g. inhibition of Aβ-induced cell death in cell systems), medium-sized clinical interventional studies (e.g. balancing improvements in Parkinson’s disease and ataxias), and large international multi-centre controlled neuro-protection trials (e.g. riluzole for Huntington’s disease).
- Assessing new drugs for the treatment of epilepsy and Parkinson’s disease.
- Unravelling the role of urocortin in the epigenesis of anxiety and major depression, using Xenopus, rat and mice models and post mortem human brain material.
- Exploring the molecular causes of neurodegenerative processes in retinal pathology.
- In relation to neurodevelopmental and neuropsychiatric disorders such as mental retardation, autism, ADHD, schizophrenia and depression, the Institute aims to:
• Identify genes that are involved in these disorders, determining environmental risk factors for these disorders, and study gene-environment interaction and correlation. The ultimate goal of this research is to identify the molecular and cellular base of neuropsychiatric disorders.

• Explore the neurocognitive correlates of these disorders, particularly the contribution of problems in memory, cognitive biases, and pragmatic use of language, and identify the neural circuits involved.

• Examine phenotype, endophenotype and genotype interrelations in these disorders.

The link between molecular processes occurring at the neuronal level and the synchronization of neuronal activity will be investigated using neuro-imaging studies. This link underlies important cognitive processes involved in action and perception.

Researchers at the Institute will continue to study the genetic and molecular base of X-linked and autosomal forms of mental retardation using microarray approaches, and among others, focus on the Eu-HMTase 1 and MYCN genes. Their work on neurogenetics will be intensified by using Drosophila as an animal model.

Stressful, aversive experiences are easier to recall than neutral, everyday events. Individual differences in this emotional memory effect are linked to susceptibility to stress-related mood and anxiety disorders. Stress hormone action on specific neural systems and genetic diversity modulate this effect and its variability. Researchers will explore how genes and hormones interact with mnemonic operations during and after stressful experiences.

Attempts will be made to identify novel drug targets for the treatment of psychosis. To achieve this goal, novel susceptibility pathways in the brains of clinically relevant rodent ‘psychosis’ models will be disclosed and these results will be translated by identifying variations in human genes that encode orthologues of the rodent pathways as genetic risk factors for psychosis.

Institute for Neuroscience

Postal address
PO Box 9101
6500 HB Nijmegen
The Netherlands

Visiting address
Geert Grooteplein 21
Nijmegen

T: +31 (0)24 3614244
F: +31 (0)24 3541435
E: mbfys@science.ru.nl
I: www.umcn.nl/scientist
Nijmegen Centre for Clinical and Translational Research

Director: Prof. P.A.B.M. Smits

Holistic in-vivo research on human being represents the final crucial step in exploiting the new pathophysiological concepts emerging from molecular medicine and population studies. Using specific clinical expertise, this institute translates observations from its two sister research institutes – Nijmegen Centre for Molecular Life Sciences and the Nijmegen Centre for Evidence-Based Practice into medical practice – and stimulates bedside-to-bench research. This approach underscores the central position of the patient in the Radboud University Nijmegen Medical Centre.

In the Radboud University Nijmegen Medical Centre, clinical and translational research is divided into four disease-related programmes:

**Oncology**

The Oncology Research Programme has the following objectives:

- to ensure consistent oncology research
- to combine research priorities with excellent patient care to form large collaborative oncology study groups within the Medical Centre
- to harmonize research, patient care and education & training
- to promote new initiatives in the field of medical oncology
- to strengthen the national and international profile of the Nijmegen Academic Oncology Centre.

Major clinical research themes include functional imaging and interventional oncology & epidemiology.
Heart, lung and vascular diseases

The integrity of the cardiovascular system is vital to quality of life and cardiovascular disease is still the most important cause of mortality in Western societies. Disturbances of the cardiovascular system can be caused by cardiovascular disease, whose congenital forms usually involve the right ventricle. In acquired forms, the pathophysiological momentum is generally provided by the vascular process of atherosclerosis. The blood circulation is regulated by various mechanisms, which in diseased conditions may become less viable. For this reason, cardiovascular disease very often interferes with vascular haemodynamics and tissue perfusion. The response of the lung vasculature to heart disease is an important example of such interference.

Clinical research in the field of heart function and circulation has four main objectives:
- to assess and introduce new diagnostic techniques for disorders of the heart and blood vessel walls
- to develop human in-vivo models for testing new pathophysiological concepts that emerge from molecular and cellular research in cardiovascular medicine
- to investigate vascular and metabolic mechanisms in various organ systems (including the pulmonary circulation), in health as well as in disease processes such as atherosclerosis, ischemia, hypertension, heart failure and diabetes mellitus,
Infection, inflammation and repair
Clinical research focuses on the encounter between the host immune system and microbial and non-microbial attacks. Major themes of research include:
- Pathogenesis and inflammatory response
- Invasive mycoses
- Compromised host
- Infection, epidemiology and control
- Poverty-related infections
These topics are investigated from a medical perspective, i.e. in relation to infectious and non-infectious inflammatory disease, the ultimate goal of research being to improve human well being through innovation and the optimization of diagnostics and therapy.

Genetic and metabolic disorders
Most of the research in this disease-related programme is conducted within the framework of the Nijmegen Centre for Molecular Life Sciences. The programme covers the following topics:
- Genetics and metabolism
- Endocrinology and reproduction
- Cellular energy metabolism
- Renal disorders
- Nutrition and health

Research facilities
The Centre has access to the Clinical Research Centre Nijmegen, which was established in 2004 to undertake in-vivo research on healthy volunteers and patients according to European rules on Good Clinical Practice. Modern techniques available for diagnostic and therapeutic procedures in patients can also be applied for clinical research purposes.

At Radboud University Nijmegen Medical Centre, the following human in-vivo models, techniques and facilities have been developed:
- Clinical diagnostic laboratories for cardiology, pulmonology, gastro-enterology and neurophysiology
- the perfused forearm/leg technique (brachial or femoral artery cannulation) for vascular and metabolic studies in human skeletal muscle
- exercise testing
- invasive monitoring
- the microneurography of sympathetic nerves and other extensive neuro-physiological monitoring
- clean-rooms for transplantation and immunotherapy according to GMP standards
- tracer techniques for kinetic studies, a cyclotron for PET scanning, other facilities for in-vivo imaging and NMR techniques combined with specific labels for metabolic studies
- special sampling techniques such as in-vivo microdialysis in tissues
- well-equipped laboratories with FACS facility, LC-MS/MS, GC-MS, HPLC and radionucleotides for determining concentrations of a wide variety of substances, including pharmacological agents, neurotransmitters, hormones and second messengers
- facilities for genomics, proteomics and metabolomics
- access to databases containing information on specific patient groups.

Awards
In 2006 Dr John Raemaekers was honoured with the Ank van Vlissingen award for his outstanding research on lymphomes.

Jan Smeitink, MD, PhD, who received the 2006 research award from the Princess Beatrix Foundation, was appointed “Foreign Adjunct Professor” in the Karolinska Institute in Stockholm, Sweden.

Niels Riksen, MD, received the Novartis Excellence award for the best curriculum vitae as clinical researcher in the field of cardiovascular medicine. Jacqueline de Graeff, MD, PhD received an award from the Dutch Society of Vascular Medicine and Gerard Rongen, MD, PhD has been appointed “established clinical investigator” by the Dutch Heart Foundation.

Collaboration
International partners include the European Organisation for Research and Therapy of Cancer (EORTC), the European Group for Blood and Marrow Transplantation (EBMT), K.U. Leuven and University of Antwerp (Belgium), Hospital de Bicêtre and Institut National de la Santé et de la recherche Médicale (France), University Hospital Düsseldorf (Germany), Florence University Hospital (Italy), University of Auckland (New Zealand), University of Bergen (Norway), University of Cape Town (South Africa), University of Valencia (Spain), Baylor College of Medicine Houston (USA); Brigham and Women's Hospital of Harvard Medical School, Boston (USA); Columbia University, New York (USA); Mayo Clinic Rochester, Minnesota (USA); National Institute of Health, Bethesda, MA, (USA); Presbyterian Hospital, New York (USA), The Texas A&M University System Health Science Center, Houston (USA); University of Colorado, Denver (USA); Washington University, Seattle (USA) and University of Colorado, Denver (USA).

In the Netherlands, the NCCTR collaborates with the University Medical Centres in Amsterdam, Groningen, Leiden and Maastricht, and with the Dutch Cooperative Head and Neck Oncology Group (NWHHT), the Dutch Foundation for Adult Haematology-oncology (HOVON), and the Dutch Foundation for Child Oncology (SKION).
Research results

Radboud University Nijmegen Medical Centre has been very successful in acquiring AGIKO Clinical Research Grants from ZonMw. Over the past eight years, it has acquired 35 such grants for projects that closely combine clinical work and research.

Within the research programme Oncology, a new biomarker for prostate cancer (DD3/PCA3), was identified. The discovery, clinical evaluation and valorisation of this biomarker were initiated by the department of Urology. Furthermore, a new tumour-specific endothelial molecule was discovered (plexine D1). In 2006, new research on Cancer and fatigue was started.

Within the research programme Heart, Lung and Vascular Diseases, there were three awards in 2006 (see above). In the latter project, which is led by Dr Rongen, a human in vivo model for ischemia-reperfusion injury using Annexin A5 scintigraphy will be used.

Within the research programme Infection, Inflammation and Repair, a great deal of effort was invested in research on the mechanisms of host defence against invading micro-organisms. In particular, the research groups within this programme published interesting data on the host defence against candida albicans and the role of Toll-like receptors in this response. Furthermore, an important review was published on the discovery of the “inflammasome” as a line backer of innate defence. Finally, Mihai Netea, MD, PhD et al. identified interleukine-18 (IL-18) as a pivotal cytokine in the homeostasis of energy intake and insulin sensitivity, and as a causal factor in the metabolic syndrome characterized by obesity and insulin resistance.

Within the topic “Poverty-related infections”, Andre van de Ven, MD, PhD was very successful in acquiring grants for research on tuberculosis, HIV infections and malaria.

Within the research programme Genetic and metabolic disorders, the Department of Anthropogenetics was able to acquire an Integrated Project within the European Union’s Sixth Framework Programme, together with ten other European research groups. The aim of the project is to elucidate the role of the p63 gene in epithelial

---

Prof. P. A.B.M. Smits

Prof. Smits trained as an Internist at Radboud University Nijmegen Medical Centre and has been a Full Professor of Pharmacology at the University since 1995. In 1994 he was a visiting scientist at Harvard Medical School, Boston, USA. His research focuses on clinical and translational pharmacology and he specializes in vascular medicine. Prof. Smits is a board member of the Dutch Medicines Evaluation Board of the Health Council of the Netherlands, the Dutch Pharmacological Society, and the Federation of Innovative Drug Research.


stem cell proliferation and differentiation. Within the Radboud University Nijmegen Medical Centre, the Department of Anthropogenetics will cooperate with the Department of Dermatology and with the Centre for Molecular Bioinformatics.

**Societal impact**

As fundamental research and epidemiological surveys continue to reveal new biological concepts, human in-vivo models are crucial for ‘proof of concept’ studies on data emerging from the molecular life sciences and from population studies. While the main causes of death are still cardiovascular disease and cancer, a considerable role in chronic diseases is played by infections and immunological disorders. Because polymorphisms and mutations of genes are proving to be increasingly important in the aetiology of diseases, the societal impact of genetics is increasing every year. Because of the societal impact of our research, several investigators have an important role in health-related committees in our society. Prof. Jos van der Meer is vice-president of the Science Division of the Royal Netherlands Academy of Arts and Sciences (KNAW). Mihai Netea, MD, PhD was appointed as a new member of “The Young Academy” of this KNAW. Several researchers of our institute are member of the Health Council of the Netherlands (Gezondheidsraad), an independent advisory body charged with providing Ministers and Parliament with scientific advice on public health matters. Finally, several colleagues from the NCCTR significantly contribute to the work of the Dutch Medicines Evaluation Board. This board is responsible for the authorisation of safe and effective medicinal products within our society. As fundamental research and epidemiological surveys continue to reveal new biological concepts, human in-vivo models are crucial for ‘proof of concept’ studies on data emerging from the molecular life sciences and from population studies. While the main causes of death are still cardiovascular disease and cancer, infections and immunological disorders also play a considerable role in chronic diseases. Because polymorphisms and mutations of genes are proving increasingly important in the aetiology of diseases, the societal impact of genetics is increasing every year.

**Future research**

The targets for clinical research will be matched with the development of new concepts in molecular life sciences and epidemiology. From a clinical point of view, these studies will be associated with one of four programmes: 1) Oncology, 2) Heart, lung and vascular diseases, 3) Infection, inflammation and repair, and 4) Genetic and metabolic disorders. In all of these programmes, new NWO clinical fellowships or Veni and Vidi grants were acquired. Within the theme “Infection and inflammation”, molecular imaging will get a strong impulse from investments in new imaging tools for animal experiments.

Several topics within the programme “Heart, Lung and vascular diseases” share metabolic aspects with the programme “Genetics and metabolic disorders”. As from 2007, these two programmes will be merged into a single new clinical research institute.
The Nijmegen Centre for Evidence-Based Practice (NCEBP) was established to carry out high-quality research in this field, focusing on two key questions:

- What can be defined as effective, efficient and acceptable patient care and prevention?
- How can we best guarantee that patients and populations receive such care?

The Centre tackles a number of major problems in current health care provision. All research – both fundamental and applied – is geared to answering basic questions about the effectiveness, efficiency, implementation and ethical acceptability of clinical and preventive services.

NCEBP’s aim is to be a national and international centre of excellence in this field. This objective is attained by combining the expertise from a wide variety of disciplines – in particular, medicine, epidemiology, social sciences, economics, nursing sciences, allied health care sciences and ethics – within joint research themes. The research includes prevention and important chronic diseases such as cancer, lung diseases, cardiovascular disease, mental health and neurological diseases, infectious diseases and reproductive disorders.

Research combines patient-directed research on optimal clinical and preventive interventions on the one hand with health services research on determinants of, and
Methods for optimal patient care on the other. The core programmes include generic issues and methodologies as well as research on patient groups and conditions. A wide range of methodological expertise is available within the centre.

**Determinants of Health and Disease** (Prof. F. Kraaimaat)
Here the research focus lies on the medical, genetic, psychosocial and exogenous factors that determine health and disease. Results are used to improve the quality of prognostics, diagnostics and patient treatment, as well as to help prevent diseases such as cancer, reproductive disorders and mental health problems.

**Effective Hospital Care** (Prof. G. Zielhuis and Prof. G.J. van der Wilt)
Research within this programme focuses on the cost and effects of clinical interventions. Simple and complex diagnostic, therapeutic or care interventions may be involved, relating to a variety of conditions, such as rheumatoid arthritis, fertility problems and dementia. To learn more about intended and unintended health outcomes – e.g. morbidity and mortality, as well as societal costs and the effects on quality of life – interventions are studied on a multidisciplinary basis in patient populations. The results provide an invaluable basis for establishing evidence-based hospital practice.

**Effective Primary Care and Public Health** (Prof. C. van Weel)
Research on primary care addresses common chronic diseases in general practice such as asthma/COPD, diabetes mellitus, hypertension/cardiovascular diseases and depression-mental health problems as well as preventive and restorative dentistry.

In the field of public health, an extensive international research programme has been built around the prevention and care of the three main poverty-related infectious diseases: malaria, tuberculosis and HIV/AIDS.

**Quality of Care** (Prof. R. Grol and Dr M. Wensing)
One of the most important and challenging developments in health care today is to set up systems for assessing and managing quality. This requires feasible, cost-effective methods for improving quality, such as evidence-based guidelines, performance and outcome indicators, and instruments for assessing practice performance. Moreover, this programme focuses on tools for quality management, strategies for changing individual professional behaviour, organizational structures, communication and concerted action in teams and in health care.


care chains. The programme also addresses the ethical, philosophical and historical dimension of health care practices, focusing on palliative care, biomedical research and biotechnology, clinical and organizational ethics, nursing and allied healthcare.

Prizes and awards

M. van Iersel, MSc, received the Frye stipendium.

Dr R. Kessels received the Toptalent Award.

The Pfizer Zorg voor Morgen award for the ParkNet project (recognized as the best health care innovation of 2006 in the Netherlands) was awarded to Dr B. Bloem and Dr M. Munneke.

Dr T. Olde Hartman received the ‘Case history prize’ of the Dutch College of General Practitioners, for the best case history analysis (published in ‘Huisarts en Wetenschap’).

Dr M. van den Muijsenbergh received the Corry Hermann award of the Netherlands Society of Women Physicians (NVVA), which acknowledges major contributions in the field of gender equity.

Dr T. Schermer received two awards for his thesis ‘Optimizing health care for patients with COPD or asthma in Dutch general practice’: the CaRe award of the Netherlands School of Primary Care Research and the NCEBP award of the Nijmegen Centre of Evidence Based Practice.

Dr S. Lo Fo Wong received the Libelle ‘General Practitioner of the Year’ award.

Prof. C. van Weel was awarded the Eric Elder Medal of the Royal New Zealand College of General Practitioners for a career contribution to the development of general practice.

Prof. Th. van Achterberg was acknowledged as a Fellow of the European Academy of Nursing Science.

Research facilities
- Cancer Registry of the Comprehensive Cancer Centre (IKO)
- Formal link to the Automated Population Registry (GBA)
- Coordination of the Nijmegen Biomedical Study, resulting in a biobank cum lifestyle database obtained from a random sample of the general population (N=9,500)
- A data warehouse on thousands of urology patients (DNA, lifestyle, clinical data)
- Data from a cohort of 20,000 patients with psoriasis and eczema
- Cohorts of men (N=1,200) and women (N=900) exposed to pesticides and/or organic solvents with referent populations of non-exposed people
- A databank (AGORA) with DNA and environmental data on parents and children with congenital malformations or childhood cancer
- Automated high-speed scanners for data entry (i.e. questionnaires and CRFs) (Teleform)
- Affymetrix DNA SNP chip technology for high-throughput genotyping
- Toxicology laboratory for the development and assessment of novel biomarkers
- A facility for genetic epidemiological consultancy and analyses
- Continuous database of follow-ups of more than 1,000 IVF and ICSI children < 4 years old
- Fertility registries with 4,000 fertility episodes and 10,000 IVF treatments
- Integrated and real-time measurements of Transcranial Doppler measurement device and expertise (TCD) and Cranial near infrared spectroscopy (NIRS)
- New Neuropsychological test battery (CANTAB®; revised CAMCOG®)
- Sway star®: mobile trunk balance measurements
- EASYCare®: user rights of EASYCare screening system for functional performance in the elderly.
- Nijmegen Motor Unit: fully equipped lab for advanced gait and balance research
- Radboud Laboratory for Transcranial Magnetic Stimulation for advanced TMS studies in man
- Nijmegen Continuous Morbidity Registration: all data on morbidity in 12,000 general-practice patients
- Nijmegen Monitoring Project (NMP): data on the process and outcome of care in a population of 45,000 patients with hypertension, diabetes and asthma
- General Practice Academic Network: a recently formed network of 150-200 practices involved in education and research
- Network of primary care and public health practices and institutions: includes a collaboration with three regional institutes of public health, 25 nursing homes and more than 120 general practices
- Research network for studies of COPD and asthma in primary care: regional general practice laboratories on spirometry and monitoring of patients in three regions
- Research network for Nursing Home research (21 nursing homes)
- National General Practice Registration Network (LINH): national reference data on primary care morbidity and performance on 400,000 patients and 100 practices
- Research Network for patients with Parkinson’s disease (ParkNet)
- European Influenza Surveillance Scheme in collaboration with NIVEL Utrecht
• PINCH: European programme on environment and child health
• European Information Network Ethics in Medicine and Biotechnology (Eurethnet)
• Continuous database of follow-ups in cohorts of pre-term infants (1996-2006)
• Research network for patients with Prader Willi Syndrome
• Research network for patients with neuromuscular diseases
• Database on a population of 400 patients with low-back pain and neck pain

Collaboration

National collaboration
• Participation in several KNAW-recognized research schools.
• Part of NCEBP participates in the Centre for Quality of Care Research (WOK), a collaborative venture between Radboud University Nijmegen Medical Centre (RUNMC) and the University of Maastricht (UM), which carries out evidence-based research on quality improvement.
• Within the framework of the National Evaluation Team for Breast Cancer Screening (NETB), the Department of Epidemiology and Biostatistics collaborates with the National Expert Evaluation Team for Breast Cancer Screening (NETB), the Department of Epidemiology and Biostatistics collaborates with the National Expert Evaluation Team for Breast Cancer Screening (WOK) and Erasmus Medical Centre, Rotterdam.
• The Department of Gynaecology is part of the Integral Network of Infertility care East (INF-O, Ede), a regional network of 12 regional infertility clinics.
• Dutch dementia research is clustered in three Alzheimer Centres located in Nijmegen, Amsterdam and Maastricht.
• In collaboration with the Universities of Amsterdam (VU), Leiden, Groningen, the Netherlands Institute for Health Sciences Research, and Trimbos, the Centre participates in the Netherlands Study of Depression and Anxiety (NESDA), which involves prospective data collection (over ten years) on a cohort of patients with anxiety and depression.
• Prevention in dentistry: the Centre collaborates with Wageningen University on research into the aetiology of dental erosion, with a particular focus on the role of diet.

International collaboration
• TOPAS-Europe: collaboration of institutes in nine countries to carry out research on performance in primary care practices.
• Collaboration between nine European countries to study cardiovascular prevention and risk-management in primary care, coordinated by the Centre for Quality of Care Research (WOK).
• Participation in the European Breast Cancer Network, co-funded by the EU, to improve the quality and effectiveness of breast cancer screening and breast cancer services in Europe.
• Participation in the EU 6th framework STREP programme POLYGENE (inherited risk of breast and prostate cancer).
• Participation in the International Consortium for Prostate Cancer Genetics, Childhood Cancer and Testicular Cancer.
• Participation in the prostate and bladder cancer groups of the European Prospective Investigation into diet and Cancer (EPIC).
• Longstanding collaboration with Arizona State University, the Medizinische Hochschule Hannover, University of Central Florida, University of Toronto, and University of Wisconsin-Madison on psychological determinants of chronic diseases.
• European IVF Monitoring taskforce (EIM), Brussels, Belgium, to collect the national IVF data of the European countries.
• The Parkinson Centre Nijmegen (ParC) collaborates with the Institute of Neurology (London), the Universities of Basel, Southampton, Johns Hopkins, Hamburg, Kiel, Tel-Aviv, the University of Lübeck and the University of Vancouver.
• The European collaboration ‘Gender in medical education’ involves the Universities of Berlin, Lübeck, Basel, Umea and Vienna.
• There is international collaboration on prevention in dentistry with the WHO regional Centre for Oral Health Services Research in Damascus, Syria; Ege University, Izmir, Turkey; Witswatersand University, Johannesburg, South Africa; and the Pan-American Health Organization (PAHO), Washington, USA.
• APRIORI is a collaborative effort involving RUNMC, UMC, Killimanjaro Christian Medical Centre in Tanzania, AHRI Ethiopia and MRTC Mali to establish Killimanjaro Christian Medical Centre, where multidisciplinary research will be conducted on the prevention, control and treatment of malaria, tuberculosis and HIV/AIDS.
• The IMPACT programme is an EU-funded consortium, with RUNMC as the European coordinator and Cordaid, UM, University of Antwerp and Padjadjaran University Bandung, Indonesia as partners. The aim is to control the HIV/Aids epidemic in Bandung, West Java, by targeting the main risk group (intraavenous drug users).
• The Research Centre for Allied Health Sciences participates in the development of core sets of the International Classification of functioning, disability and Health for different patient groups, coordinated by the University of Münich (Germany).
• The Colleges of General Practitioners in Australia, Ireland and the Netherlands contribute to a Cochrane Collaboration to construct a new Primary Care Field.

Research results
This was again a successful year for the NCEBP with a large number of scientific publications in high ranked journals, a substantial number of PhD theses super-
In 2006, the first ever whole genome association analysis on prostate cancer was completed within the Polygene project. The results were submitted to the leading genetics journal at the end of the year.

A large study on pesticides and fertility showed that pesticide exposure leads to longer times to conception among male (and possibly female greenhouse workers) and spontaneous abortions among female greenhouse workers. These results received considerable media and professional attention.

Feasibility, efficacy and cost-effectiveness were demonstrated in the Dutch EASYCare study on multidisciplinary outpatient intervention in frail elderly patients and on occupational therapy in dementia.

In the field of neurodegenerative disorders, new insights were obtained into various aspects of balance and gait disorders in neurodegenerative diseases and new diagnostic tools developed for the differential diagnosis of hypokinetic-rigid syndromes.

In the Royal Academy of Arts and Sciences’ China Exchange programme a two-year randomized controlled trial assessed the caries-inhibiting effect of EC40 varnish and chlorhexine varnish in six-seven-year-old children.

Research on self management of osteoarthritis demonstrated the effectiveness of a programme to promote patients’ ability to manage their own symptoms.

Urinary incontinence is a common health problem in the aging primary care population. Major deviations were found in the treatment part of guideline recommendations, mainly due to the fact that patients often refused treatment.

Asthma and COPD are among the most frequent chronic diseases in the primary care population. A series of longitudinal studies showed that patients’ involvement in work-related activities was positively correlated with quality of life and that patients value the ability to work.

On the basis of PubMed publications between 1995 and 2005 a Top 20 list of European research centres involved in research on asthma and COPD was published. The department of General Practice – the only department not specializing in lung diseases – ranks 15th.

Violence in the family presents a major but by and large hidden health threat in the population. A study in a large number of general practices in the Netherlands
produced unique empirical data of patients’ and general practitioners’ experience.

Societal impact
The societal impact of NCEBP research is reflected not only in the large number of invitations to give keynote lectures at home and abroad, but also in memberships of numerous advisory boards and committees. Many scientists at NCEBP are members of influential Dutch scientific committees such as the Health Council, KNAW, ZonMw, the Dutch Cancer Society, NWO, the Council of Health Research, the Asthma Foundation, the Diabetes Foundation, the Dutch Arthritis Association and the Netherlands Heart Foundation. Scientific staff at NCEBP also contributed to many national and international clinical guidelines and systematic reviews.

The following activities attracted special attention in the media in 2006:
- Studies on the adverse effects of occupational exposure to pesticides on fertility led to recommendations for personal protection of workers in horticulture and further directives of the Health Council on reproductive toxicants.
- Clinical epidemiological research has directly led to the abolition and the use of specific markers in urological practice.
- Innovative descriptive cluster research has solved persistent problems for local authorities raised by anxious citizens with respect to cancer clusters in their villages or neighbourhoods (e.g., the example of Weurt, which attracted local and national media attention).
- At the request of KWF Kankerbestrijding, a report was written with life-table-based risks of cancer for use in education and in web-based reports so that the general public can access these figures.
- The www.familialbladdercancer.org domain has been claimed in order to educate patients and relatives around the world about the risks and screening opportunities for relatives of bladder cancer patients.
- A study on artificial hearts and Left Ventricular Assist Devices as a destination therapy for patients with terminal heart failure was used to advice the Ministry of Health on this subject.
- After intensive lobbying, the reimbursement of IVF in the Netherlands has been adapted based on the result of several studies performed within NCEBP. The first IVF cycle is reimbursed and the number of embryos per transfer is limited to two.
- The department of Geriatrics featured in three documentaries by Kruispunt which were broadcast in September 2006.
- The participation in the WHO Global Alliance of Respiratory Diseases (GARD) emphasized primary care’s role in respiratory health care internationally.
- The NCEBP plays a leading role in European Influenza Surveillance, resulting in participation/keynote lectures at various WHO, US and EU meetings in the area.
- Based on dental caries studies the oral health status of young children has been placed on the political agenda.
- A Centre of expertise in ‘gender and medical education’ has been established.
- Performance indicators, focusing on practice accreditation, public reporting and pay-for-performance, were developed and tested in a number of large-scale studies for general practices.
- In Indonesia and Tanzania, the Centre is involved in major staff development work, building research capacity (conducted through the PRIOR, APRIORI and IMPACT projects).

Future research
In the years ahead, NCEBP anticipates a further increase in the importance of health care methods that are based on the principles of evidence-based practice and the results of applied research. The Centre will play an important role in this process, thanks to the collaboration of researchers who between them cover the whole range of health sciences and health services research.

Determinants of health and disease
Areas for future research include the effects of breast cancer screening on mortality, the efficacy of routine follow-up control examinations of cancer patients and the relationship between nutrition and cancer. Large-scale projects are being conducted on Mendelian inheritance and on the efficacy of new tumour markers for bladder and prostate cancer. New areas include the aetiology of Wilms’ tumours and the effect of exposure to hormonal disruption in early pregnancy.

Another continuing challenge involves further expanding the identification of psychological risk factors in chronic diseases other than rheumatoid arthritis and infertility problems. In addition, E-health cognitive behavioural interventions will be developed and implemented in these groups of patients. Further areas for research include physiological mediating mechanisms in the stress-disease relationship in patients with rheumatoid arthritis, fibromyalgia and psoriasis.

Effective Hospital Care
Areas for future research in Medical Technology Assessment include pseudo-cluster randomisation and the develop-
ment of more powerful designs and methods for the analysis of studies. New studies will be designed e.g. to develop benchmarks for the efficiency of health care organizations and health systems, patient involvement in the choice between prostatectomy and radiotherapy for prostate cancer, health-related quality of life value measurement in Alzheimer’s and the relationship between health-state values derived from patients versus healthy people.

In the management of reproductive disorders, future research will develop a virtual regional hospital for couples with reproductive disorders, using a patient-centred interactive website. In addition, more attention will be paid to development of European guidelines in this field.

Research on ageing will focus on outcome measures, completion of the ongoing ParkNet trial, implementation of the new multidirectional dynamic posturography platform and starting up the ParC trial, a cluster-randomised trial of multidisciplinary care for Parkinson’s disease. New areas include freezing of gait and fall prevention in Parkinson’s disease.

Effective Primary Care and Public Health

The Academic Collaborative Centre Public Health (AMPHI) will start research on diseases that can be prevented with vaccines, focusing on the rejection of vaccination by religious groups and further improvement of the quality of care for hepatitis B and C in particular among marginalized groups.

In 2007 the DIMCA programme on the development of chronic obstructive airways disease will be completed. This will allow an analysis of 10 years of follow-up of subjects with early signs/symptoms. In addition, COPD research will focus on the development of user-friendly spirometry for and the development of a database of spirometry data. New areas include the effectiveness of hypertension treatment in general practice and nephropathy in patients with diabetes. Research in these domains will be combined to address integrated cardiovascular risk management.

Palliative care gained a boost through a grant to study the concept of ‘unbearable suffering’ in patients. Another new aspect will be the field of geriatric rehabilitation.

In close cooperation with TNO Kwaliteit van Leven, a grant was obtained to study under-treatment of restorative dentition among young children.

In the framework of the PRIOR, APRIORI and IMPACT studies, the focus will be on the main poverty-related diseases HIV, tuberculosis and malaria. Fundamental research will be combined with field studies in Tanzania, Indonesia and Mali (www.PRIORnetwork.org).

Quality of Care

Research topics that have high scientific, clinical, and societal relevance include patient safety, life style interventions, performance indicators, integrated care models, chronic disease management, ethical aspects of quality of care, and team/network approaches to quality improvement. Research will focus on a number of clinical domains, including asthma/COPD, diabetes mellitus, cardiovascular disease, mental health problems, and out-of-hours services. Networking with practitioners, policy makers, and other researchers will be systematically enhanced.

Future research at the Research Centre for Allied Health Sciences will include the development of criteria to guide allied health care indication, the development of methods to increase the efficacy and efficiency of allied health care, and the development of intervention methods to increase motor learning processes in patients with motor disorders. A key clinical focus in this research group is neuromuscular disorders, musculoskeletal disorders, and developmental motor disorders.

The Nursing Science Research Centre will focus on patient safety issues and on promoting healthy behaviour and disease adjustment in patient populations.

Nijmegen Centre for Evidence-Based Practice

Postal address
PO Box 9101
6500 HB Nijmegen
The Netherlands

Visiting address
Geert Grooteplein Noord 21
Nijmegen

T: +31 (0)24 361 49 37
F: +31 (0)24 354 01 66
E: info@ncebp.umcn.nl
I: www.ncebp.nl
The NCMLS brings together researchers from several groups at Radboud University Nijmegen Medical Centre and the Faculty of Science. There is particular emphasis on the relationship between fundamental and translational research. All research and education within the NCMLS focuses on the study of molecular life sciences in relation to disease. There are three main research themes.

**Theme 1. Infection, immunity and tissue repair (Prof. G. Adema)**
Infection and autoimmunity (Prof. J. Schalkwijk), Immune regulation (Prof. G. Adema), and Tissue engineering and pathology (Dr A. van Kuppevelt).

The immune system has the dual task of eliminating pathogens and eradicating incipient tumours, while preventing auto-reactive responses harmful to the host. In maintaining this balance, there is a complex interplay between immune and tissue cells and many stimulatory and inhibitory circuits operate simultaneously. Outcomes are further shaped by genetic and environmental factors. Deregulation of this intricate balance is associated with human diseases, ranging from inflammatory and autoimmune disorders to cancer, infection and transplantation disorders.
In each case, prolonged deregulation can initiate a cascade of events, ultimately leading to tissue damage and destruction. Tissue engineering is a relatively new field of research involving the repair or replacement of damaged tissues by implanting ‘smart’ synthetic bio-matrices or stem cells. Immune control is intrinsically involved both in tissue acceptance and in preventing autoimmune attacks on engineered tissues.

A multi-disciplinary approach involving molecular science, mice and patients is taken to discover the molecular basis of immune regulatory circuits. These are crucial to any understanding of immune-related disorders, infectious diseases, tissue pathology and regeneration as well as stem cell behaviour and differentiation.

Theme 2. Metabolism, transport and motion (Prof. B. Wieringa)

Energy and redox metabolism (Prof. B. Wieringa) and membrane transport and intracellular motility (Prof. R. Bindels).

Disease at the molecular level, which is central to the NCMLS, is studied in relationship to a contextual hierarchy of the macromolecular world of cellular organelles, the intact cell, and of organs and tissues in the whole organism.

The study focuses on:

- the intrinsic genetic problems or extrinsic factors that cause cellular energy deprivation, ion and metabolite and water transport failure
- toxic accumulation of intermediates, or ischemia and anoxia caused by cerebro-vascular obstruction due to a range of diseases (including cancer, neuropathy and myopathy, degenerative disorders such as Alzheimer’s and Parkinson, ischemic/anoxic organ failure, exercise intolerance and fatigue or renal tubulopathy and retinopathy)
- conditions such as obesity, type II diabetes and some aspects of ageing that are directly linked to metabolism and molecular transport and motility.

Within this overall theme the NCMLS bundles its studies in two areas: (a) energy and redox metabolism and (b) membrane transport and intracellular motility. There are links between these topics at many levels. Metabolites such as ATP and NAD(P)(H), which are produced in key pathways such as glycolysis and mitochondrial respiratory complexes, are consumed as fuel or needed as co-factors for ion-transport ATPases or drug-transporters and for the acto-myosin.
machinery involved in organelle dynamics and cell movements. Renal disease, cardiomyopathy, brain and muscle disorders have all been shown to be caused by defects in the production or assembly of ATPases, in water channels or in the mitochondrial machinery. Defects in metabolic signalling are often involved.

**Theme 3: Cell growth and differentiation**

(Prof. H. Stunnenberg)

Genetic and epigenetic pathways of disease (Prof. H. Stunnenberg) and Chemical and physical biology (Prof. J. van Hest).

The fate of all cells lies in the fine balance between growth and differentiation. If this balance is disturbed, uncontrolled growth and deregulated cellular development can lead to disease. Understanding the molecular processes that underlie growth and differentiation is pivotal to a basic understanding of the causes of many diseases and malfunctions. Multi-level analysis is used to study the functional blueprint of all cellular decisions. The research is designed to:

- unravel the molecular basis of cell behaviour, which emanates from the genetic and epigenetic code contained in the nucleus, in the context of health and disease (e.g. cancer, developmental disorders, mental handicap, cognitive impairments, neurodegenerative disorders and age-related bone diseases)
- elucidate protein structure and protein-protein interactions within cellular signalling pathways that control cell proliferation and differentiation

---

Prof. C.G. Figdor

Prof. Figdor has been a Full Professor of Cell Biophysics at the University of Twente since 1992, and a Full Professor of Immunology at Radboud University Nijmegen since 1994. From 1984 to 1994 he was a staff member at the Netherlands Cancer Institute. His research focuses on the immune system and its ability to resist cancer. He specializes in the role of dendritic cells in immune responses. In 2006 he received the Spinoza prize from the Netherlands Organisation for Scientific Research (NWO) – the most prestigious science prize in the Netherlands.
exploit the potential of molecular chemistry to modify, design and mimic proteins and their building blocks in order to modulate and analyze their activities and properties in the cellular environment.

Renowned researchers working on this theme are engaged in interdisciplinary work – basic research as well as technology development for subsequent diagnostic and therapeutic approaches and translational research. Examples include microarray-based genomic profiling (ArrayCGH, SNP arrays), expression profiling arrays, whole-genome ChIP-on-chip technology, which is used to study epigenetic profiles and target sites of protein (complexes) such as ER and p53 bound to their chromosomal sites of action, and proteomics platforms (high accuracy and high throughput mass spectrometry). Integration with high-profile bio-informatics groups is an invaluable asset in all of these activities. There are many applications for these experimental approaches and research across the NCMLS benefits from the state-of-the-art technological advances.

**Awards**

Prof. Figdor, (Dept of Tumour Immunology) was awarded the prestigious Spinoza prize by NWO for his excellent contributions in Immunology and Cell Biology.

Dr Hoenderop (Dept of Physiology) received the prestigious Eurly Award from the European Science Foundation for his research project ‘Regulation of the epithelial calcium channel by extracellular calcitropic factors.

Prof. Jan Smeitink (Dept of Paediatrics) received the Princess Beatrix Foundation Jubilee Award for his research on mitochondrial disease.

Prof. Ger Pruijn was appointed to the chair of Biomolecular Chemistry.

Prof. Roland Brock was appointed to the chair of Biochemistry of Integrated Systems.

Dr Mihai Netea (Dept. of Internal Medicine) was appointed a member of The Young Academy at the KNAW.

**Research facilities**

These are grouped in the following categories:

**Animal models**

Animal models are of great importance to molecular life scientists. The available disease-related models include those for arthritis, cancer, kidney disease, tissue engineering, heart transplantation, neural disorders, metabolic disorders, osteoporosis, haematopoiesis, fungal and bacterial septicaemia and malaria (*P. falciparum*). A behavioural testing battery (of mice & rats) is also available to investigate the functional consequences of genetic-environmental interactions and for developing transgenic/knock-out models.

**Molecular imaging**

Imaging at the molecular level is an essential tool for life scientists. Electron microscopy and other high-resolution instruments such as Atomic Force Microscopy are available within a state-of-the-art facility. Furthermore, confocal laser scanning microscopy, flow cytometry and other fluorescent microscopic techniques are combined to carry out dynamic

---

**Centre for Molecular and Biomolecular Informatics (CMBI)**

**Prof. G. Vriend**  
[www.cmbi.ru.nl](http://www.cmbi.ru.nl)

The CMBI – the Dutch National Centre for Computational Molecular Sciences, which is affiliated to both the Faculty of Science, Mathematics and Computing Science and the Radboud University Nijmegen Medical Centre. CMBI is an integral part of the NCMLS. The CMBI, which recently moved into the NCMLS building, pursues a rigorous research programme with topics ranging from computational small molecule chemistry to bioinformatics. The centre’s facilities, databases and software packages are made available to external scientists and there is a helpdesk for scientists who use the service facility.

Currently, the CMBI is primarily involved in bioinformatics research and in maintaining a data and software infrastructure to help scientists improve bioinformatics and/or computational small-molecule research. CMBI also organizes courses and tutorials to support these scientists, while maintaining www-based servers which provide scientists access to commonly used bioinformatics and small-molecule databases. The CMBI also facilitates data or expertise-intensive research by allowing scientists to visit and work at the Centre for short periods. Two senior NCMLS members are actively involved in the CMBI: the NCMLS principal investigator in technology development, Prof. G. Vriend (a specialist in macromolecular structure analysis) and principal investigator Prof. M. Huynen (a specialist in comparative genomics).


measurements of fluorescent GFP-based tagged proteins (such as FRET & FRAP) and intracellular metabolites. Magnetic resonance facilities for in vivo NMR and MRI of animals and humans (7 Tesla) are also available.

**Translational research (cellular therapy)**
A GMP facility with clean rooms is used for translational research e.g. immunotherapeutic cell therapy, stem cell transplantation and gene therapy. In 2006 a total of 65 patients were treated in NCMLS translational research studies.

**Genomics and proteomics**
DNA sequencing as well as micro-array technology for gene expression profiling are now basic tools for molecular life scientists. Novel microfluid-based quantitative PCR are available to perform high-throughput quantitative RT-PCR and there is a state-of-the-art proteomics facility at NCMLS with, for example, 2D-electrophoresis, SELDI-TOF and Mass spectrometry (MALDI-TOF, FT-MS, nLC-2D-electrophoresis, SELDI-TOF and Mass facility at NCMLS with, for example, 2D-electrophoresis, SELDI-TOF and Mass spectrometry (MALDI-TOF, FT-MS, nLC-MS/MS).

**Bioinformatics**
See box on Centre for Molecular and Biomolecular Informatics (CMBI).

**Collaboration**
NCMLS researchers continue to collaborate at the local, national and international level. The Institute is allied with the Institute for Molecules and Materials (IMM), providing a solid platform for integrating the Neurosciences and/or Nanoscience with the Molecular Life Sciences. Furthermore, the incorporation of the Centre for Molecular and Biomolecular Informatics (CMBI) strengthens the Institute’s multi-disciplinary approach to solving research problems, including links with the Netherlands Bioinformatics Centre (NBIC). The NCMLS also has associations with the Dutch Programme for Tissue Engineering (DPTE) and the Netherlands Proteomics Centre.

The NCMLS contributes to the Top Institute Pharma (TI Pharma) and has several both academic and industrial partners in this context (see below). In addition, researchers at the Institute contribute to the Center for Translational and Molecular Medicine (www.ctmm.nl). A CTMM taskforce has been set up in Nijmegen in which the NCMLS plays a leading role.

Furthermore, the NCMLS actively contributes to The European Molecular Imaging Platform, which spans the range ‘From Molecule to Man’. This platform shows great potential for the early detection of and monitoring of disease. The platform represents research groups from a number of other institutes and research groups such as FC Donders Centre, Molecules and Materials (IMM), and the Radboud University Nijmegen Medical Centre (UMC St. Radboud). A platform website has been launched (www.molecule2man.eu).

International collaboration is evident in several collaborative projects and publications. Also, an increasing number of international PhD students and postdocs now work in the Institute. In addition, the NCMLS graduate school has established formal contacts with four international institutes in the context of the MSc programme: Molecular Mechanisms of Disease. These are the Mayo Clinic (USA), Faculties of Medicine and the Faculty of Biology at University of Münster (Germany), the Faculty of Science and Engineering at the University of Southern Denmark and the Faculty of Science at the University of Milano-Bicocca Milan (Italy). The possibilities for other formal collaborations with several European institutes are being explored.

**Research results**
A number of research projects were awarded to members of the NCMLS by TI Pharma in 2006:

- Exploitation of Toll-like receptors in Drug Discovery. Internal Medicine, (Netca/Kullberg), Tumour Immunology (Adema), Rheumatology (van den Berg/Joosten/Radstake). **Industrial partners**: ISA, Numico, Organon BioSciences. **Academic partners**: TNO, Kwaliteit van Leven, Universiteit Leiden, Universiteit Maastricht, Universiteit Utrecht

- The GPCR Forum. Novel concepts and tools for established targets. CMBI (Vriend). **Industrial partners**: Organon BioSciences, Solvay. **Academic partners**: Rijksuniversiteit Groningen, Universiteit Leiden, Universiteit Utrecht, Vrije Universiteit Amsterdam

- An integrated strategy for in-silico prediction and clinical evaluation of the cardiotoxicity of drug candidates. CMBI (Vriend). **Industrial partners**: Johnson & Johnson, Pharma-Bio, Research, Solvay. **Academic partners**: Erasmus Universiteit Rotterdam, Rijksuniversiteit Groningen, Universiteit Leiden

- Nuclear receptors as targets for anti-atherosclerotic therapies. Molecular Biology (Stunnenberg). **Industrial partners**: Organon BioSciences. **Academic partners**: Rijksuniversiteit Groningen, Universiteit Leiden, Universiteit van Amsterdam


Bindels and Hoenderop (Dept of Physiology), Human Genetics (Knoers) and the Dutch Cancer Institute (Jalink)
have been awarded a TOP grant by NWO for a research project using a multidimensional approach including positional cloning to identify affected genes; characterization of magnesium transporters at the molecular, cellular and functional level; and studies at a systemic level which combine basic and clinical research to establish a comprehensive cell model for epithelial magnesium transport.

Hoenderop and Bindels (Dept of Physiology) were awarded a TOP grant to define the function of the anti-aging hormone klotho in the regulation of the epithelial calcium channel TRPV5 and the consequences for the calcium balance, thus providing novel insights into the molecular mechanism of aging. The project benefits from important collaborations within the NCMLS including van Kuppevelt and van Delft of the Nijmegen Glycobiology Platform and van den Heuvel and Wevers of the Nijmegen Proteomics Facility. In addition, a new collaboration was established with Bertozzi (University of California, USA), an expert in the field of glycobiology who has developed in vivo detection methods for probing the endogenous glycosylation of proteins.

Fidgör (Dept of Tumour Immunology) was awarded a TOP grant to initiate a nanoscale study of the receptor landscape on the surface of immune cells.

Fidgör (Dept. of Tumour Immunology) received a grant from the EU RTN project IMMUNOMAP for a project entitled ‘Unravelling the nano-landscape of receptors controlling molecular processes of the immune system.’

**Societal impact**

Various members of the NCMLS are funded by national and international patient-oriented non-profit organizations, such as the Kidney Foundation, Dutch Cancer Society, the Diabetic Foundation, and the Rheumatoid Arthritis Foundation. In addition, NCMLS members have advisory functions or are board members within these organizations or at the Royal Netherlands Academy of Arts and Sciences (KNAW). Moreover, clinical groups (Berden, Netea, Punt, de Witte, Knoers, Kullberg, Smeitink), which are in daily interaction with patients or their relatives, inform patient organizations and are involved in public and strategic policy. Several examples of translational research are being developed within the NCMLS and between the NCMLS and its collaborators.

**Future research**

Future lines of research will focus on the following themes:

**Theme 1: Infection, Immunity and Tissue Repair.**
Future research will be take place within the sub-themes (a) Inflammation and infection (Prof. J. Schalkwijk), (b) Immune regulation (Prof. G. Adema) and (c) Tissue engineering and pathology (Prof. T. van Kuppevelt). Some examples of planned projects in these areas are:
- Vaccination of multiple myeloma patients with mature dendritic cells expressing multiple tumour antigens following RNA electroporation.
- Prediction of response to drug therapy in advanced colorectal cancer based on DNA copy number profiles of primary tumours.
- Selection and functional characterization of allo-antigen-specific regulatory T cell subsets for clinical use in organ transplantation (with the Dutch Kidney Foundation).
- The role of interleukin-18 for glucose metabolism and insulin resistance (with the Netea Diabetes Fund)

**Theme 2: Metabolism, transport and motion**
Future research will focus on the sub-themes (a) Energy and redox metabolism (Prof. B. Wieringa) and (b) Membrane transport and intracellular motility (Prof. R. Bindels). Examples of planned projects in these areas:
- Molecular mechanisms of TRPV5 activation by the anti-aging hormone klotho.
- Disturbed water balance by Vasopressin V2 receptor mutations: from bench to bed side (with the Dutch Kidney Foundation).
- Heme oxygenase as a novel target in the prevention of vascular complications in type 2 diabetes (with the Dutch Diabetes Research Foundation).

**Theme 3: Cell growth and differentiation**
Future research will be carried out in the sub-themes (a) Genetic and epigenetic pathways of disease (Prof. H. Stunnenberg) and (b) Chemical and physical biology (Prof. J. van Hest). Examples of planned projects in these areas:
- Unraveling the genetic causes of Walker-Warburg syndrome and other congenital muscular dystrophies.
- Inherited blindness, retinitis pigmentosa and cone-rod dystrophy: identification of molecular causes and genotype-phenotype correlation.
- Identification of genetic risk factors in the aetiology of anomalies belonging to the renal dysplasia spectrum (with the Dutch Kidney Foundation).
- Development of Self Healing pMMA.

The following grants, which were recently awarded to members of the NCMLS, will be the basis for important future research:
- A Vici award for Prof. P. Deen of the Dept. of Tumour Immunology For his project ‘Molecular regulation of the renal water homeostasis’
- A Vidi award for Dr I.J.M. de Vries of the Dept. of Tumour Immunology for...
her project ‘Visualising therapeutic cells on the way to their targets’
• A Veni award for Dr M.J.H. Coenen of the Dept of Human Genetics for her project ‘Why does my medicine not work?’

Nijmegen Centre for Molecular Life Sciences

Postal address
PO Box 9101
6500 HB Nijmegen
The Netherlands

Visiting address
Geert Grooteplein 28
Nijmegen

T: +31 (0)24 3610707
F: +31 (0)24 3610909
E: info@ncmls.nl
I: www.ncmls.nl
The Institute for Water and Wetland Research (IWWR) stimulates interdisciplinary cooperation between scientists engaged in microbiology, animal, plant and environmental sciences. The institute aims to integrate these disciplines and to stimulate joint research in order to enhance our understanding of interactions between plants, animals, and microorganisms, their interactions with the environment, and to find solutions to a variety of problems arising from these interactions.

Research is carried out in three programmes: Integrative Physiology, Gene-Environment Interactions, and Water and Wetland Research, focusing on systems where there is considerable variation in environmental conditions, both in space and in time, and from gene to population level. The specific relationships between the organisms living in these fluctuating environments – as well as the regulatory mechanisms used to maintain homeostasis – are studied under natural and experimental conditions.

Integrative Physiology: stress and adaptation
The central question here is: How do living organisms cope with natural and anthropogenic stressors? Stressors include chemical variables (e.g., ion, light, oxygen, nutrient and toxicant concentrations) as well as physiological, physical and hydrological factors such as feeding, social stress, flooding, currents and substrate composition. Regulatory mechanisms studied include the plasticity of neural, neuro-endocrine and endocrine adaptation and communication systems.

Gene-Environment Interactions
The central themes of this program are: what are the molecular mechanisms of signal transduction between environmental factors and gene and protein expression? How does gene and protein expression change under fluctuating environmental conditions? How do environmental factors influence differentiation of cells? How can we determine the metagenome of ecosystems?
Water and Wetland Research: nutrient and toxicant cycles

What is the impact of human activity on the nutrient cycles in fresh water and marine ecosystems? How can we restore disturbed wetland ecosystems? How do plants, animals and micro-organisms interact in the nutrient cycles of wetland ecosystems? How much do human activities contribute to the emission of toxicants in the environment and how are these distributed over water, soil, air and food chains? How can these influences be modelled? The nutrient cycles of carbon, nitrogen and sulphur and the influence of chemical and physical stressors set the scene for species interactions and adaptation. In turn, nutrient cycles are modified by the characteristics of the component species. This provides a logically coherent field of research in which microbiologists, ecologists, animal, plant and environmental scientists can fruitfully collaborate.

Research facilities

The IWWR has ten departments located in the new Huygens building, all with state-of-the-art laboratories plus central analytical facilities. Equipment used includes:

- A confocal scanning laser microscope for detailed 3D analysis of neuronal and plant structures and microbial communities.
- Transmission and scanning electron microscopy for detailed analysis of the ultrastructure of micro-organisms, animals and plants, including morphometry and immunocytochemistry.
- Extensive molecular biological facilities such as quantitative RT PCR, RNA interference and in situ hybridisation techniques for analysis of single cells till complex ecosystems.
- Patch clamp and video imaging facilities.
- Cell culture facilities.
- Extensive aquaculture facilities for fish and amphibians.
- Phytotron – a unique national research facility for detailed ecological research on sub-soil processes such as root formation under varying oxygen conditions.

STAFF

- Prof. G.C. Angenent (e)
- Prof. C.W.P.M. Blom (p)
- Prof. E. van Donk (e)
- Prof. G. Flik (o)
- Prof. A.G.M. Gerats (o)
- Prof. L.J.L.D. van Griensven (e)
- Prof. J.M. van Groenendaal (o)
- Prof. A.J. Hendriks (o)
- Prof. P.M.J. Herman (e)
- Prof. M.S.M. Jetten (o)
- Prof. J.C.J.M. de Kroon (o)
- Prof. C. Mariani (o)
- Prof. D. van de Meent (e)
- Prof. W. Olijve (o)
- Prof. J.G.M. Roelofs (o)
- Prof. E.W. Roubos (o)
- Prof. H. Siepel (e)
- Prof. S.E. Wendelaar Bonga (p)
- Prof. P.A.T.J. Werry (e)
- Prof. D.L. Ypey (e)
- Prof. E.J.J. van Zoelen (o)
- Prof. G.J. van der Zwaan (o)

Tenured
- Full Professors 5.4 FTE
- Associate Professors 3.2 FTE
- Assistant Professors 7.3 FTE
- Researchers 0.1 FTE

Non-tenured
- Researchers 0.8 FTE
- Post-docs 11.5 FTE
- Doctoral candidates 55.8 FTE

Prof. G.C. Angenent (e)
Prof. C.W.P.M. Blom (p)
Prof. E. van Donk (e)
Prof. G. Flik (o)
Prof. A.G.M. Gerats (o)
Prof. L.J.L.D. van Griensven (e)
Prof. J.M. van Groenendaal (o)
Prof. A.J. Hendriks (o)
Prof. P.M.J. Herman (e)
Prof. M.S.M. Jetten (o)
Prof. J.C.J.M. de Kroon (o)
Prof. C. Mariani (o)
Prof. D. van de Meent (e)
Prof. W. Olijve (o)
Prof. J.G.M. Roelofs (o)
Prof. E.W. Roubos (o)
Prof. H. Siepel (e)
Prof. S.E. Wendelaar Bonga (p)
Prof. P.A.T.J. Werry (e)
Prof. D.L. Ypey (e)
Prof. E.J.J. van Zoelen (o)
Prof. G.J. van der Zwaan (o)


Collaboration
Research is conducted in close collaboration with over one hundred national and international research groups, research institutes, companies and governmental organizations. These include the Centre for Wetland Ecology, the Darwin Center for Biogeology, the Netherlands Centre for River Studies, the Graduate School Experimental Plant Sciences, the Graduate School Functional Ecology, the European Research school for Neuroscience, the Research School for Socio-Economic and Natural Sciences of the Environment, various environmental biotechnology companies, various water boards, the Joint Genome Institute (USA) and Genoscope - the French National Sequencing Center (Evry, France).

Research results
The past year was exceptionally successful for IWWR with four papers in Nature and Science and extensive coverage of these findings on TV, radio and in the newspapers. Further, the institute was strengthened by three new excellent research groups in cell biology and animal sciences. This addition opened up new avenues in research on adaptation and on gene-environment interactions and further enhanced the quality and focus of our research.

Microbes responsible for nitrate dependent anaerobic methane oxidation were discovered by microbiologists and environmental biologists at the IWWR in the ‘Tweentekanaal’ (Raghoebarsing et al. Nature, April 2006). The activity of these microbes can lead to a completely new methane sink with global implications for combating climate change.

The microbiologists at IWWR elucidated the genome of the anammox bacterium *Kuenenia stuttgartiensis* (Strous et al. *Nature*, April 2006). Anammox bacteria play an important role in the global nitrogen cycle.

Further, the microbiologists and electron microscopic specialists at IWWR – in cooperation with geologists at Utrecht and NIOZ – were able to identify two new processes in the marine nitrogen cycle. First it was discovered that marine crenarcheota are responsible for ammonium oxidation in the North Sea (Wuchter et al. *PNAS* 2006). Secondly, it was shown that benthic foraminifera – very small, ancient eukaryotes – are capable of storing nitrate and causing subsequent denitrification, making it possible to survive anoxia for more than a month (Risgaard-Petersen et al *Nature*, August 2006).

Environmental scientists at IWWR directed their efforts in the field of chemical-toxicological modelling to the development and improvement of models for life cycles analysis, fate and exposure. In collaboration with the RIVM, a new approach to life-cycle analysis in relation to acidification in European forests showed that the impact increased by a factor of 13 when the time horizon was expanded from 20 to 500 years. New statistical techniques were used by environmental scientists in collaboration with mathematicians working at IMAPP (Radboud University Nijmegen) to separate uncertainty and variability in input data. In addition, models for the fate of and exposure to new generations of chemicals with completely new properties, such as polar substances and nano-particles, are being developed in cooperation with the RIVM. Further, environmental scientists at the Institute received the Award ‘Groynes of the future’ for an innovative design of river groynes in cooperation with Royal Haskoning, Nijmegen.

The plant cell biologists at the institute continued to work on two main research tracks. The first of these is hormone signal transduction in tomato fruit development (EU grant). This project has resulted in the conclusion that interaction between the hormones ABA and GA is antagonistic to fruit development. In the second line, new research was started on *S. dulcamara*, which grows in wetlands and shows great potential for adaptation to biotic and abiotic stress factors. Recently, it was possible to identify and characterize at the molecular level the fact that *S. dulcamara* plants are resistant or sensitive to late blight (an infection caused by *Phytophthora infestans*).

Using an ecogenomics and bioinformatics approach, the aquatic ecologists at the Institute were able to show that changes in the dispersal infrastructure within Dutch freshwater ecosystems were just as important in explaining the alarming loss of plant biodiversity as the usual explanation of habitat deterioration. Further, several wetland species such as ducks and fish were used as vectors, showing remarkable contrasts in otherwise apparently similar river systems. Recent results on meiofauna analysis indicated that there is more and more evidence that the much debated process of sympatric speciation indeed reduces the speed of biodiversity loss.
Studies on tropical coast areas using stable isotope and micro-tags resulted in new evidence for the importance of mangroves and sea-grass fields as nurseries for larval and juvenile fish by providing high food density and shelter during these vulnerable life stages. Studies carried out by the Institute’s animal ecophysiologists on dramatic changes in the ecosystem of the River Rhine, in particular after the Danube-Rhine connection was opened, focused on recent invasions of macro-invertebrates from the east and their competition with local communities.

Animal physiologists at IWWR intensified their research on the two main adaptation control centres of vertebrates: the hypothalamo-hypophyseal axis and the Edinger-Westphal nucleus (EW). In the frog, *Xenopus*, new neuropeptides were found, which control the plasticity of neural and endocrine systems. Working together with the Department of Experimental Physics (IMM) a surface-enhanced Raman spectroscopy method was used to monitor high-voltage activated Ca2+ channels of the L-type channels which appear to be essential to the signal transduction pathway concerned. The EW of male suicide victims contains eight times more urocortin1 mRNA than in female victims or in healthy individuals. This suggests that urocortin plays an important role in stress adaptation. Further, EW neurons were shown to contain the feeding-related peptide CART (cocaine and amphetamine-regulated transcript) and receptor for the obesity factor (leptin), indicating that the EW plays a central role in regulating feeding during stress.
Plant Ecologists at IWWR study adaptations of plants and their mechanistic regulation from an ecological and evolutionary point of view, with special emphasis on the costs and benefits and ultimately the consequences for fitness of the traits involved. Their studies on root plasticity under patchy nutrient and water conditions have revealed that plant roots have a tremendous plasticity that enables them to effectively capture the underground resources, irrespective of the spatio-temporal pattern by which the resources are supplied. Experiments in the new large Phytotron facility were used to investigate the benefits and costs on an appropriate time scale for the perennial species involved. Comparative studies with white clover genotypes on morphological characteristics and herbivore and pathogen defence have revealed important differences in driving the micro-evolution of the white clover population.

Cell biologists at the Institute made a mutant EGF which binds all three ErbB receptors. Moreover they identified specific residues in EGF-like growth factors that prevent binding to other ErbB receptors. Further EGF-like growth factors were designed that have great potential as drugs for the treatment of neural and cardiac disorders. These are currently being investigated, together with Organon BV (Oss).

Polypeptide growth factors studied by the cell biologists at IWWR play a central role in controlling the proliferation of mammalian cells. Synthetic EGF factors have been designed that have great potential as drugs for treatment of neural and cardiac disorders. These are currently being investigated, together with Organon BV (Oss).

Research by animal scientists at the Institute has considerable potential for the development of stress parameters for aquatic organisms. This knowledge has been disseminated within the EU research programme and there is extensive cooperation in this area with aquaculture companies in Eastern Europe.

In 2006 collaboration with KeyGene was further intensified by both plant scientists and microbiologists at the IWWR. Furthermore, the Institute acquired three new research projects within the DARWIN Center for Biogeology, which seeks active collaboration with Dutch industries. The IWWR and Faculty of Science renewed and extended the Center for Wetland Ecology (CWE) for a further period of five years. The CWE was also actively engaged in cooperation with Dutch consultant engineering companies to improve the management of wetlands in general, with respect to water quality, sediment quality, hydrological regimes, and ecological and socio-economical development.

The Institute’s experimental plant ecologists, environmental scientists and microbiologists have extended their collaboration with Chinese scientists in research on increasing the efficiency of water use in crops in the arid provinces of China, river management and removing nitrogen from water.

A new symbiosis between endophytic methane oxidizing bacteria and sphagnum mosses has had a significant impact on restoring peatlands. Worldwide, the area of peat bogs has been drastically reduced by human activities such as peat extraction, agriculture and forestry. The new microbial sink for methane in nitrate-loaded fresh water ecosystems will require adaptation of current climate change models.

Expertise on the biology of plant reproductive organs at the Institute was much appreciated by three Dutch Biotech companies (ProteoNic, Nunhems Zaden and Goldsmith Seeds), who intensified their collaboration to solve various propagation problems.

The discovery of anammox bacteria in the oxygen minimum zone of the oceans had great impact on current models of the global nitrogen and carbon cycles used by oceanographers. This discovery was the basis for further expeditions to verify the observation and generate data for input to upgraded oceanographic models. Furthermore, two new waste water treatment plants...
based on the anammox concept were built to remove ammonia from industrial waste streams more cost effectively. An anammox reactor in the wastewater treatment plant of the city Rotterdam reached full capacity in 2006.

Studies by animal ecologists and ecophysiologists at the IWWR provided tools for landscape restoration and nature development projects. One of these is nature evaluation and development in the Rotterdam ecoport. In biofouling research, cooperation with KEMA Power Generation and Sustainsibles in Arnhem was further intensified. Studies on biological invasions are continuing, in cooperation with RIZA, Lelystad.

Staff members at the IWWR were invited to give keynote lectures at numerous national and international conferences and were asked to participate in international evaluation panels.

Future research
In 2007 the institute will strengthen its research on gene-environment interactions and ecogenomics. An ecogenomics workshop in Soeterbeek in the Netherlands and the elucidation of the anammox genome stimulated new initiatives and grant proposals in this programme in collaboration with other universities and industries.

Within the DARWIN Center and the CWE consortium, research groups at the IWWR will continue to investigate the effects of climate change on nutrient and carbon limitation in oligotrophic wetlands. Special emphasis will be placed on the functioning and restoration of wetlands, including the role of micro-organisms on carbon, sulphur, iron and nitrogen cycles. The microbial production of the noxious greenhouse gas nitrous oxide in heavily nitrogen loaded wetlands and riparian soils is one of the research topics. These and other studies will provide experimental input for the development of models for ecological risk assessment in river, wetland and estuarine ecosystems. Future plans include a study on biotic and a-biotic stress factors in plant biology and how plants adapt to their natural environment. Genetic diversity and physiological adaptations to different environmental conditions (temperature and water, or pathogen attack) in plants of the genus Solanum will be also studied in 2007.

In 2007, animal scientists and cell biologists at the IWWR will perform research on the basal mechanisms of adaptation in growth factors and endocrine systems of animals and man in collaboration with Organon Biosciences (Oss). The role of the EW nucleus in the epigenesis of chronic neuropathic pain, feeding disorders, depression and suicidal behaviour will be studied. Together with the FC Donders Centre for Brain Imaging, the role of the EW nucleus will be investigated with respect to adaptation to stressors during a war situation (Dutch soldiers in Afghanistan). Research on the role of CRF and urocortin will be intensified by participating in an European network KEP application.

In 2007, IWWR experimental plant ecologists and environmental biologists will start to use the new Nijmegen Phytotron for advanced studies of underground processes under outdoor conditions. This will combine observations of detailed responses of the roots with whole plant responses in realistic settings. Environmental scientists at IWWR will continue a study on the impact of pollution and reconstruction – including changes in land use – on plant, animal and human populations, especially in river and estuarine systems.

Microbiologists at the IWWR will continue to investigate the role of anaerobic ammonium oxidation in marine waters and sediments. The role of aerobic and anaerobic ammonium-oxidizing micro-organisms in past and present oceanic nitrogen cycles will be studied using unique ladderane lipids as biomarkers and proxies, together with the NIOZ and Utrecht University. The genome of the marine anammox bacteria will be sequenced, and using new technologies in collaboration with KeyGene (Wageningen). Furthermore, the fate of methane in various wetland ecosystems will be assessed using stable isotopes as well as molecular and environmental genomic methods.

In 2007, animal and environmental scientists at IWWR will continue to investigate the ecology of rivers with an emphasis on the effects of invasive species of fish and invertebrates on animal communities and ecosystems in large rivers and mangrove estuaries. In several international projects the influence of the river on seagrass beds will be evaluated using a four-scale approach: plant, community, landscape and economic value. Restoration of seagrass beds will also be a topic in the study of the Wadden Sea, where interaction with mussel beds will be included.

In 2007 over 70 research projects will be continued or initiated. These include:

- 30 NWO-ALW, STW, and DARWIN-ALW projects (together with a number of ecological restoration projects for the Dutch Ministry of Agriculture, Nature and Food Quality)
- several projects on developing indicators for comparative environmental risk assessment, (financed by the Dutch Ministry of Housing, Spatial Planning and the Environment)
- a number of EU and industrial projects
Institute for Water and Wetland Research

Postal address
Toernooiveld 1
6525 ED Nijmegen
The Netherlands

Visiting address
Huygens Building Room HG02.406
Toernooiveld 1
Nijmegen

T: +31 (0)24 365 34 30
F: +31 (0)24 365 28 30
E: m.martens@science.ru.nl
   m.jetten@science.ru.nl
I: www.iwwr.science.ru.nl
Complexity is embraced in a broad perspective: large organic and bio-organic structures, nano-sized materials and molecular assemblies, but also detailed study of ultra-fast processes in small structures and molecules, and rigorous theoretical description of materials and molecular interactions.

The 19 groups within the IMM possess all the expertise needed to explore the two main research areas: bio-inspired systems and nano/mesoscopic structures. This coordinated effort includes both experimental and theoretical physics and chemistry, as well as state-of-the-art skills in analytical and synthetic techniques. The IMM aims to position itself as one of the top institutes in Europe in this field of science.

The design and synthesis of individual molecules, the controlled growth of materials, and the creation of complex molecular architectures from these molecules is extremely challenging. The problems of measuring molecular constructs individually, determining their precise properties, and linking them to the external environment so that functional devices can be constructed present even greater challenges, requiring a high level of experimental and theoretical skills in physical and chemical research.
In line with the need for this expertise, the IMM maintains and develops excellent facilities such as the High Field Magnet Lab, the Nuclear Magnetic Resonance (NMR) laboratory and the NanoLab Nijmegen, all of which meet or exceed international standards.

The institute offers its junior researchers an extensive training programme, organizing symposia, lectures and meetings on a wide variety of topical subjects.

Research facilities
The IMM houses a number of national and international research facilities. These include:
- The High Field Magnet Laboratory (HFML). Continuous magnetic fields of 33 Tesla and pulsed fields up to 60 Tesla are available for research in combination with low temperature and full spectroscopy equipment.
- The NMR Large-Scale Facility, which has 10 NMR instruments including 600-MHz and 800-MHz machines for high resolution liquid and solid state NMR.
- A Scanning Probe Laboratory, in which molecules and materials can be investigated and manipulated at nanometre and sub-nanometre scales, using a broad range of STM and AFM techniques.
- Laser Laboratories, in which high-resolution spectroscopy is carried out on molecules and materials using ultra-short timescales.
- A Velocity Map Imaging Laboratory for the study of unimolecular and bimolecular dynamical processes with complete quantum state characterization.
- The European Life Science Trace Gas Exchange Facility for the detection of very small amounts of gas in the Life Sciences and atmospheric applications.
- A Thin Film Growth Laboratory, where materials and thin films can be grown with atomic precision.
- The FOM Centre for Computational Materials Sciences, which uses computational methods to assist in the understanding and design of materials.
- NanoLab Nijmegen, a facility that is dedicated to innovation and making new developments in Nanoscience and Nanotechnology available to small and medium-sized enterprises.
- Spin-off companies such as Spinnovation, NovioMetrix and VICIM, which were specifically set up to give industrial partners access to scientific research facilities.


Dissertations: 22
Scientific publications: 261
Professional publications: 4
Patents: 7
In addition, the institute has state-of-the-art facilities for carrying out advanced synthesis and analyses, including instruments for synthesis under extremely high pressure, equipment for combinatorial synthesis, a peptide synthesis laboratory, MALDI-TOF mass spectrometers and mass-spectrometer combinations, and high-pressure liquid chromatography facilities as well as X-ray diffractometers. There is also unique apparatus for combinatorial synthesis under extremely high pressure (15,000 bar).

The Institute for Molecules and Materials was recently received a significant grant to develop a brand new spectroscopy facility, which will be the first step towards establishing an international techno-campus (see inset). The facility should be operational in 2011.

**Collaboration**

The IMM has a formal research collaboration with the KU Leuven, Belgium in the field of single molecule spectroscopy (the group led by Profs. J. Hofkens and F.C. de Schryver, Department of Chemistry, section Molecular and Nanomaterials). This collaboration involves the exchange of PhD students and post-docs and the use of special laser equipment at the two locations, leading to successful joint publications.

A similar relationship exists with the University of Barcelona (Department of Organic Chemistry) in the field of supramolecular chemistry and organic synthesis. Several students from Barcelona have carried out part of their research training at the IMM and the same holds for students in Nijmegen who went to Barcelona for a research internship.

The section Molecular and Biophysics collaborates with the Institut fur Physikalische Chemie of the Heinrich Heine University in Düsseldorf, which has led to six joint publications in high-impact journals. There are also strong links between the IMM and the Fritz Haber Institute of the Max Planck Society in Berlin, Germany (Director: Prof. Gerard Meijer), which resulted in a very important paper in Science in 2006, and with the Fraunhofer Institut fur Mikroelektronische Schaltungen, Duisburg, which led to two patents being filed within the joint project ‘Processes on a chip’.

There is also strong collaboration between the IMM and the Ioffe Institute in St. Petersburg, Russia. This includes joint projects involving PhD students from both institutes that have led to a number of high-ranked publications, including two articles in Nature. Collaboration with the Jozef Stefan Institute in Ljubljana, Slovenia led to a patent on Liquid Crystal Displays being filed.

Many of the groups in the IMM participate in EC projects with European partners, which strengthens research contacts and enhances the training of PhD students and post-docs. Five IMM faculty members (Profs. A. Fasolino, R. de Groot, R. Nolte, L. Meerts and F. Rutjes) hold part-time professorships at other universities in the Netherlands.
The decision taken by physicists and chemists at the University to form a single institute in 2005 has produced a great deal of synergy. Scientists are venturing into uncharted waters with often unexpected, at times even surprising, results.

In the field of small molecules exciting new results have been reported and related to dissociation and collision processes. Prof. Van der Zande and colleagues isolated the absorption originating from the collision of oxygen molecules, a process that frequently occurs in our atmosphere. In a fruitful collaboration with the Fritz Haber Institute in Berlin, the group led by Prof. Van der Avoird reported in Science on velocity-controlled collisions of Xenon with the OH molecule, providing the best possible theoretical predictions for the energy-dependent cross sections. Prof. Ter Meulen’s group found new ways to coat steel with diamond, which could for instance be useful in the production of steel tools with higher performance and an extended lifetime. Finally, Prof. Parker published results relating to the role that the photochemical dissociation of OH and SH molecules plays in astrophysical events.

The design and synthesis of larger, more complex molecules and supramolecular complexes continue to yield fascinating results with the potential for useful applications. In the group led by Prof. Rutjes, sulfation techniques were optimized to

---

**Prof. R.J.M. Nolte**

Prof. Nolte held the position of Associate Professor at the University of Utrecht from 1979 to 1987. Since 1987 he has been a Full Professor of Organic Chemistry at Radboud University Nijmegen. He is also an Adjunct Professor of Supramolecular Chemistry at the Technical University of Eindhoven. In 2003 he was elected to the Royal Netherlands Academy of Arts and Sciences and appointed Science Professor. Prof. Nolte is also a member of the Royal Belgian Academy of Science, a member of the Netherlands Science Academy, fellow of the Royal Society of Chemistry (UK), a fellow of the Japanese Society for the Promotion of Science and a Knight in the Order of the Netherlands Lion. In 2006 he won the Izatt-Christensen Award for Excellence in Macrocyclic Chemistry.
create a synthetic tool that is currently being explored for application in the synthesis of natural products and biologically active compounds. Prof. Nolte’s team – in a joint effort with four other IMM research groups – reported on spontaneously formed patterned surfaces by self-assembly and dewetting (Science). His group members designed and synthesized a porphyrin trimer, which is encoded to self-assemble into long columnar stacks, as a result of hydrogen bonding and \(\pi-\pi\) stacking interactions. Prof. Rowan and co-workers investigated a processive enzyme mimic based on a toroidal catalyst, which is able to convert the alkene moieties of polybutadiene to epoxides inside its cavity by first threading onto the polymer and then sliding along it while performing the epoxidation. And in the group led by Prof. Van Hest controlling the hydrophobic-hydrophilic balance made it possible to direct the assembly process of a peptide. Such control provides the researchers with a tool for further manipulating the self-assembled structures that are formed.

Using powerful NMR methodology, the groups led by Prof. Kentgens, Prof. Wijmenga and Dr Vuister made significant progress in their understanding of biomolecules and materials. A major breakthrough was a publication on the structure and mechanism of the calcium ion pump in the framework of the research line ‘Regulation and modulation of ion transport across membranes in neuronal and muscle cells’ (Molecular Cell). Also, the nature and function of riboswitches – recently discovered regulatory RNAs that control gene expression by binding small biomolecules – are promising drug targets. Furthermore, the ability to determine local bond lengths, such as the hydrogen bond length in \(\text{OH}\)-groups in solid-state samples has opened exciting new possibilities for studying the structure of materials that control interactions in biological, biomimicking and supramolecular materials. Finally, members of group led by Prof. Pruijn established a novel subtractive selection strategy that enables the identification of targets that are uniquely or predominantly present in one of two complex protein mixtures.

In the materials research programme, the group led by Prof. Katsnelson presented theoretical results on chiral tunnelling and the so-called Klein paradox in graphene. In a one-atom-thick layer of carbon, electrons behave as ultrarelativistic particles and are accurately described by the Dirac theory. The Klein paradox can be employed to improve the characteristics of graphene-based transistors. Prof. De Groot and colleagues determined the different phases of the basic state of the element Boron by performing a series of computational experiments to investigate this element. Prof. Buydens’ group developed network models for solving classification problems, yielding accurate prediction models. Elaborating on the subject of prediction, Prof. Vlieg’s group produced a novel tool for crystal morphology prediction. An automated procedure was developed for finding the right ‘molecular’ configurations in a crystal structure. And in the search for high-power, high-frequency operations in radar and mobile phone base stations, Prof. Larsen and Dr Hageman advanced the development of GaN-based high electron mobility transistors.

Another exciting development was the demonstration of controlled magnetization reversal by the group led by Prof. Rasing. A single femtosecond circularly polarized laser pulse controls the orientation of the spin in the ferromagnetic alloy GdFeCo. Demonstration of ultra-fast, all-optical magnetization reversal may lead to a new generation of ultra-fast magnetic recording devices. Prof. Maan and colleagues used the newly built pulsed field installation at the High Magnetic Field Laboratory to establish the measurement of low-temperature (4.2 K) luminescence at 52 Tesla of a narrow GaAs quantum well. And the group led by Prof. Speller explored the possibility of realizing a purely organic magnetic surface layer based on radical assemblies and managed to do so with the free radical galvinoxyl.

**Societal impact**

One of the aims of the IMM is to valorize research results. The formation of spin-off companies and patent filing is stimulated at all levels. Life science processes and material applications inspire much of the research and most groups have extensive collaborations with industrial partners. The IMM has formal cooperative arrangements with major companies in the Netherlands such as DSM, Philips, Organon, Solvay, Unilever and Akzo Nobel.

One important initiative is the ‘Innovation Lab’, in which enterprising researchers commercialize innovative research results. They have access to technical and scientific support as well as business training and coaching. In the new Huygens science building a completely furnished lab space has been created for this purpose. Financial support for the Innovation Lab comes from the university and NWO and the scientific entrepreneurs receive help in attracting start-up finance.

In 2006 the IMM opened a state-of-the-art NanoLab. Its primary goal is to facilitate knowledge transfer between the university and industry, targeting mainly small and medium-sized enterprises. They can make use of a training unit as well as five research units that focus on biomedicine, nano-electronics, nano-chemistry, nano-optics and nano-materials. This wide range of application areas is possible thanks to

---

**Institute for Molecules and Materials**

In 2006 the IMM opened a state-of-the-art NanoLab. Its primary goal is to facilitate knowledge transfer between the university and industry, targeting mainly small and medium-sized enterprises. They can make use of a training unit as well as five research units that focus on biomedicine, nano-electronics, nano-chemistry, nano-optics and nano-materials. This wide range of application areas is possible thanks to
the availability of a variety of Scanning Tunnelling (STM) and Atomic Force Microscopes (AFM) as well as other techniques. Most significant is the embedding of the NanoLab within the IMM, with its High Field Magnet Laboratory, its NMR facility and cutting-edge experimental and spectroscopic expertise.

Furthermore, the Institute for Molecules and Materials collaborates closely with the Nijmegen Centre for Molecular Life Sciences in order to develop novel tailor-made molecular and (bio)macromolecular systems for monitoring and addressing personal health issues. This includes real-time NMR and scanning probe imaging of identified species, targeted drug-delivery systems, and diagnostics on a nanometre scale with the development of molecular sensors and markers. In addition, an IMM-developed initiative specifically aimed at innovation is the ‘process on a chip’ programme, which is fueling progress in sustainable chemistry. Also, non-invasive diagnostic tools are being developed such as “the breath test”, which allows researchers to analyze the trace gas constituents of human breath for diagnostic purposes. These successful examples reflect a wider trend in nanotechnology, i.e. to find solutions for more complex bio-inspired problems.

Another important line of research within the institute that has a clear significance for society is the study of materials science. Combined experimental and theoretical efforts to investigate and manipulate the properties of materials lead to an advanced understanding of novel systems which can be directly linked to applications in the semiconductor industry and in electronics. The manipulation of spins with ultra-fast light or extremely high magnetic fields, which contributes to the issue of enhancing data storage on hard drives, is but one example. The development of thin film solar cells with the greatest possible efficiency is another.

IMM scientists participate in various national and international advisory boards, committees and journal editorial boards (including prestigious journals such as Science). Many leading IMM scientists are also actively involved in public debates on a variety of topics. One example that attracted substantial media attention was a performance in the context of ‘The battle of the universities’, where a group of dancers artistically interpreted the phenomenon of atom lithography.

**Future research**

Future research within the Institute for Molecules and Materials is structured under broad research themes in which physics and chemistry merge. These can be summed up by asking four questions:

1) What is the physics behind self-assembly of complex molecules?
2) What are the fundamental properties of bio-inspired systems?
3) How can we understand exciting, yet unresolved, issues relating to strongly correlated electron systems and nano-sized materials?
4) How can we coherently control ultra-fast processes in small structures and molecules?

This institute receives substantial external funding. Prestigious grants awarded in 2006 included a VICI grant, a VIDI grant and a VENI grant, as well as three ECHO, one TOP, and several prestigious ‘FOM Projectruimte’ grants.

The most important opportunity for the next decade has been created by a grant of €26 million from a national investment in large infrastructures (NWO-BIG). This grant will enable the IMM to set up an Advanced Spectroscopy Centre (see insert on page 127).

€4 million was secured from a separate NWO-BIG programme for a new solid-state 850 MHz NMR machine. This important injection of funds will stimulate the advanced materials science programme in the institute and help attract scientific talent and, in combination with state-of-the-art NMR equipment, the new free electron laser facility and the 4.5 T high magnetic fields, will lead to a wealth of new possibilities and ideas that will become feasible in the next ten years.

In close collaboration with the Nijmegen Centre for Molecular Life Sciences (NCMLS/ UMC) the institute has formed a Chemical Biology cluster, with the purpose of further exploiting knowledge in organic chemistry and applying it to biochemical, biological and medical issues. Working closely together with NCMLS research groups and pharmaceutical partners, this promising research line will enhance our understanding of complex molecules, making it possible to synthesize molecules with specific physical, chemical and pharmaceutical properties.

Increasingly groups within the IMM are collaborating across the rapidly disappearing boundaries between chemistry, physics, and biology, and those between theoretical and experimental science. It is becoming possible, for instance, to do calculations on large bio-structures and to perform high-resolution spectroscopic experiments on floppy molecules in the liquid phase. The future of science is in interdisciplinary research and the IMM is fully equipped and ready to tackle the challenges that lie ahead.
Institute for Molecules and Materials

Postal address
P.O. Box 9010
6500 GL Nijmegen
The Netherlands

Visiting address
Toernooiveld 1
6525 ED Nijmegen
The Netherlands

T: +31 (0)24 365 21 21
F: +31 (0)24 365 21 90
E: deniz@science.ru.nl
   r.nolte@science.ru.nl
I: www.ru.nl/imm
Institute for Mathematics, Astrophysics and Particle Physics

Director: Prof. S.J. de Jong

The Institute for Mathematics, Astrophysics and Particle Physics carries out fundamental research in mathematics, high-energy physics and high-energy astrophysics, with an emphasis on interdisciplinary topics. It is also engaged in outreach.

Mathematics
This subject centres on three interdisciplinary themes: symbolic computing, financial mathematics, and mathematical physics. There are well-established links between these themes and computer science, economics and physics, respectively. The traditional areas Algebra, Analysis, Geometry and Stochastics relate closely to these themes.

Astrophysics
The department concentrates on two areas of research in high-energy astrophysics: astroparticle physics and compact objects. The main goals are to unravel the sources of the highest-energy particles in the universe, the physics of the surroundings of black holes, neutron stars and white dwarfs, and the evolution of white dwarf binaries as important sources of gravitational waves. The approach is observational as well as theoretical.

High-energy Physics
This group carries out and analyses experiments in the field of elementary particle physics at the smallest distance and highest mass scales that are attainable. This entails both accelerator-based and cosmic ray detection experiments and the theoretical foundation of elementary particle interactions. In particular the focus is on electroweak symmetry breaking and the Higgs
boson, thus gaining more insight into the structure of vacuum.

**Awards**
Stefan Maubach received an NWO Veni award.

**Research facilities**
Experimental groups make use of leading national and international astronomical observatories (ESO, La Palma, LOFAR, LOPES, WSRT and Kascade-Grande) and high-energy particle accelerators (LEP, LHC and Tevatron). The Institute itself houses two optical telescopes and a radio interferometer, which are used for core educational activities and to encourage public participation. The Institute has ‘computing farms’ for both astrophysics and particle physics. It also makes use of the faculty’s mechanical and electronics’ workshops and the facilities of the Amsterdam-based National Institute for Nuclear and High-Energy Physics (NIKHEF).

**Collaboration**
Mathematicians in Nijmegen are involved in two NWO mathematics clusters: DIAMANT (symbolic computing, jointly with ICIS) and GQT (Geometry and Quantum Theory, with a leading contribution from mathematical physicists at the IMAPP).

The elementary particle physics group is a partner in the NIKHEF and is associated with the European Laboratory for Particle Physics (CERN in Switzerland) and the Fermi National Accelerator Laboratory (FNAL in the USA). Intensive collaborations of the particle physics theory group exist with KEK in Japan and Demokritos in Greece.

Astronomical research is carried out in association with ASTRON and ESA. Nijmegen will become the expertise centre for cosmic ray detection with LOFAR, one of four key programmes. The department is a member of the LOPES consortium, which has radio antennas installed at Kascade-Grande, while particle physicists and astronomers of IMAPP are jointly members of the Pierre Auger Observatory Collaboration in Argentina.

The Institute participates in the following Dutch national research schools: MRI (mathematics), OSAF (elementary particles), LOTN (theoretical physics) and NOVA (astronomy). All researchers


Dissertations: 4
Scientific publications: 182
Professional publications: 28
in the institute are member of one or other of these research schools, which are recognized by the Royal Netherlands Academy of Arts and Sciences.

**Research results**

In mathematical physics, Profs. Hochs and Landsman brought the construction of Yang-Mills theory, a benchmark for contemporary mathematics, a bit closer by proving an extension of the Guillemin-Sternberg conjecture to all semi-simple Lie groups with discrete spectrum, such as the physically relevant De Sitter group SO(4,1).

New results were derived in the areas of the relationship between entanglement and the Bell inequalities, the application of free stochastics to the interaction between an atom and a chaotic field, and the application of quantum operators in computer simulations of decay and entanglement.

New research was started in association with the Institute for Computing and Information Sciences on the connection between quantum logic, locales, quantales and topos theory.

In the computer algebra group, a study in intuitionistic reverse mathematics produced a characterization of finite subsets of the natural numbers and compact subsets of R, using logic schemes. An algebraic proof was found to show the equivalence of the Jacobi and Dixmier conjectures. A large class of polynomial mappings with unit Jacobian in dimension three was described. An algorithm was found to determine whether a one-dimensional sub-ring is the kernel of a derivation of a polynomial mapping, and if so, to identify an algorithm for such a derivation. Methods to develop real numbers into infinite series were found for the entropy of Kählerian manifolds. These lead, among many other things, to a satisfactory equation of state for baryon-baryon interactions which has been constructed as part of an STW project, scientific software on new statistical methods for auditing has been validated. Asymptotic behaviour of parameters in discrete Heath-Jarrow-Morton interest models, in which interests are generated with random fields, has been studied.

The main astroparticle physics effort focused on the exploitation of LOPES data in which a novel technique was the use of ultra-short burst (nanoseconds) of radio waves that are emitted by particles as their trajectories are deflected in the Earth’s magnetic field. Regular detection of these nano-bursts allows statistical tests on the dependence of the radio strength on the energy of cosmic rays. The first antennae became operational in 2006 and a start was made to search the Auger data for variable cosmic ray sources and to apply radio detection in Auger.

Compact binary stars research is boosted by the fact that several new surveys (UVEX, IPHAS, VPHAS+, EGAPS, GBS) are now online and data from Chandra, XMM-Newton and other X-ray satellites are now available as fully functional pre-series and the full order will be delivered in 2007. ATLAS will be ready to take the data when the LHC starts in the autumn of 2007.

Research on effective actions with non-concave potentials has continued and is expected to render important results on the Higgs mechanism and cosmology. The Nijmegen Extended Soft-Core potentials for baryon-baryon interactions have been published. These lead, among many other things, to a satisfactory equation of state for neutron stars.

New in 2006 was work on an NWO-funded teacher research programme. One of the first results was a Euclidian construction of the Kepler orbits for planets that can be used in high school mathematics.
The textbook on Mixed Hodge Structures by Steenbrink and Peters has been completed and will shortly appear in print. A description of the results obtained with the Magma computer algebra system was published in the book Discovering Mathematics with Magma, Reducing the Abstract to the Concrete, edited by Bosma and Cannon. The textbook on quantum control theory by Maassen and Kümmerer is nearing completion.

**Societal impact**
The Institute has long-term objectives for its fundamental research. Many results will only produce an impact in future decades, but may then have far-reaching consequences, changing the way we view the world.

Prof. de Jong has been a Full Professor of Experimental Physics at Radboud University Nijmegen since 1998. From 1990 to 1998 he served in several functions at CERN in Geneva, Switzerland. He is an expert in the physics of elementary particles. His research focuses on the Higgs mechanism which he studies at the large accelerators in CERN (Geneva) and Fermilab (Chicago). He has particular expertise in semiconducting detectors, ultrafast electronics and innovative analysis techniques.

The Institute plays an important role in national discussions on science and mathematics in secondary education, e.g. supporting the development of the new subjects wiskunde D (advanced mathematics) and Natuur, Leven en Technologie (Nature, Life and Technology. Four staff members teach in the prestigious honours programme at the University. Through the STW project and membership of the Statistical Auditing board of NIVRA-Nijenrode, there is interaction with accountancy firms and many other players in the world of finance. The Institute initiated the Ratio project for mathematics in high schools (www.ratio.kun.nl) and the HiSPARC project building air-shower array telescopes on high-school roofs in Nijmegen and other places (www.hef.kun.nl/nahsa). A number
of secondary school projects (part of the Dutch university entrance examination) have been produced within the context of various initiatives in which the Institute is involved.

The popularising mathematics book *Magische Vierkanten: van Lo-Shu tot Sudoku* (Magical Squares: from Lo-Shu to Sudoku) by Prof. Van den Essen, which was published in 2006, makes current mathematics research accessible to a wider audience in the Netherlands.

On 10 October a high-profile symposium was held on the origin of the universe, featuring some of the most famous scientists in the world, such as Roger Penrose and Gerard ’t Hooft.

**Future research**

A central theme of IMAPP is the origin and evolution of the universe. In astronomy this translates into the study of compact objects, which test the limits of known physics and the study of cosmic rays as a new window on the universe in a multimessenger approach. For the study of cosmic rays, techniques from radio astronomy and elementary particle physics are used and there is full cooperation between astrophysicists at the IMAPP and particle physicists. In elementary particle physics much of the focus is on the structure of vacuum and the associated Higgs mechanism. The mathematical physics department concentrates on the Guillemin-Sternberg conjecture, as a possible mathematical basis for symmetry in quantum theory. Also, rigorous mathematical techniques are applied to typical quantum phenomena. In algebra the focus is on the development of computer algebra with – among other things – applications for solving physical problems, and on the construction of a proof of the Jacobi conjecture. In the foundations of mathematics, the study of intuitionistic reverse mathematics will be continued. Financial mathematics research will concentrate on forward rate models in discrete time, multi-step and optimal sampling schemes and calibration of credit risk model parameters, all with applications in auditing. Research will continue on risk measures in finance, concentration inequalities and unimodal distributions.

With major new equipment becoming available for the astrophysicists and high-energy physicists and two new full professors to be hired in mathematics and one in astroparticle physics, 2007 promises to become an exciting year for IMAPP.

**Institute for Mathematics, Astrophysics and Particle Physics**

*Postal address*
PO Box 9010
6500 GL Nijmegen
The Netherlands

*Visiting address*
Toernooveld 1
Nijmegen

*T: +31 24 3652099*
*F: +31 24 3652191*
*E: secr@hef.ru.nl*
*I: imapp.ru.nl*
The mission of the Institute for Computing and Information Sciences (ICIS) is to improve the fundamentals of software development via formal, mathematically founded theories, methods and tools that support the specification, design, analysis and evaluation of computer-based systems. Research aims include improving the quality of software, with an emphasis on reliability, security, architecture and system alignment. Work at the Institute is inspired by problems encountered in society and in other disciplines. The applicability of the methods and tools is validated by tackling these problems. Research is concentrated within six research groups.

Foundations (F)
To study and develop mathematically oriented models of computing and reasoning, both in their own terms and for providing the mathematical background for other research. Computer Mathematics involves the study of the connections between symbolic computing and mathematical reasoning as well as developing computer systems that support this.

Software technology (ST)
To develop theory, methods and tools for specification, programming (in particular functional and generic programming techniques), static analyses (especially type systems), and dynamic analyses (with a focus on specification and model-based testing) to support designers and developers in building and verifying reliable software.

Nowadays computer systems influence virtually every aspect of our lives. Sometimes these systems appear in an easily recognizable form, as in eCommerce sites such as Amazon, and in pocket calculators, but they are also increasingly hidden inside, for example, television sets, multimedia devices, cell phones, cars and washing machines. This trend is known as ambient computing. However, while computing is becoming increasingly pervasive, there are growing problems with the associated software in terms of security (breaches of information access restrictions or privacy), reliability (the system behaves erratically), safety (use of the system is harmful), trustworthiness (low reliability of system services), efficiency (the system is unable to handle problems of a particular size) and conformity with requirements. The inherent complexity of computer-based artefacts — together with the slow pace of software development, high costs and strong competitive pressures — further complicates the search for solutions.
Information and knowledge systems (IRIS)

To perform fundamental and applied research around the theme of knowledge-intensive systems, i.e. systems that can elicit, structure and process implicitly and explicitly represented knowledge of a problem or domain, drawing on ideas, methods and techniques from information systems and artificial intelligence.

Security of systems (SoS)

To develop theories and formal methods that can be used to analyse and improve security in the digital world. This involves on the one hand investigation of the security and correctness of software systems and on the other hand identity-centric security and privacy, i.e. notions and protocols for managing and protecting digital identity.

Informatics for technical applications (ITA)

To carry out fundamental research on formal methods and tools for the specification, design, analysis and testing of computer systems for technical applications (in particular embedded systems and protocols), and demonstrate and assess the effectiveness of using these methods and tools in industrial software development.

Biophysics

To study the neuronal information processing that takes place in the brain, using both experimental techniques and theoretical approaches. The aim is to understand the functional organization and the adaptive properties of the central nervous system in action and perception. Insight into the natural intelligence of the brain is used for applications in Artificial Intelligence and also for the diagnosis and therapy of neurological diseases.

Collaboration

International cooperation is integral to the work done at ICIS, because developments in computing take place around the globe. Partners include AIST (Amagasaki, Japan), Ministry of Internal Affairs (The Netherlands), ST Microelectronics (France and Belgium), Netherlands Cancer Institute, ASML, Océ Technologies and Philips Research (Netherlands), Makerere University Kampala (Uganda), MIT Computer Science & Artificial Intelligence Laboratory (USA), INRIA-Microsoft Research Lab Paris and ETH Zurich.

Research results

The Foundations group has continued to use computers in order to formalize mathematics within the C-CoRN (Constructive Coq Repository at Nijmegen), focusing on exact real arithmetic. It has developed various web interface mechanisms for proof assistants. Studies of deduction graphs have continued, especially their connection with proof nets, and also of constructive mathematics, especially its use to investigate the computational content of known mathematical results. Dr Wiedijk edited the book ‘The Seventeen Provers of the World’, where the styles and methods of several proof assistants for mathematics are compared, using Pythagoras’ proof of the irrationality of $\sqrt{2}$ as a test case.

The Software Technology group has successfully applied generic programming techniques to abstract programming, to automatic generation and the handling of interactive graphical user interfaces (i-Data) as well as web-enabled applications such as web shops and project administrations, and also to compiler construction. A different line of work focuses on testing – via the group’s own...

Staff

- Prof. H.P. Barendregt (o)
- Prof. J. Bruijning (o)
- Prof. J.H. Geuvers (o)
- Prof. C.C.A.M. Gielen (o)
- Prof. B.P.F. Jacobs (o)
- Prof. H.J. Kappen (p)
- Prof. J.W. Klop (e)
- Prof. C.H.A. Koster (o)
- Prof. A.J. van Opstal (o)
- Prof. M.I. Plasmeijer (o)
- Prof. H.A. Proper (o)
- Prof. D.B.B. Rijswijk (e)
- Prof. F.W. Vaandrager (o)
- Prof. E.R. Verheul (e)
- Prof. M. van Vliet (e)
- Prof. Th.P. van der Weide (o)

Tenured
- Full Professors 5.8 FTE
- Associate Professors 3.1 FTE
- Assistant Professors 6.2 FTE
- Researchers 1.6 FTE

Non-tenured
- Researchers 1.2 FTE
- Post-docs 14.0 FTE
- Doctoral candidates 33.0 FTE
GAST test system for higher order functions – which has also been applied to web pages.

The Information and knowledge systems group applied various economic models for the digital market to information disclosure strategies, and used formal methods and various verification tools to improve a medical guideline for managing diabetes mellitus type 2, indicating a number of shortcomings. New techniques were developed for the compact representation of probability tables in Bayesian networks – based on Boolean functions – in a successful collaboration with clinicians.

The Security of Systems group tested the new Dutch biometric passport and analyzed the protocols involved. As part of ongoing research in electronic voting, the group played an active role in the public debate about electronic voting machines. In the area of software security and correctness, an effort to formally verify an open source Java implementation of SSH revealed serious security flaws, demonstrating the maturity of the group’s program verification methodology that has been developed over the years.

The Informatics for Technical Applications (ITA) group worked successfully on model checking, a technique for automatic exploration of large state spaces. At the QEST’06 conference in Riverside, CA, USA, a new version (4.0) of the tool UPPAAL was presented, a model checker for timed systems. Its focus on speed and usability has made this popular both as a teaching tool and as a tool for tackling serious industrial problems. One of the key new features of UPPAAL 4.0, symmetry reduction, was developed by Martijn Hendriks as part of his PhD research in the ITA group.

The Biophysics group has gained a better understanding of the problem how human subjects can decompose complex sounds from a variety of sources – each with different spectral content and at located different positions in 3-D space – into its original sources. This is of major importance for virtual reality applications and for the development of hearing aids. The group has further developed new algorithms for optimal decision making in machine learning, with new applications in gene-linkage analysis and medical diagnostics. Moreover, it has developed a next step in the problem of stochastic optimal control, which is relevant for applications of optimal control in uncertain real-world applications and for understanding the stochastic mechanisms in neuronal processes.

Societal impact

The institute’s impact is visible in various industrial projects designed to improve the...
quality of software, for instance with the Royal Dutch Navy (testing) and with Océ© and ASML (model checking). The institute takes an active role in the public debate on computer security, including issues such as privacy, open source software, electronic voting, and biometric passports. The group took part in a heated debate on the use of electronic voting machines in the national elections in November 2006, a debate which resulted in a partial return to paper voting and the group carried out an independent recount of the electronic votes cast by Dutch citizens abroad who voted via internet. In medicine, Bayesian techniques developed at ICIS are being used to combine data with background knowledge, for instance to localize sources in the brain, to improve the performance of brain-computer interfacing and for decision support systems in the context of breast cancer screening. New algorithms for adaptive control resulted in two spin-off companies.

The institute collaborates via the joint LaQuSo Laboratory with the Technical University Eindhoven on transferring state-of-the-art technology for software analysis from universities to industry through contract research, and runs CodeYard, an innovative project set up to interest and involve high school students in computer science.

Future research

Many of the innovations within the institute result from external projects, often with multiple partners. A great success for the Institute was Dr Tom Heskes’ project ‘Artificial Intelligence, Full of Chances’, which was recently awarded a Vici grant. Within this project, which combines ideas from Bayesian decision theory, experimental design and machine learning, a probabilistic Artificial Intelligence framework will be developed for adaptive personalization. Other new projects include Workflow Management Systems, MathWiki, brain-computer interfacing, architecture modeling, anonymity and privacy, RFIDs, links between testing, model checking and theorem proving and interpretation of EEG activity in terms of the various sources of activity in the brain.

Institute for Computing and Information Sciences

Postal address
PO Box 9010
6500 GL Nijmegen
The Netherlands

Visiting address
Toernooiveld 1
Nijmegen
T: +31 (0)24 365 22 36
F: +31 (0)24 365 31 37
E: bart.jacobs@cs.ru.nl
I: www.cs.ru.nl

Prof. B.P.F. Jacobs

Bart Jacobs has been a Full Professor since 2002, specializing in software security and accuracy. He is a former fellow of the Royal Netherlands Academy of Arts and Sciences and winner of a prestigious Pioneer grant. He is board member of the national research programme “Sentinels” in computer security and is active in various debates on societal issues relating to the use of ICT. In 2007 he was appointed to the “Korthals Altes” committee, which was set up to redesign the electronic voting process in the Netherlands.

Institute for Computing and Information Sciences

Postal address
PO Box 9010
6500 GL Nijmegen
The Netherlands

Visiting address
Toernooiveld 1
Nijmegen
T: +31 (0)24 365 22 36
F: +31 (0)24 365 31 37
E: bart.jacobs@cs.ru.nl
I: www.cs.ru.nl
In today’s knowledge society, scientific, technological and societal developments are closely interrelated, resulting in the emergence of new technologies such as ICT, genomics and nanotechnology. These developments affect the ways in which we see ourselves in relation to the world around us. Science and technology clearly have a profound influence on society, but the reverse is also true: society significantly shapes the ways in which science and technology evolve. ISIS brings together a group of experts from the natural sciences, social sciences and the philosophy of science. Our mission is to understand, assess and improve the interaction between science, technology and society.

ISIS has defined three overarching research themes and, all three research groups are involved in at least two of these:

- Concepts of Nature
- Knowledge Society
- Sustainability

Starting in 2007, ISIS will organize a series of international conferences devoted to these themes.

**Theme 1: “Concepts of nature”**

It is often claimed that new concepts of nature are emerging, in science as well as in society, transcending the “modern” or “Faustian” will to dominate nature. Nature is now seen as a set of complex, dynamic systems of which we are inevitably a part and with which we must learn to interact in a more intelligent, anticipatory and sustainable way. Such an approach would not only affect our basic cultural attitudes towards nature, but also our scientific research priorities. Is the claim justified? What precisely does it mean? Does it imply that scientific research will lead the way to more sustainable and nature-friendly interactions with nature in the near future?

**Theme 2: “Knowledge society”**

In a knowledge-based society, expert knowledge is both indispensable and
contested. Professional practices are expected to be evidence-based, yet we recognize that the complexity of our world is beyond the grasp of any particular form of expert knowledge. How does scientific expertise influence public and policy debates in our knowledge-based society? The focus is on newly emerging research fields, such as genomics, with its “flagship project”, the Human Genome Project (HGP).

Theme 3: “Sustainability”

It is widely agreed that we need to be aware, not only of the epistemological, but also of the ethical, societal, environmental and economical dimensions of knowledge. Science and technology have been seen by many as causes of a variety of large-scale problems such as environmental pollution. We now understand that we have to rely on new forms of science and technology to develop sustainable interactions with the natural environment. The emergence of new research fields aimed at fostering more sustainable ways of living is thus an important development.

These three themes provide the context for the research agendas of the three ISIS groups:

**Department of Philosophy & Science Studies/CSG**

This group is studying the claim that a paradigm shift is emerging in the way in which research in the molecular life sciences is conducted. The current focus is on genomics. Basically, genomics is about producing information in the form of genetic databases that can be used for research. How is the epistemological profile of research in the molecular life sciences changing? What is the effect on the way we understand nature and ourselves? Does this new information challenge us to redefine ourselves and our moral responsibilities? How are we to communicate new research findings to wider audiences? In the autumn of 2004, the Centre for Society & Genomics (CSG) was launched to improve the understanding of and interaction between genomics and society, both at a national and an international level.

**The Centre for Sustainable Management of Resources (CSMR)**

The CSMR focuses on two topics: Water & Society and Sustainable Regional Development. “Water and Society” addresses issues involved in river management, combining scientific and societal perspectives and starting with the way in which researchers, policy makers, politicians and citizens view this topic. For centuries, the emphasis was on technological mastery of water and river systems. Now, a more ecocentric methodology is emerging. This ecological approach, which is based on river ecosystems, focuses on strategies needed to move towards more sustainable planning and design of river basins, including economic, ecological, societal and spatial aspects. This research is carried out regionally, nationally and internationally (Yangtze, Rhine, Loire).

**MT/MICORD**

The MICORD programme (Managing Innovation, Collaboration and Outsourcing in Research and Development) focuses on patterns of collaboration in three sectors: food, chemicals and equipment manufacturing. These sectors are analyzed in the light of two questions: How can companies organize themselves in order to innovate more radically while they are under pressure to deliver short-term results? How can companies profit from sources of complex knowledge such as universities? In 2006, six PhD projects were set up.
**Facilities**
ISIS has moved into the new premises of the Faculty of Science. The new buildings, with their compact, transparent layout, embody a new philosophy that views scientific research as an interactive and collaborative enterprise rather than as a black box. ISIS occupies the second floor of the North-eastern wing of the new building.

**Collaboration**
ISIS collaborates with more than 70 national and international institutes and organizations:
- At the local level: with the Institute for Water and Wetland Research (IWWR)
- At the regional level: Waalweelde and Freude am Fluss are projects in which various regional societal partners participate
- At the national level: CSG is a national research centre, located at our institute but collaborating with groups and experts at various other universities
- At the international level

**International collaboration**

**Department of Philosophy/CSG**
CSG collaborates with various international partners, notably the ESRC Centre for Economic and Social Aspects of Genomics (CESAGen) at Lancaster and Cardiff in the UK. Together we organize international academic conferences on the societal aspects of genomics annually. Jointly, CESAGen and CSG host the online journal Genomics Society & Policy. We also work together in the EU programme “Institutionalisation of Ethics in Science Policy” (INES), in which CSG was responsible for the work package on medical genetics. CSG also coordinates the European Research Area in Social Aspects of Genomics (ERASAGE).

CSMR
With the Universität Duisburg-Essen and in collaboration with IWWR, ISIS offers a two-year international Master’s program in Transnational Ecosystem-based Water Management (www.twm-master.com). A knowledge consortium on water management between CSMR and the Tsinghua University in China, the Chinese Academy of Sciences and the National Science Foundation in China has been created to stimulate knowledge on “living with water” in China.

**MT/MICORD**
MICORD receives funding from a number of international companies including Akzo Nobel, Philips, Shell and the Dutch Polymer Institute for its research programme.

**Research results**
An international mid-term review committee chaired by Prof. John Dupré was enthusiastic about the achievements of CSG to date: CSG had made an excellent start and has a “bright future”. The management team, Prof. Hub Zwart and Dr Annemiek Nelis, were perceived by the committee to provide strong and energetic leadership. Prof. Zwart’s research led to invitations to give a series of lectures and papers internationally.

CSMR research has produced some important results. A thematic issue of the Journal Hydrobiologia was produced with the department of environmental science. Core themes of this issue, with articles by CSMR researchers, were trends in water management over the last fifty years. The article by Smits et al (2006) became the most cited article of the journal Hydrobiologia of 2006. A further volume was published on restoration and cyclic rejuvenation of floodplains. Irene Dankelman – a council member and senior environmental advisor of WEDO (Women’s Environment and Development Organisation) – was involved in the Champions of the Earth Award, which was presented in Singapore (May 2006).

The MICORD programme began in earnest in 2006 with six newly appointed PhD students and ISIS has been granted extra research time by the Radboud University to strengthen the academic prospects of women.

---


**Vries, R. de (2006). Ethical concepts regarding the genetic engineering of laboratory animals. Medicine, Health Care and Philosophy, 9: 211-225.**

**Dissertations:** 0  
**Scientific publications:** 31  
**Professional publications:** 8
Societal impact

In the context of public communication, CSG hosts the public website watisgenomics.nl and co-organized a three week program on the societal impact of genomics called “Great expectations”. On November 17th 2006, an internet article on the possible relevance of genomics research for childhood obesity (on the Dutch parents’ website Ouders Online) marked the start of the first online event in CSG’s project The DNA Dialogues.

An indication of the societal outreach of the CSMR’s research is the large number of public partners that collaborate in its projects, including government ministries, regional governmental organizations and, internationally, non-governmental organizations in China, Western Europe, Eastern Europe and the EU Region Rhine Waal. We have developed educational programs and material that are used in international communities for training professionals and academics and have initiated research to resolve specific issues raised by different partners. Regional development plans are structured by the Joint Planning Approach, a method of stepwise decision-making that involves all relevant stakeholders.

Future research

The research of the department of philosophy will focus on new concepts of nature, the transformations of knowledge production and the role of experts in public debate. In June 2007 the first international ISIS International Expert Seminar will be organized: “New visions of nature: beyond mastery?” The Netherlands Genomics Initiative has invited the CSG management team to develop a comprehensive plan for societal research and interaction on genomics for the period 2008-2012 (CSG II). This proposal will be assessed by various experts. It would mean that CSG could continue and significantly expand its activities in the near future.

Institute for Science, Innovation and Society

Postal address
PO Box 9010
6500 GL Nijmegen
The Netherlands

Visiting address
Toernooiveld 1
Nijmegen
T: +31 (0)24 365 22 04
F: +31 (0)24 355 34 50
E: h.zwart@science.ru.nl
I: www.isis.science.ru.nl

Prof. H.A.E. Zwart

Prof. Zwart has been a Full Professor of Philosophy of Science at Radboud University Nijmegen since 2000. The focus of his research is on epistemological and ethical issues in the life sciences: biomedicine (1988-1996), research with animals (1996-2003), environmental research (1998-2003) and genomics (2003-now). He was also Coastal Values (1999-2003). Since 2004 Prof. Zwart has been the director of the Centre for Society & Genomics. He is a co-editor of the journal Genomics, Society & Policy and member of the Editorial Boards of the journals Environmental Values and Tailoring Biotechnologies.
Glossary

(e) Extraordinary chair
(o) Ordinary chair
(p) Personal chair
AGIKO Arts/assistent-geneeskundige in opleiding tot klinisch onderzoeker – someone who has a Master’s degree in Medicine, has met the internship requirements, and is training as a clinical researcher
BSIK Besluit Subsidies Investeringen Kennisinfrastructuur – Decision from the Netherlands government on Subsidies for Investments in Knowledge Infrastructure
DFG Deutsche Forschungsgemeinschaft – German Research Foundation
DFN Diabetes Fonds Nederland – Dutch Diabetes Research Foundation
EMBO European Molecular Biology Organization
ESF European Science Foundation
FES Fonds voor Economische Structuurversterking – Netherlands Fund for Strengthening Economic Structures
FOM Stichting voor Fundamenteel Onderzoek der Materie – Foundation for Fundamental Research on Matter (Netherlands)
FP6 EU Framework Programme 6
FTE Full-time equivalent for research
FTE1st Full-time equivalent for research directly funded by government
FTE2nd Full-time equivalent for research funded by KNAW or NWO
FTE3rd Full-time equivalent for research funded by other organizations
IST Information Society Technologies
ITEA Information Technology for European Advancement
KNAW Koninklijke Nederlandse Akademie van Wetenschappen – Royal Netherlands Academy of Arts and Sciences
KWF Koningin Wilhelmina Fonds – Dutch Cancer Foundation
MPI Max Planck Institute for Psycholinguistics
NHS Nederlandse Hartstichting – Netherlands Heart Foundation
NROG Nationaal Regio-Orgaan Genomics – Netherlands Genomics Initiative
NWO Nederlandse Organisatie voor Wetenschappelijk Onderzoek – Netherlands Organisation for Scientific Research
NWO-EW Nederlandse Organisatie voor Wetenschappelijk Onderzoek, Wetenschapsgebied Exacte wetenschappen – Netherlands Organisation for Scientific Research, Research Council for Physical Sciences
NWO-VNSG Nederlandse Organisatie voor Wetenschappelijk Onderzoek, Vlaams-Nederlandse Samenwerking Geesteswetenschappen – Netherlands Organisation for Scientific Research, Flemish-Dutch Cooperation
Senter An agency of the Netherlands Ministry of Economic Affairs which is responsible for managing grant allocation in technology, energy, environment, export and international cooperation
Spinoza The most prestigious prize (€1,500,000) for scientists in the Netherlands who are at the very top of the research profession, awarded by NWO
STW Technologiestichting STW – Technology Foundation STW (Netherlands)
UMC Radboud University Nijmegen Medical Centre
<table>
<thead>
<tr>
<th>Grant</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Veni grant</td>
<td>Personal grant from NWO (max. value: €200,000) awarded over a period of three years to researchers who have recently obtained their PhD, to allow them to continue to develop their ideas.</td>
</tr>
<tr>
<td>Vici grant</td>
<td>Personal grant from NWO (max. value: €600,000) awarded over a period of five years to researchers who wish to develop an innovative line of research in which they appoint one or more co-researchers.</td>
</tr>
<tr>
<td>Vidi grant</td>
<td>Personal grant from NWO (max. value: €1,250,000) awarded over a period of five years to senior researchers who wish to establish their own research group.</td>
</tr>
<tr>
<td>ZonMw</td>
<td>ZorgOnderzoek Nederland NWO Medische Wetenschappen – Netherlands Organisation for Health Research and Development.</td>
</tr>
</tbody>
</table>